Abstracts of the ASHS Southern Region 58th Annual Meeting

Little Rock, Ark. 31 Jan.–2 Feb. 1998

J.B. Edmond Undergraduate Competition

In Vitro Rooting *Vitis* Single-node Cuttings

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Current propagation techniques for grapevine rootstocks involve rooting cuttings from dormant or actively growing canes and require relatively large amounts of propagation wood. We report an alternative method involving high-frequency, in vitro rooting of single-node cuttings that can be used when limited amounts of plant material are available. Propagation material was taken from greenhouse-grown plants of *Vitis arizonica, V. treleasei,* and *V. treleasei* interspecific hybrids (with *V. acerifolia, V. arizonica,* and/or *V. doaniana*) collected from the wild in New Mexico. Shoots were cut into one-node sections and surface sterilized in 25% commercial bleach for 10 minutes followed by three rinses in sterile water. The cuttings were placed on media containing half-strength Murashige and Skoog (MS) salts, MS vitamins, 20 $g \cdot L^{-1}$ sucrose, 2 $g \cdot L^{-1}$ phytagel, pH 5.8. The cuttings were incubated at 27 °C under a 16-hour photoperiod. *Vitis vinifera* 'Cabernet Sauvignon' and 'Chardonnay' were also rooted under similar conditions. All genotypes investigated rooted, but with varying frequency. Particular selections from the genotypes collected from the wild rooted at high frequency (>84% of cuttings rooted), while 66% of 'Cabernet Sauvignon' and 'Chardonnay' cuttings rooted. Plants were successfully established in the greenhouse. In vitro rooting of single-node cuttings appears to be a valid alternative for grapevine propagation.

Growth and Flowering of *Lagerstroemia* in Response to Pinching, Photoperiod, and Fertilization

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Three experiments were conducted using *Lagerstroemia* 'Victor' and 'Zuni', one on pinching, another on photoperiod, and the third with fertilizer rates. Liners were potted with either one or three liners per container. In the pinching experiment, treatments were 0, 1, 2, 3, or 4 pinches at 0, 2, 4, or 6 weeks after planting. In the photoperiod experiment the plants were exposed to 0, 4, 8, or 12 weeks of short days before being moved to long days. In the fertilizer experiment the plants were fertilized at 0, 200, 400, 600, or 800 $mg \cdot L^{-1}$ nitrogen from 20–10–20 liquid feed and 0 or 6 g per container of 15–11–13 slow-release fertilizer. For both 'Victor' and 'Zuni', three liners per container resulted in plants that were wider and shorter than those with only one liner. Neither timing nor number of pinches significantly affected plant size. Short days prevented vegetative growth and floral development in both cultivars. 'Victor' grew and flowered best after receiving 8 weeks of short days before moving to long days. 'Zuni' grew and flowered best when moved directly to long days after potting. Both 'Victor' and 'Zuni' grew best when receiving either 200 $mg \cdot L^{-1}$ or 6 g of slow-release fertilizer.

Effect of Silver Nitrate on In Vitro Regeneration of Cowpea (*Vigna unguiculata*) Cotyledon Explants

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Cowpea *(Vigna unguiculata* L.) is an important grain legume that is grown extensively in Africa, South America, India, and in the United States. This study investigated the effects of silver nitrate ($AgNO_3$) on regeneration of cowpea cotyledon explants. Silver nitrate at 50 μM significantly increased percent regeneration in comparison to the control. The effect of duration of exposure was also determined with the ethylene inhibitor $AgNO_3$. By exposing explants to 59 μM $AgNO_3$ during different stages of culture, significant increases were actualized in percent regeneration and shoot number. The greatest percent regeneration was obtained when 59 μM $AgNO_3$ was augmented to both the initiation and regeneration media or to only the regeneration media. These results indicate that the low percentage of regeneration of this genotype may be related to ethylene biosynthesis or metabolism. This study resulted in an improved regeneration system for the commercial cowpea cultivar Early Scarlet, and will be useful in developing a cowpea transformation system.

Seedcoat Discoloration in Cowpea (*Vigna unguiculata* L. Walp), cv. Mississippi Silver

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The major markets for cowpea are seed sales and processing. During the storage period prior to sales, some seedcoats of 'Mississippi Silver' darken from tan to varying shades of brown. This darkening is undesirable for the processing market, since it results in an unattractive product lacking uniformity. A series of studies was undertaken to investigate this problem. It was noted that darkening proceeded at a rapid rate when seed were left in the field after drying. Selection against darkening was unsuccessful, and attempts at extracting the colored compound with polar and nonpolar solvents were inconclusive. A method of screening for the darkening trait was devised. It was found that darkening could be induced by exposing seed to a high-oxygen environment, suggesting that oxidation is involved in the darkening process. In support of this, it was found that the lowest rate of darkening occurred when the seed were placed in an enriched nitrogen chamber after harvest.

Norman F. Childers Graduate Competition

Use of Cowpea to Manage Soil Phosphorus Accumulation from Poultry Litter Applications in a Cool-season Vegetable Rotation

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Cowpea [*Vigna unguiculata* L. (Walp.)] cover crops were grown in a rotation with broccoli (*Brassica oleracea* L. var. *italica* Plenck.), spinach (*Spinacia oleracea* L.), and turnip greens [*Brassica rape* L. var. (DC.) Metzg. *utilis*] to evaluate the legume's ability to remove excess P from soils when poultry litter was used as a fertilizer. Fertilizer treatments were litter to meet each crop's recommended preplant N requirements (1X), litter at twice the recommended rate, and urea at the 1X rate as the control. Following the vegetable crops, cowpeas were planted on half of each replication, while the other half was fallowed. The cowpeas were harvested for green-shell seeds and then underwent a simulated haying operation. Soil samples were taken at 0- to 15-cm and 15- to 30-cm depths at the onset of the study and after each crop to monitor plant nutrient levels. The cowpeas effectively lowered soil N levels but not soil P levels. However, there was no consistent evidence of an increase in soil P or K levels with litter applications. All three vegetable crops were successfully grown using poultry litter, although the 1X rate appeared inadequate for maximum production of broccoli and turnip greens.

Applying Conservation Horticulture to Save *Hibiscus dasycalyx*, the Neches River Rose Mallow

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In 1995, the SFA Arboretum initiated a "three Rs"—rescue, research, and reintroduction—endangered plants program, a conservation horticulture strategy that links the Arboretum with the goals of the Texas Parks and Wildlife, U.S. Fish and Wildlife, and other conservation agencies. The program includes two tiers of activity: 1) a 1-acre endangered plants theme garden in the SFA Arboretum for germplasm studies and educating the public, and 2) "introduction" research plots at Mill Creek Gardens, a 119-acre conservation easement 6 miles west of Nacogdoches, Tex. This paper reports on an "introduction" study of one of the most endangered endemics in East Texas, the Neches River rose mallow, *Hibiscus dasycalyx*. A randomized complete-block design with three blocks and four plants per replication was established in Dec. 1995, in a full-sun wetland planting at Mill Creek Gardens. Two mulching regimes (with and without) and four rates of slow-release 13–13–13 were applied at planting and again in Mar. 1996. Data collected in 1996 and 1997 included number of stems, flowering, and the weight of all aboveground growth harvested after the first frosts in both years. After 2 years, 1) 80% survival across all treatments with losses primarily in the wettest portions of the plots, 2) mulch influences are nonsignificant, and 3) plant response to slow-release fertilizer is significant with medium and high rates favored for "at-planting" application.

Education

The Use of Interactive Television in Graduate Education

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Interactive television was successfully used in the fall semester, 1997, to teach a graduate course on nutrition of horticultural plants to resident students at TAMU–College Station and distance education students at TAMU–Commerce, TAMU–Texarkana, and Tarleton State Univ. These campuses are connected with fiber-optic telephone lines, which constitutes the Trans-Texas Video Conference Network. This medium was used by county extension agents, who are working toward graduate degrees, to progress toward graduation and a higher salary. The lab portion of the course was taught on the College Station campus, but distance sites received only the lecture portion with an option to come to College Station in the summer to take the lab as a separate 1-hour, week-long course.

Utilizing a GIS Vegetation Model for a Campus-as-arboretum Development

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This paper outlines the history of the SFA Arboretum's effort to establish a campus-as-arboretum at the university. In 1996, the participants created a robust Geographic Information System (GIS) for the campus forest based primarily on a 1993–95 campus mapping and tree inventory project in the 144-acre main core of the campus (Wilson to North St.; College to Starr). The project served as the MS thesis of Susan Perkins. In brief, the campus model reveals a pine-dominated Type 2 forest (one rapidly approaching maturity), difficult campus hydrology issues, and a landscape low on diversity with 68 species represented. In 1996, the Arboretum's AutoCAD® map and Excel® tree data files were integrated into the College of Forestry Unix-based ArcInfo® platform. This now provides full GIS capabilities for landscape planners. The resultant maps based on user queries reveal a robust vegetation analysis and management tool. In 1997, the SFA administration, Physical Plant, Grounds, College of Forestry, and SFA Arboretum initiated a "campus beautification" funding campaign. The SFA Arboretum will play a key role in building unique, documented, and mapped woody ornamental collections for the campus. This provides a unique opportunity in the South for long-term Zone 8 woody plant evaluation in a high-visibility and "perpetual" landscape.

Posters

Evaluation of *Fragaria Virginiana* from Mississippi for Disease Resistance and Horticultural Traits

James R. Ballington and Barbara J. Smith, 1998. North Carolina State University, Raleigh, NC 27695, and USDA Small Fruit Research Station, Poplarville, MS 39470

Thirty-three accessions of *Fragaria virginiana* collected from Mississippi in 1995 were evaluated for horticultural traits and leaf disease resistance at Reidsville, N.C., and strawberry anthracnose resistance (*Colletotrichum acutatum* and *C. fragariae*) at Poplarville, Miss., in 1997. The range of variability in berry shape, fruit flesh color, fruit skin toughness, and degree of sunkenness of seeds among accessions indicated probable introgression with *F.* ×*ananassa* in most all accessions. Seventeen of 29 accessions screened for resistance to *C. acutatum* were resistant, and an additional 10 were tolerant. Overall, these accessions appear to be good additional sources of resistance to this, the prevalent species of anthracnose in the southeastern United States. In addition, the majority of accessions appear to be tolerant-resistant to leaf scorch, leaf blight, and/or powdery mildew. Nine accessions were resistant to all three leaf diseases, and four were resistant to *C. acutatum* as well as the three foliar diseases. No accessions were resistant to *C. fragariae* and only five were tolerant. All five accessions tolerant to *C. fragariae* were also either resistant or tolerant to *C. acutatum* but the converse was not true.

Performance of New Muscadine Cultivars and Selections in Mississippi

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Eight cultivars, including five recent releases, five selections from the Florida AES, and 16 selections from the Georgia AES were planted in the muscadine germplasm working collection at McNeil, Miss., in 1992. All cultivars and one replication of the selections were evaluated in 1997. None of the new cultivars yielded as much as 'Fry', the standard fresh fruit cultivar. The percent dry picking scar of 'Dixie' and 'Fry' was low. 'Tara', 'Polyanna', and 'Fry' produced the largest berries. Percent soluble solids was lowest in 'Fry', 'Nesbitt', and 'Alachua' but highest in 'Dixie' berries. 'Fry', 'Alachua', and 'Polyanna' had the lowest and the other cultivars did not differ in number of seed per berry. One selection, 33-1-4, appeared to have the qualities of a potential cultivar. Incidence and severity of berry rots were generally low.

Cluster Modification Effects on the Performance of an Arkansas Table Grape Selection

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Flower cluster thinning effects were investigated on A-2274, a large-fruited, seedless table grape selection from the Univ. of Arkansas Grape Breeding Program. The objective of the study was to evaluate flower cluster thinning as a method to enhance cluster size and fill. Treatments included thinning to one flower cluster per shoot, removing one-half of each cluster, and a control (no flowers removed). Each treatment consisted of three, single-vine replications, with each vine being pruned to 32 buds. Removal of entire flower clusters (to one per shoot) resulted in larger clusters and a trend toward higher cluster fill ratings. Berry mass, number of clusters per vine, and yield per vine were unaffected by flower cluster treatment. Berries per cluster were reduced by the partial flower cluster removal treatment. Flower cluster thinning to one cluster proved a beneficial practice in increasing cluster characteristics of this promising selection.

Comparative Organic Acid Profiles of Highbush, Southern Highbush, and Rabbiteye Blueberries

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The organic acid composition of blueberries of three highbush (*Vaccinium corymbosum*) cultivars, three rabbiteye (*V. ashei* cultivars and nine southem highbush (*V. corymbosun* hybrids) cultivars or selections was determined by HPLC. Species means off the individual acids (citric, malic, succinic, and quinic), expressed as a percentage of total acid, formed profiles or patterns that are thought to be characteristic of the species. Citric (75%) was the predominant acid in highbush fruit with lesser percentages of succinic (13%), quinic (9.6%), and malic (2.7%). The percent composition of rabbiteye berries [quinic (49%), succinic (39%), citric (6.7%), malic (5%)] was distinctly different from highbush. The acid profile of southem highbush fruit reflected their *V. corymbosum* heritage with an acid profile similar to that of highbush. When related to a clone's pedigree, these results suggest that organic acid profiles may be a useful screening tool for studying the contribution of southeastern native species such as *V. darrowi* or *V. ashei* to the inheritance of organic acids.

Performance of Peach and Nectarine Cultivars in the Gulf Coast Area of Alabama

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There are a limited number of peach and nectarine cultivars available with chilling requirements that perform well in the Gulf Coast area of Alabama. A test planting of 40 peach and 13 nectarine cultivars was established in 1985 at the Gulf Coast Substation at Fairhope, Ala. The plot was prepared and trees grown according to commercial procedures. Blocks of four trees of each cultivar were planted on a 6 × 6-m spacing. Chill hours were calculated each year based on number of hours at or below 7.3 °C; starting from and including the first 10 consecutive days a total of 50 hours were accumulated to 15 Feb. Data collected included date of full bloom, first harvest date, and total yield. Fruit were measured or rated for skin color, attractiveness, firmness, stone freeness, pubescence, flesh color, dessert quality, shape, weight, percentage with split pits, and occurrence of malformed sutures and extended tips. All cultivars were evaluated for 9 years (1987–95). The best performing varieties are discussed.

Reevaluation of a Desiccating Surfactant for Thinning Peach Blossoms

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The surfactant "Surfactant WK" (dodecyl ether of polyethylene glycol) was applied to peach trees [*Prunus persica* (L.) Batsch] at full bloom over 3 years. Blossoms died rapidly so that within 2 days dead blossoms could be distinguished easily from live blossoms or set fruit. There were strong ($R^2 > 0.87$), linear correlations between concentration of "Surfactant WK" applied and percent blossoms removed and fruit set, which were similar over the 3 years. Trees were hand-thinned according to commercial practices after treatment. There was similar cropload, fruit weight, and yield across treatments at harvest indicating no negative effects by the chemical on productivity. There was only slight limb damage at the highest concentrations of "Surfactant WK," which overthinned blossoms. We recommend that based on the effectiveness, consistency, and lack of significant phytotoxicity, "Surfactant WK" be reevaluated as a thinning chemical for peach trees.

Comparison of Postharvest and Processing Characteristics of Mayhaw

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Fruits from five mayhaw selections were harvested and frozen at −2 °C. Juice was extracted with a steamer and kept in storage at 5 °C until processing. Percent soluble solids, percent malic acid, initial pH, and color were then determined for postharvest characteristics. 550 mL juice was placed in a 2000-mL beaker and heated until boiling. Dry pectin mixed with a portion of the total sugar equivalent to 5–10 times the weight of the pectin was sprinkled into the boiling juice. Once pectin was in solution, the amount of sugar to obtain a ratio of ≈45 parts fruit : 55 parts sugar was added to the mixture. The mixture was cooked until the soluble solid reading reached 65% and then poured into jars to cool to room temperature. The five mayhaw jellies alone with one commercial apple and one commercial mayhaw were evaluated using a panel preference test. Evaluation was based on a scale from dislike extremely to like extremely. Preference scores indicated that mayhaw jellies were preferred to a commercially available apple jelly. There was a definite preference to deep red colored jellies. The specific varietal jellies were preferred to a commercially available mayhaw jelly.

Hydrophilic Polymer Amendment in Field Soil to Improve Establishment of Perennial Wildflowers at Transplanting

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Perennial wildflowers, once established, are a low-maintenance alternative in a flowerbed. However, water stress and poor root development in field soil can be detrimental to young plants at the time of transplanting. A fully expanded hydrogel, HydroSource, was incorporated to replace 0% (control), 7.5%, 15% (recommended rate), and

30% of the volume of a clayey field soil to determine its effect on plant water status. Addition of hydrogel reduced water stress in *Asclepias incarnata* and *Gaillardia grandiflora* plants. Plants growing in hydrogel amended soil had: 1) significantly lower stomatal resistance ($P < 0.01$); and 2) significantly higher leaf water potential ($P < 0.01$). *Gaillardia grandiflora* control plants showed considerable wilting (reflected in high stomatal resistance and low water potential readings) on the 3rd day of the drought period while those with 15% and 30% hydrogel were turgid even on the 5th day. Hydrogel-amended soil appeared less compacted, and root growth in *Asclepias incarnata* increased with the increasing rate of hydrogel added to the soil.

The Use of Crumb Rubber as a Container Component for Lantana Production

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Lantana camara 'New Gold', 'Irene', and 'Patriot Dove Wings' were planted in five pine bark-based media containing 0%, 12.5%, 25%, 37.5%, and 50% crumb rubber. Each medium was amended with 7.14 kg·m^{-3} dolomite lime, 0.892 kg·m^{-3} of Micromax, and 4.76 kg·m^{-3} of 17–6–12 Nutricote fertilizer. Height and visual quality ratings were taken at 4 and 8 weeks. Dry weights were taken when the experiment was terminated. There were no significant differences in height, visual quality, and dry weight of 'New Gold' lantana for all crumb rubber rates. 'Irene' grew taller and had higher visual quality rating in the 4th week with 12.5% and 25% crumb rubber. This trend continued in the 8th week with taller plants grown in 25% crumb rubber. However, there were no differences in plant quality. Dry weight of plants grown in 37.5% and 50% crumb rubber was reduced when compared to the control. There were no differences in growth or quality of 'Patriot Dove Wings' at week four. At week eight a reduction in both height and visual quality occurred with 37.5% and 50% crumb rubber. Plant dry weights were also significantly reduced at >37.5% crumb rubber.

A Practical Lysimeter for Determining Nutrient Loss by Leaching in Mulched Landscape Plantings

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Lysimeters have been used extensively in the study of soil water and the movement of compounds in solution. In the management of landscape plantings where the use of various fertilizer application methods is common, loss of NO_3-N from the fertilizer source may limit plant growth and be less cost-effective. During a study examining the influence of mulch type (cottonseed hulls, cypress wood, pine bark, and pine straw) and fertilizer application method (granular, liquid, and time-release), a simple lysimeter was constructed to examine NO_3-N loss under normal irrigation and cultural practices in annual beds. Losses of large quantities of NO_3-N were initially seen in all treatments during the 1st week followed by a gradual decline to the study's end. Liquid and time-release fertilization methods contained NO_3-N as a partial source of N and limited plant growth due to early rapid N loss. Granular fertilizer contained no NO_3-N source and demonstrated the greatest plant growth at the lowest cost per square meter.

The Effects of Drainage Hole Size on Container Leachate

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One component of container production influencing the water quality concerns in the nursery industry is the amount of container effluent leaching from the container substrate. Potential exists for reduced water use, less leachate volume, and improved irrigation efficiency by altering the container design. This research compares the container leachate volume from a standard, 11.3 l (# 3) container with seven 1.9-cm-diameter drainage holes to containers with one, three, or five holes with diameters of 1.9, 0.9, and 0.5 cm. Leachate volume was 41% less (312 to 182 mL) when the diameter of the drainage hole was reduced from 1.9 to 0.5 cm. Nitrate-N was 85% less (3093 to 452 mg) when the container drainage holes were reduced to 0.5 cm. Plant growth and quality of *Lagerstroemia fauriei* x *L. indica* 'Hopi', crapemyrtle, was similar in all container modifications.

Effects of Ammonium, Nitrate, and Zero Leachate on Poinsettia

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Nitrate nitrogen has been recommended as the best form of nitrogen for the production of poinsettia while ammonium and urea have been reported to be deleterious to poinsettia growth. Recent studies have indicated that lower nitrogen and leaching levels will produce quality poinsettias. Poinsettias were grown with 21–7–7 Acid Special (9.15% NH_4, 11.85% urea), 20–10–20 Peat-lite Special (7.77% NH_4, 12.23% NO_3), 15-220 plus Ca and Mg (1.5% NH_4, 12.7% NO_3, 0.8% urea), and 15–5–15 Excel CalMag (1.2% NH_4, 11.75% NO_3, 2.05% urea) applied at 200 mg·L^{-1}. Plants were fertigated by drip irrigation with zero leachate. There were no significant differences between fertilizer treatments for plant height, width, bloom diameter, and dry weight. Electrical conductivity and pH did vary significantly between treatments; however, this did not effect plant growth. Thus, by using lower nitrogen levels and zero leachate, quality poinsettias can be grown with commercial fertilizers high in ammonium/urea or high in nitrate nitrogen, or ammonium and nitrate in combination.

Slow-release Fertilizer Source and Rate Affects Fall Garden Mum Vegetative Growth

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Three slow-release fertilizer formulations (Osmocote 14–14–14, 18–6–12, and Nutricote 17–6–10) at three rates (1, 2, and 3 lb/yd^3) were incorporated into 4 pine bark : 1 sand (by volume) media filling 1-gal nursery containers. Additional treatments included slow-release fertilizer formulations at 1 lb/yd^3 fertigated with 100 ppm N 20–10–20 fertilizer. As fertilizer rates increased, vegetative height, width, and dry-weight accumulation generally increased for both pinched and no-pinch mum crops. Fertigated pinch and no-pinch mums were the largest plants with the greatest dry-weight accumulation for each fertilizer formulation. The high rate for all slow-release fertilizers produced the greatest vegetative growth for nonfertigated treatments. This research suggest that higher rates for incorporated slow-release fertilizers and/or fertigation are required to produce maximum vegetative growth.

Conception and Development of the Carolina Children's Garden

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The Clemson University Sandhill Research and Education Center is one of four branch stations of the South Carolina Agriculture and Forestry Research System, with a mission to conduct research and extension education programs in urban ecology. The Carolina Children's Garden has been created in partnership with other state agencies, funding sources, and volunteers as a site for environmental education. Learning from gardens and landscapes has steadily decreased since the late 1940s and today the average child spends 6 hours at indoor pursuits at school, an equal number at the television or computer screen at home, leaving little time for outdoor exploration. Recently, children's gardens have been established around the county as resources to reconnect children with their environment. The 2-acre Carolina Children's Garden is an interpretive framework for visitors to experience gardening as a tool for bringing families in touch with nature, each other, and local environmental issues. A volunteer team designed and installed eight theme gardens, an entertainment stage,

and picnic area as the first phase of this garden. Themes include Mesozoic Memories Dinosaur Garden, Three Bears Garden, Growing Healthy Garden, Butterfly Garden, McGregor's Garden, and Alphabet Garden. The development of the garden has generated community interest and positive media exposure, inspires lifelong appreciation of the natural environment, encourages replication of ideas, and facilitates family recreation in a learning environment.

Branching, Growth, and Flowering Responses of *Perovskia atriplicifolia* to Florel, Sumagic, and B-Nine

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Russian sage (*Perovskia atriplicifolia*) grown in a pine bark medium in 1-gal containers were sheared to a height of 15 cm on 20 June 1997. One day later the plants were treated with foliar sprays of Florel (ethephon) at 0, 500, or 1000 ppm. One week later, sprays of B-Nine (daminozide, 5000 ppm) or Sumagic (uniconazole, 15 ppm) were applied to some of the plants previously treated with Florel, or previously nontreated. Three weeks after initial treatments, the Florel (500 and 1000 ppm) and the Sumagic treatments, applied individually, reduced plant height by 26%. The B-Nine treatment reduced height by 18%. Combination treatments (Florel followed by Sumagic or Florel followed by B-Nine) provided additional height control Florel at 500 or 1000 ppm significantly increased branching of *Perovskia*. Additional treatments with B-Nine or Sumagic had little effect on this response. Florel delayed flowering by ≈7 to 10 days.

Cotyledon Age and Somatic Embryogenesis of Cowpea

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Somatic embryogenesis can be used to facilitate the improvement of traits in plants. The study was conducted to assess different ages of immature zygotic cowpea (*Vigna unguiculata* (L. Walp), "MN13" cotyledons for their ability to produce somatic embryos. Cotyledons were harvested weekly for the first 8 weeks following anthesis. After removal of their embryo axes, they were cultured in Murashige and Skoog (MS) medium containing 0.6% agar, B-5 vitamins, 3% sucrose, and 20 $mg \cdot L^{-1}$ 2,4-dichlorophenoxy acetic acid (2-4D). Cotyledon explants of all the ages produced calli. The percentage of explants producing calli ranged from 32% to 92%. On transfer of the calli to similar medium containing 0.2% gellan gum instead of 0.6% agar, all ages except those from the 1-week cotyledons produced white globular somatic embryos. The largest of these embryos were 9 mm in length. The highest frequency of globular embryos was produced with the 3- to 5-week-old cotyledons.

'Charleston Greenpack': A New, Blackeye Cowpea Mosaic Virus–resistant, Pinkeye-type Southernpea with Green Cotyledons

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The USDA has released a new, pinkeye-type southernpea cultivar that is homozygous for the *gc* gene conditioning the green cotyledon trait. The new cultivar, 'Charleston Greenpack', can be harvested at the near-dry stage of pod maturity without loss of the pea's fresh green color. 'Charleston Greenpack' originated as a bulk of an F8 ['Kiawah' x ('Kiawah' x 'Bettergreen')] population grown in 1994. Except for the green seed color, a tendency for a slightly greener foliage, and a slightly smaller pea size, the phenotype of 'Charleston Greenpack' is quite similar to those of 'Coronet' and 'Pinkeye Purple Hull-BVR'. The results of replicated field tests indicate that 'Charleston Greenpack' yields are comparable to those of 'Coronet' and 'Pinkeye Purple Hull-BVR'. Results of raw product evaluations conducted at a commercial freezing facility indicate that 'Charleston Greenpack' produces an excellent processed product. 'Charleston Greenpack' has excellent field resistance to blackeye cowpea mosaic virus, the major pathogen of southernpea in the United States.

Sweet Corn Performance under Different Tillage Systems

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The performance of two sweet corn *(Zea mays* var. *saccharata)* cultivars grown in the Rio Grande Valley in Spring 1997 were evaluated under three tillage practices. On 25 Apr. 1997, 'Champ' and 'Sensor' seeds were sown on 0.76-m row centers of 4.6 × 91-m (12 × 300-ft) plots which had been in continuous conventional (CT), minimum tillage (MT), and/or no tillage (NT) since Aug. 1994. All production inputs were similar except tillage practice. Ears were harvested beginning 16 Jun 1997. Cultivars differed in leaf greenness, plant stand ($P < 0.11$), ear diameter, length, and dry matter, percentage of total yield at first harvest, season yield, and ears/ha. 'Sensor' ears had higher concentrations (dry-mass basis) of total N, K, S, NO_3, and B, but lower concentrations of Mg ($P < 0.06$), Ca, Fe, and Mn than did 'Champ'. *Amaranthus* spp. weed populations were higher in 'Champ' then in 'Sensor' tillage treatments. MT and CT resulted in greater ear attributes, yield, ears/ha, and less corn earworm damage, lower ear S concentrations, and fewer total weeds/ha than corn grown with NT. Plant stand was highest in CT plots. Weed populations of *Panicum* and *Amaranthus* spp., but not Texas tridens [*Tridens texanus* (S. Wats.) Nash] or common purslane (*Portulaca oleracea* L.), were higher in NT-grown corn than MT- or CT-grown corn.

Cell Size and Pretransplant Nutritional Conditioning Influences Early Vine Growth and Yield of Transplanted Watermelon

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Research is needed to better understand the influence of cell volume and fertility on watermelon transplant size and field performance in order to determine the most economic production practices. 'Jubilee' watermelon transplants were grown using a 4 × 4 factorial experimental design consisting of 4 cell volumes (30.7, 65.5, 147.5, and 349.6 cm^3) and 4 fertility rates (0, 1/4, 1/2, and full-strength Hoagland's solution). Transplant shoot dry weight significantly increased as cell volume and fertility increased. Increasing cell volume linearly increased watermelon number/ha and tons/ha for early and total harvest in 1995. The average weight per watermelon significantly increased for early-harvested fruit but not for total harvest as cell volume increased in 1995. Soluble solids concentration linearly increased with increasing cell volume for early and total harvests in 1995. Cell volume had no significant influence on the harvest parameters measured in 1997. In 1995, increasing fertility linearly increased watermelon number/ha and tons/ha for early harvests. Increasing fertility increased the soluble solids concentration linearly for early-harvested watermelons in 1997 but not in 1995. Fertility rate had no significant influence on any of the other harvest parameters measured in 1995 and 1997. The growing conditions and disease pressure in 1997 reduced melons/ha, yield, and soluble solids content when compared to 1995 values. The half-strength Hoagland's solution produced the greatest number of watermelons/ha, tons/ha, and the highest soluble solids concentration in 1995 and 1997. Pretransplant nutritional conditioning had no significant effect on total 'Jubilee' watermelon production in Louisiana for 1995 and 1997.

Potential for Recyclable Plastic Film for Vegetable Production

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A clear polyester plastic was evaluated to determine if its physical properties were suitable for vegetable plasticulture. Integrity of the clear plastic was greatly reduced if edges were damaged or torn, resulting in ripping during the mulch laying process. All six punching devices evaluated for planting holes performed well on the black plastic. Flame burner rated highest for the clear plastic and the lowest rating was achieved with the standard transplanter wheel punch. Clear

plastic deteriorated quickly and by 78 days after laying was brittle. Where paint treatments provided adequate coverage, deterioration was greatly reduced. Weed growth under clear plastic was a problem early, but weeds soon died due to heat accumulation under the clear plastic. Despite a lower cost, limited agricultural use could be made of this material.

Controlling Deer Damage to Vegetable Crops with Organic Products

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Because deer pressure in Alabama is high, the efficacy of Garlic Barrier™ (GB) in controlling deer damage was evaluated with sweetpotato (SWP), southernpea (STP), sweet corn (SC), and zucchini squash (ZSQH). GB was applied on or around the plots at 10× the recommended rate. Damage was rated three times weekly on a 0 (0% damage) to 5 (100%) scale between 15 June and 18 Sept. All damage observed was unambiguously attributed to deer. GB on the plot significantly ($P < 0.02$) reduced grazing damage to SWP and STP, but not enough to prevent economical losses. Protection from GB around the plots was similar to the unsprayed control. Damage to SWP began 3 days after establishment. Damage to STP was limited to the developing pods. No damage was observed to SC and ZSQH ($P > 0.37$) during vegetative and reproductive stages. These results document scientifically the deer-repellent property of GB under natural conditions when applied directly on the plants. However, in its present formulation and under severe deer pressure, GB alone may not provide economical protection.

Soil Phosphorus Removal as a Function of Cropping System

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A factored experiment was established at the Texas A&M Univ. Research and Extension Center at Overton in Spring 1995. The objective was to investigate the use of warm- and cool-season legume cover crops in vegetable cropping systems for reducing phosphorus (P) accumulation from poultry litter (PL) and commercial blend (CB) fertilizer. PL rates were based on soil test nitrogen (N) requirement of the vegetable crop and percent N content of the litter. This was considered the 1X rate. Fertility treatments were applied to the vegetable crop only. PL was applied at O, 1X, 2X and 4X rates. CB was applied at recommended rates for N, P, and K. The vegetable crops were: Spring 1995—watermelon; Fall 1995—turnip; Spring 1996—tomato; Fall 1996—collard; Spring 1997—squash. The legumes were: spring—Iron and Clay cowpea; fall—crimson clover. Dry-matter yield of cowpeas and clover was not affected by fertility treatment in any of the years studied to date (Spring 1995, 1996, 1997). Plant concentration of P for both cover crops was increased all 3 years as rate increased. PL applied at the 1X rate maintained P levels in the surface 0–15 cm of soil at 60 mg·kg^{-1} over the five-season study period. CB maintained levels of P equal to the control. A cropping system of spring vegetable–fall legume greatly reduced P accumulation. A reduction in P was also noted from a system of fall vegetable–spring legume, but not as pronounced. The greatest accumulation was with a system of spring vegetable–fall vegetable.

Recovery of Declined Pear Tree Vitality through Grafting with Scions from a Vigorous Cultivar

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Taiwan, located in subtropic regions, naturally is not an ideal region for temperate-zone fruit trees' production due to the supra-optimum temperature, heavy rainfall, and higher relative humidity in summer and insufficient chilling in winter. Higher relative humidity and temperature in summer and autumn months cause excessive vegetative growth, resulting in poor flowerbud initiation and formation. Typhoon invasions result in the severe damage of twigs as well as the loss of quality and yield of fruits. In order to overcome these natural barriers, Hengshan *(Pyrus serotina* Rehd.) pear has been selected as a major cultivar for lowlands in Taiwan. It has low-chilling requirement and higher temperature tolerance. Branches of Hengshan are pulled and tied to a horizontal wire net to adapt to the environmental status. This trellis system enhances flowerbud initiation through the retardation of vegetative growth. It also induces numerous water shoots. Scions from high-chilling cultivars grown at a high altitude on mountains are grafted onto water shoots of Hengshan pear trees. The system has been successful in the production of both high-chilling pears in June and the Hengshan pears in August, and has made production of both pears an important industry in Taiwan. Heavy load and trellis systems, however, result in hastening the senescence of Hengshan trees. Vitality of trees could be restored by grafting scions from a vigorous cultivar, *P. koehnei,* onto the terminal position of the branches. The practice resulted in several advantages including: 1) uniform growth of branches, 2) redistribution of water shoots, 3) inducing formation of calluses on old damaged trunks, 4) quick recovery of mealybug-damaged branches, 5) rejuvenation of branches, and 6) termination of dormancy.

Flower Bud Initiation in Primocane-fruiting, Tetraploid Blackberry Germplasm

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Floral initiation (FI) was studied both in greenhouse- and field-grown plants of primocane-fruiting (PF) blackberries recently developed by the Univ. of Arkansas. Root cuttings of A-1836 and APF-13 were dug from the field and planted in a greenhouse on 1 Mar. 1997. NC 194 was included only in the field study. Terminal apices were sampled weekly starting at 0 (just before emergence) nodes of growth on 21 Mar. Floral primordia were first seen at five and six nodes of growth in greenhouse-grown A-1836 and APF-13, respectively, 35–42 days after root cuttings were planted (DAP). Under field conditions, the same event was not observed until 21 May when A-1836 and APF-13 reached at least 20 nodes; NC 194 did not show evidence of floral parts until 10 July. Once FI occurred, floral differentiation proceeded uninterrupted until completion. Blooming occurred 32–35 and 40–45 days after FI in APF-13 and A-1836, respectively; NC 194 bloomed in late August. The first fruits of APF-13 were harvested 120 DAP. These findings demonstrate that PF blackberries form flower buds soon after a short period of vegetative growth. This information should be useful for implementing horticultural practices, such as programming of the harvest date.

In Vitro Germination of Native Terrestrial Orchids

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Scarification treatments (a control, a 10-minute vacuum, or a 1.5-minute ultrasound), different media (modified Norstog and Van Waes) and growth regulators [benzyladenine (BA) at 0, 1, 1.5, or 2 mg·L^{-1} and 6-(*r,r*-dimethylallylamino)-purine riboside (2iPR) at 0, 1, 1.5 or 2 mg·L^{-1}] were used in combination to increase seed germination of *Cypripedium calceolus* var. *parviflorum.* Seeds treated with ultrasound had higher germination (58.0%) than those treated with vacuum (27.4%) or controls (19.2%). Germination rates increased with 2iPR level and reached a maximum between 1.5 and 2 mg·L^{-1}. Seeds on Van Waes medium, which were not transferred to fresh medium after germination, had a severe browning problem causing many protocorms to die. Those on Norstog medium continued to grow into seedlings with less browning. Germination rates of *Calopogon tuberosus* × *Calopogon* 'Adventure' and *Liparis liliifolia* were determined on the different media and growth regulator treatments. Multiple shoots of *Calopogon* developed from single seeds on media containing growth regulators. Flower buds formed in vitro on *Calopogon* in media containing 1 mg·L^{-1} or higher BA 5 months after germination. *L. Iliiifolia* seeds in Norstog medium had a higher proportion of germination than those in Van Waes medium.

Vegetable Crops

'Betasweet' Carrot Designed for Flavor, Nutrition, and Health

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'BetaSweet' is a new "designer" carrot that was conceived as a research project with the objective to create a new high-quality vegetable with unique characteristics. The gene responsible for purple or maroon color in carrots is a natural one and has been around for many years. Carrot breeders have discarded carrots which occasionally segregated to this color because orange has been the preferred traditional color. In 1989, three carrots grown from Brazilian seed were observed to have a blotchy maroon color mixed with the normal orange. Within two generations of breeding effort I had obtained a few carrot roots with near complete maroon exterior color and orange interior. The contrast of orange and maroon was very attractive in carrots cut as coins or sticks. The maroon and orange color would serve as the perfect way to identify and promote this new variety. Several additional generations were required using extensive laboratory testing for low terpenoids (strong carrot flavors), high sugars, high carotene, and crispy texture. Thousands of carrot roots were analyzed and selected for those qualities and for the dark maroon exterior and orange interior colors. The few best for those characteristics were intercrossed, and reselected for their adaptation when grown under Texas climatic conditions.

Seeding Rate Affects Turnip Root Production

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A precision seeder (Stanhay Model 870) and a bulk seeder (Planet Jr.) were used to evaluate the effects of precision seeding, seed spacing, and row configuration on yield and grade-out of two cultivars of root turnips. Seed spacings for the precision seeder included within-row (WIR) spacings of 56, 112, and 168 mm in single plant line/row and 112 and 168 mm in two plant lines/row. Seed spacings with the bulk seeder were obtained by using 100% viable seed or a 50% viable : 50% killed seed mix. The experiments were conducted during the spring and fall on two rows on a 1.2-m-wide bed. Total yield was not affected by plant population or seeder. Plant population, however, caused a shift in yield among grades. Yield of culls increased as plant population increased. Yield of extra-large (>114 mm) roots decreased as plant population increased. Turnips seeded 168 mm apart in a single line/row yielded more extra-large and large (25–114 mm) grade roots and less medium (4–24 mm) and cull (<4 mm or misshapen) roots. More consistent results were obtained with the precision seeder than the bulk seeder. During both seasons, yield was lower for the hybrid ('Royal Crown') cultivar than for the open-pollinated ('Purple Top White Globe') cultivar.

Genotype×Environment (G×E) Interaction in Southernpea [*Vigna unguiculata* (L.) Walp] Genotypes in the Southeastern USA

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Genotype by environment (G × E) effects in Regional Cooperative Southernpea trials for the southeastern United States were investigated to characterize the extent, pattern, and potential impact of G × E on seed yield of southernpea [*Vigna unguiculata* (L.) Walp] genotypes. The structure of G × E effects was investigated using the Additive Main Effect and Multiplicative Interaction (AMMI) method. AMMI analyses revealed a highly significant genotype × environment interaction, most of which was partitioned into a genotype × location component of variance. AMMI first principal component axis scores stratified environments into two groups that minimized variation within groups. Biological interpretation of groupings and visual assessment of the AMMI biplot, revealed high-yielding genotypes interacting positively with one group of environments and conversely, low-yielding genotypes interacting positively with the other group. There were some significant rank changes of genotypes as yield potential varied across environments. Some environments showed similar main effects and interaction patterns indicating that most of the G × E effects could be captured with fewer testing sites, and consequently redundancy of some testing environments over years.

Tomato Production on Sand with Polyethylene Mulch, Microirrigation, and Using Banded Compost as Soil Amendment

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Tomatoes, cv. Agriset 761, were grown in Spring and Fall 1996 at three compost rates, 0x, 1x and 2x (1x = 12 t·ha^{-1}). Production system was the full-bed polyethylene mulch with micro- (trickle-) irrigation. The crop in each treatment received (kg·ha^{-1}) 73 N, 34 P, and 121 K from preplant dry, and 225 N and 372 K from injected liquid fertilizers in 117 days during the spring and in 107 days in the fall. Plant growth (plant height) was best with the 1x compost rate. Fruits were harvested five times in the spring and four times in the fall. Compost amendments in both seasons delayed fruit maturity. In the spring, marketable yields in the first two harvests were higher ($P \leq 0.05$) without than with compost. For the season, marketable yields (t·ha^{-1}) were 57 with 0x, 71 with 1x, and 77 with 2x compost rate ($P \leq 0.001$). In the fall, yield differences were smaller or nonsignificant among the treatments and marketable yields for the season were highest with the 1x compost rate.

Preliminary Evaluation of Extended Shelf-life Tomatoes under Tennessee Conditions

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Eight extended shelf-life hybrid tomato cultivars, along with six conventional entries including the commercial cultivars, 'Sun Leaper' and 'Plum Dandy', were evaluated at The Univ. of Tennessee Agricultural Experiment Station. Plants of extended shelf-life cultivars had an indeterminate growth habit and were 18 cm taller than plants of the determinate conventional cultivars. Subjective ratings for disease incidence were less for extended shelf-life cultivars early in the season but were no different late in the season. Fruits were harvested at the pink stage over a 4-week period and graded by size according to the Los Angeles lug arrangement. Yields from extended shelf-life cultivars ranged from 2000 to 2666 with an average of 2394 boxes of marketable fruit per hectare. Yields from conventional cultivars averaged 2323 boxes of marketable fruits per hectare. Yields of fruits occurring in the 5 × 5 and larger size ranges were greater for the extended shelf-life cultivars, while the reverse was true with yields of fruits in the 6 × 6 range. Extended shelf-life cultivars produced more cull fruits than conventional cultivars. For firmness comparisons, fruits were selected from the 4 × 5 grade and stored at a temperature of 22 to 24 °C. Starting 2 days after harvest, fruits were subjectively evaluated at 2-day intervals by hand-squeezing, using a rating scale of 1–5, 5 being equivalent to that of the firmness of a mature green fruit of the same size category. Fruits of extended shelf-life cultivars were firmer at harvest and remained firmer during 12 days of postharvest storage than those of conventional cultivars.

Lab Screening of the Wild Tomato, *Lycopersicon peruvianum*, for Foliar Resistance to the Tomato Fruitworm, *Helicoverpa Zea*

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A lab screening method has been devised to evaluate a diverse

population of a heterogeneous wild tomato species for foliar resistance to tomato fruitworm. This method isolates neonate fruitworms on individual, 25-day-old plants. The larvae are allowed to consume the plant material for 4 days, after which they are removed from the plants, weights are taken and percent survival recorded. The trial is conducted in a growth chamber at a constant temperature of 28 °C with a 16-hour light cycle. The replications are set up as a complete randomized block design. Preliminary data reveal at least two plant introductions expressing strong foliar resistance to *H. zea,* showing a significant difference from the susceptible control, *L. esculentum,* and no significant difference from the resistant control, *L. hirsutum* f. *glabratum.*

Influence of Mechanical Scarification on Emergence and Seedcoat Adherence of 'Genesis' Triploid Watermelon

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Production of triploid watermelon [*Citrullus lanatus* (Thunb.) Matsum & Nakai] transplants is hindered by low and nonuniform emergence, and seedcoat adherence. Seedcoat adherence leads to weakened and slow-growing plants. High seed costs are prohibitive to many transplant growers. Improvement of emergence would lower financial risks to growers and transplant producers. Mechanical scarification was examined as a means to decrease the impact of both problems. Seeds of 'Genesis' triploid watermelon were placed in a cylinder with 100 g of very coarse sand and rotated for 6, 12, 24, and 48 hours at 60 rpm. Nontreated seeds were used as a control. Data were taken daily on emergence and seedcoat adherence. The experiment was repeated at three temperature regimes. No significant differences were observed in seedcoat adherence. Scarification, however, did significantly improve emergence under test conditions.

Effects of Amisorb on Muskmelon and Bell Pepper

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The active ingredient of a product known as "AmiSorb" is carpramid, a long-chained polyaspartate polymer. This product is currently being marketed as a soil or irrigation water applied nutrient absorption enhancer for vegetable crops. Our objective was to evaluate the growth, yield, and leaf photosynthetic responses of muskmelon (*Cucumis melo* L., 'Caravelle') and bell pepper (*Capsicum annuum* L., 'Enterprise') to a range of carpramid application rates under well irrigated and fertilized conditions. Carpramid solutions were applied at concentrations of 0, 200, 400, 600, and 800 mL·L^{-1} (0 to 0.18 mL per carpramid plant) in both greenhouse and field experiments. Biomass of individual plant parts and leaf area were measured at weekly intervals during the greenhouse experiment by destructive sampling. Light saturated leaf photosynthetic rates as a function of both carpramid treatment as well as leaf position on the vine were measured for muskmelon in the field experiment. Final yield was determined for both muskmelon and bell pepper in the field experiment. None of the plant response variables were significantly ($P \leq 0.05$) affected by carpramid treatment in either the greenhouse or field experiments. Leaf photosynthetic rates increased from the youngest leaf on the vine to the sixth leaf, counting basipetally. We conclude that further research under nutrient deficient conditions may be warranted for this product.

Web-based Tool for Diagnosing Cucurbit Disorders

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Plant problems often are diagnosed by comparing the problem in hand to a set of color photographs of known symptoms. Color photographs are expensive and time consuming to publish and distribution of books and pamphlets is costly. Delivery of high resolution color photographs of common plant disorders via the World Wide Web is a cost-effective alternative. A web-based diagnostic resource has been created to assist problem identification of cucurbit disorders including nutritional, disease, and insect problems. The diagnostic tool consists of arrays of high resolution, color images grouped by similarity of appearance. The image arrays are clickable image maps, and the user is provided with increasingly detailed information and larger images as images are selected. At the final selection, the user is presented with a full screen image and text information describing the identity and control recommendations for the problem illustrated. This tool is intended to allow experienced diagnosticians to confirm a problem diagnosis, and to aid less experienced individuals in making proper diagnoses.

Regional Vegetable Variety Trials: Myth or Reality?

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Vegetable variety trials (VVT) are of interest to the entire vegetable industry from breeders, seed companies, growers, consultants, researchers, to Extension personnel. However, despite their importance VVT have always been given little-to-no scientific merit. In a period where resources are limited, regional VVT may provide a way for Land Grant institutions to include VTT as an entire part of their effort. This presentation will discuss the advantages (better use of resources, increased service to industry), challenges (credit given to VTT authors during tenure, timeliness of publication, uniformity of methods), and opportunities (publications in *HortTechnology*, regional publication, VTT web page, SR-IEG) associated with VVT. Participants will be given an opportunity to express their opinion through a questionnaire. Together with industry response, results will be used to inform the administration and work toward a regional VTT for the Southeast.

Adaption of a Spectrophotometric Assay for Pungency in Onion to a Microplate Reader

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A spectrophotometric assay for pyruvic acid in onion has been adapted to a microplate reader. Correlations between the spectrophotometer and microplate reader ranged from 0.991 to 0.997 for sodium pyruvate standards and 0.899 to 0.934 for onion samples. Onion pungency values were slightly higher with the microplate reader for both sample and background compared to the spectrophotometer when both are used in the single wavelength mode. Comparing the spectrophotometer in the single wavelength mode to the microplate reader in the dual wavelength mode resulted in no statistically significant difference between them. Standards for both the microplate reader and spectrophotometer followed a quadratic function.

Do Cell Size and Age Influence Growth and Yield of Containerized Onion Transplants?

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The effect of cell volume and age of 'Texas Grano 1015Y' onion transplants on survival, growth, and yield were evaluated. Transplant ages and cell volume were 5, 7, 9, and 11 weeks (W) and 6.5 cm^3 and 20.0 cm^3 in Florida; and 6, 8, 10, and 12W, and 4.0 and 7.1 cm^3 in Texas. In Florida, total yields were unaffected by transplant age and cell volume, but jumbo size bulbs increased with increasing age from 5 to 9W in 6.5 cm^3 cells. Bulb size increased significantly for 11W transplants only in 20.0 cm^3 cells. In Texas, survival was reduced for 6W compared to ≥8W transplants. At planting, root count increased linearly with age. Cell volume did not affect root count, plant height, or leaf number, but shoot dry weight was greater in 7.1 cm^3 compared to 4.0 cm^3. Total jumbo and large size yields were highest for ≥10W in 7. 1 cm^3 and ≥8W in 4.0 cm^3 cells. Total yields were unaffected by cell size but seedlings in 4.0 cm^3 had a 16% decrease of jumbo size compared to 7.1 cm^3. The use of 10 and 12W transplants produced in small cell sizes may be viable for onion establishment.

Potential for Jicama in Southeast Georgia and Effects of N Fertility

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Jicama (*Pachyrrhizas erosus* L.) is a vigorous herbaceous vining plant of the Leguminosae family. Native to northern Central America and Mexico, it is produced commercially in Hawaii, Puerto Rico, and in warm regions of the southwestern United States. Also known as yam bean, Jicama produces a starchy edible root, although mature pods may be poisonous. This study was undertaken to evaluate the potential for Jicama as a crop in southeastern Georgia and to get some information on the N requirement of the crop. Jicama seeds were planted on 29 May 1997 in three row plots. The planting was arranged with 61 cm between rows and 20 cm between plants in the row. Plots were 6 m long. Each plot received one of five N rates: 0, 30, 60, 90, and 120 $kg \cdot ha^{-1}$. Treatments were replicated four times. Otherwise normal cultural practices were employed. Data were collected at harvest on 2 Dec. on number and weight of marketable roots, average root size, percent marketability, external and internal color, and root diameter. There were no significant differences among treatments for any of the parameters measured. However, most of the parameters measured showed some linear relationship to fertility level. Jicama produced under lower fertility levels revealed smaller roots, lower yield, and lower percent marketability. External color of roots with lower fertility levels were darker which may have contributed to a lower percent marketability. N fertilizer at between 60 and 120 $kg \cdot ha^{-1}$ seems most appropriate for this crop in southeastern Georgia.

On-farm Demonstrations: A Simple Approach to Designing Drip Irrigation Systems for Small and Part-time Vegetable Growers

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Many small and part-time commercial vegetable growers in Alabama rely on rainfall to provide irrigation for their crops. This, coupled with limited financial resources, creates situations where poor-quality produce and low yields are common. Working cooperatively with county extension agents, growers that met a series of criteria and that could benefit from drip irrigation were identified. An on-farm result demonstration and educational program was developed to help combat this problem by emphasizing the importance of irrigation and introducing affordable drip irrigation systems for these growers. County agents and growers participated in an educational program, which involved a daylong course covering the basics of drip irrigation and hands-on training with all components of the drip system. Necessary background information on each site was collected and a drip irrigation system was designed for each site. Next, each grower was provided with all of the necessary materials and equipment needed to install the system. The overall flexibility in the basic design was stressed and several growers modified their systems with items that provided various levels of automation, or the capacity to fertigate. Fifteen on-farm demonstrations in 14 counties were developed ranging from 0.08 to 0.60 ha in size. Cost for this equipment (layflat, fittings, drip tape, regulators, filter) was ≈$230 per site. Success of each demonstration varied. Overall, growers were positive about using drip irrigation and that it was affordable. Most planned on continuing or expanding its use next season.

Metering Nonuniform Vegetable Seed

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Selecting the proper seeder setup to effectively meter a given seed lot can be very difficult for a vegetable grower, especially if the seed lot is not graded for size uniformity. A belt-type seeder should be able to effectively singulate the seeds if the seeds are spherical and uniform because the holes are specifically sized. Seeds that are not graded for size uniformity may not be singulated effectively by a belt-type seeder. A vacuum-type seeder should be able to uniformly meter a wider range of seed sizes better than a belt-type seeder since the holes in the seed plate must only be smaller than the smallest seeds in the lot. Seed lots (graded and ungraded) of two cultivars of turnip (*Brassica rape* L. Rapifera group) were metered with a belt seeder using belts with holes 6/64 inch (2.4 mm) or 7/64 inch (2.8 mm) in diameter or with a vacuum seeder. Neither the belt nor vacuum seeder resulted in satisfactory singulation with any of the seed lots. With the larger [7/64 inch (2.8 mm)] belt holes, there were excessive incidences of multiple seeds per drop. With the smaller [6/64 inch (2.4 mm)] belt holes, multiple drops and missed seed were both excessive. The vacuum seeder also resulted in excessive misses and multiples.

Watermelon Foliage and Yield Relationships

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Watermelon vines and foliage are often damaged or restricted by mechanical operations, diseases, and insects. There is little information to indicate the optimal ratio of plant foliage to fruit. Most watermelon fruits are produced near the plant crown, and thus some farmers believe that extensive foliage is nonessential for fruit production. Experiments have been conducted with watermelon [*Citrullus lanatus* (cvs. Sangria, Crimson Trio, and Scarlet Trio)] in Oklahoma to determine the relationship between soil surface area covered by foliage (foliar area) and fruit yield. Watermelon plants were planted on 4-m row centers, and were either pruned to allow a foliar area that was 1, 2, 3, or 4 m wide, or were physically confined to the same foliar area by redirecting the branch tips back into the row toward the base of the plant. There was a linear increase in yield as foliar area increased with both 'Sangria' and 'Scarlet Trio', but not necessarily with 'Crimson Trio'. Within a given foliar area, pruning the foliage and confining the foliage to a similar area produced similar effects on fruit yield. A second experiment was conducted to determine the effect on plant yield when the vines were physically moved, as occurred with the confined area treatments. In this study, physically moving the vines did not reduce yield as compared to vines that were not moved.

Yield Response of Watermelon to Plant Density

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In each of seven field experiments, density of watermelon (cultivar Sugar Baby) plants was varied over the range 1000–9000 plants/ha by varying the distance between plants in single-row, replicate plots. Per unit area, reproductive biomass and marketable yield each increased linearly with density. An upper limit on these response variables at high density was not detected in any experiment. The rate of increase per 1000 plants/ha ranged from 1.1 to 3.2 $Mg \cdot ha^{-1}$, for reproductive biomass, and from 0.5 to 1.1 $Mg \cdot ha^{-1}$, for marketable yield. The linear effect of density explained >90% of the increase in reproductive biomass in most experiments. The effect on marketable yield was more variable because the marketable fraction of reproductive biomass often was highly variable. In most experiments, the marketable fraction did not vary systematically with density. The linear rate of change in the marketable fraction with density did not exceed 3% per 1000 plants/ha on average in any experiment. Intraspecific competition intensified rapidly as density was increased in some experiments. Intensity of competition appeared to vary among environments.

Yield of Tomatoes as Influenced by Time of Application of Municipal Biosolids

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A trial evaluating the use of municipal biosolids application in 1996 resulted in stunted transplants, delayed fruit set, season-long reduction in plant vigor, and reduced yield of 'Mt. Pride' tomatoes. Hypotheses for these effects include nitrogen (N) immobilization,

increased salinity, and acetic acid phytotoxicity. Subsequently, a trial was initiated in 1997 at The Univ. of Tennessee Plateau Experiment Station near Crossville to evaluate the effect of timing of biosolid application on 'Mt. Fresh' tomato plant growth and fruit yield. Treatments included an inorganic control consisting of 134, 67, and 67 $kg \cdot ha^{-1}$ N, P_2O_5, and K_2O, respectively and a municipal biosolid at a rate of 168 $kg \cdot ha^{-1}$ N applied at transplanting, 2 months prior to transplanting, or 3 months prior to transplanting. The rationale for these treatments is that time would allow for mineralization of N and leaching of salts and/or acetic acid. Stunting of transplants was observed in all treatments receiving applications of municipal biosolids, with the degree of stunting increasing as length of delay decreased. Marketable and total yields were not influenced by treatment. Municipal biosolids applied at transplanting resulted in the greatest fruiting delays and increased the amount of blossom end rot observed. Plants receiving inorganic fertilization produced the highest percentage of cracked and rotten fruit. Recommendations for municipal biosolid use include applying a rate based on N in the fall prior to production or applying a rate based on phosphorus with supplemental inorganic N in the spring.

Evaluation of Southernpea Breeding Lines and Varieties for Earliness, Yield, and Maturity

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Evaluation of new southernpea cultivars and advanced breeding lines for spring and fall cropping is important for both producers and processors of this crop in South Texas. The spring trial included three commercially available cultivars and 17 advanced breeding lines from the Univ. of Arkansas breeding program. Foliage color ratings taken in the spring correlate with similar ratings taken in 1995 and indicate that Arkansas 435-87-68 may be tolerant to high pH soils that caused yellowing in several other cultivars. The highest producing varieties, Arkansas 87-435-68 and Arkansas 92-552, produced net yields >1000 lb/acre. The fall trial included the same material as the spring trial plus four more commercially available cultivars. Maturity ratings taken in early October varied widely between cultivars and breeding lines. Recorded ratings represented growth stages ranging from cultivars with no flowering to those that had set pods that were filling. The most mature types included Arkansas breeding lines 96-593, 95-368, 96-556, and 95-301, which had maturity ratings of 3.8, 3.5, 3.5, and 3.3, respectively. Net yields varied widely among cultivars in the fall trial. Yields ranged from 23.8 to 522.8 lb/acre. Those with the highest net yields included 'Early Scarlet', Arkansas 91-285, Arkansas Blackeye #1, and Arkansas 95-368, with yields of 522.8,402.2,401.2 and 400.5 pounds per acre, respectively. Although yields in the trial were considerably lower than expected, several cultivars produced 400 or more pounds of peas per acre compared to many commercial fields that were not harvested.

Variable Resistance to Gummy Stem Blight in Watermelon PI 271778

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Seeds from 19 selfed plants of watermelon PI 271778 were field-planted with seven cultivars in July 1997. Two weeks after planting, one seedling per plot was inoculated on 15 July by spraying to runoff (24 × 104 conidia/mL in water) a mixture of indigenous isolates of *Didymella bryoniae*. Plants were inoculated again on 31 July. On 7 Aug., plants with at least one stem lesion ranged from 0% to 96% (mean = 22%) for selections from PI 271778, while cultivars ranged from 3% to 71% (mean = 24%). On 19 Aug., plants with at least one stem lesion ranged from 12% to 100% (mean = 74%) for selections and 94% to 100% (mean = 97%) for cultivars. These differences were further reflected in average dead canopy of 25% for selections and 80% for cultivars on 3 Sept. By 17 Sept., dead canopy averaged 47% for selections and 100% for cultivars. Fruit harvested per plant averaged 2.5 for selections and 0.8 for cultivars. By harvest, vines were totally collapsed on all cultivars and on some selections, while stems of most selections were still vigorous but leaves exhibited significant necrosis.

Does the Preconditioning of Vegetable Crops with Aluminum, Sodium, or Ammonium Reduce the Susceptibility to CMV Infection?

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Because cucumber mosaic virus (CMV) affects southernpea *(Vigna unguiculata)* grown in the southeast, plants were preconditioned with different nutrient solutions from germination to the flowering stage, 24 DAT (days after transplanting) and rub inoculated with CMV. Symptoms were observed at a rate of 1/5, 1/5, 4/5, and 4/5 (observed infected plants/plants infected) in the Al, NH_4, NO_3, and Na treatments, respectively. At 67 DAT, ELISA detected CMV at a rate of 5/5, 5/5, 4/5, and 4/5 (detected infection/plants infected) of the Al, NH_4, NO_3, and Na treatments, respectively. The interaction of inoculation and preconditioning was nonsignificant for fresh or dry weight ($P > 0.10$); however, nutritional preconditioning significantly ($P < 0.01$) affected the fresh and dry weight. These preliminary data suggest that nutritional preconditioning affects southernpea plants' reaction to CMV.

Fruit Crops

Effects of Hydrogen Cyanamide (Dormex) and Ethephon (Ethrel) on Fruiting of 'Redhaven' Peach

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Early flowering of peach in the Southeast can result in annual crop loss as a result of late winter–early spring freezes. It has been shown in peach and other *Prunus* that a fall application of ethephon delays flowering several days. However, delayed harvest and smaller fruit size of certain varieties may occur. Hydrogen cyanamide replaces lack of chilling in peach but can also advance harvest date and possibly enhance or maintain fruit size. A randomized complete-block experimental design using 12-year-old 'Redhaven' trees was used to evaluate whether hydrogen cyanamide could offset the delayed harvest and smaller fruit size disadvantages of using ethephon without advancing bloom dates. Treatment combinations of ethephon (at 20%, 50%, and 90% of required chilling) and hydrogen cyanamide (at 90% to 100% of required chilling) were applied as whole-tree foliar sprays to near point of drip. Although nonsignificant, there were trends toward hydrogen cyanamide overcoming both smaller fruit size and delayed harvest induced by ethephon.

Mechanical Bloom Thinning as a Means to Reduce Hand Labor Needed to Thin Peaches

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A Phil Brown Corporation, hydraulic operated rope thinner was evaluated in 1995 and 1997 to determine performance for bloom thinning under Alabama peach growing conditions. Using detailed pruned trees in 1995, the rope thinner removed 55% and 57% of the blooms from two double pass treatments and 42% from single pass. Thinning was 9% to 31% higher in the upper one-half of the fruiting zone. In 1997, nondetail pruned trees were used and ground speed was evaluated. Percent blooms removed by single pass were 28, 23, and 22 for 1.6, 3.2, and 4.8 $km \cdot h^{-1}$, respectively. Double pass clockwise removed 38% of the blooms at 3.2 $km \cdot h^{-1}$. Greatest time saving for follow-up hand thinning was 15 minutes per tree with double pass over hand-thinned only.

Early Performance of Six Peach Training Systems

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The effects of six freestanding training systems (Open Center, Untrained, 2-Scaffold V, 4-Scaffold V, Leaning V, and Central Leader at tree densities of 161, 161, 245, 375, 375, and 300 trees/acre, respectively) on yield and tree growth of 'Redhaven' on Lovell rootstock were evaluated. Open-center and untrained trees were largest and had greatest yields per tree. The 2-scaffold V had the greatest production in kilograms per acre. Early productivity was related to tree density and pruning severity, not tree size. Training systems had no effect on fruit size.

Effect of Irrigation and Berm on Growth of Peach Trees during Establishment

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Long-term success in peach production requires the best possible site, but the ideal site is difficult to find. Risk of crop loss to spring freeze dictates that trees be on high ground. As a result, the best site available may have less than optimum soil. Effects of irrigation on peach tree growth are well documented. Raised beds have been used in other crops to insure adequate water drainage away from roots of crop plants. Results from larger beds or berms in combination with irrigation on peaches have been reported in Ohio, but little information is available for the southeast production region. In this study, berms on a Teller Fine Sandy Loam soil were constructed with a road grader in Oct. 1993. The berms were 55.8 cm high, 61 cm wide at the top, and sloped ≈30° to a base width of 4.3 m. 'Flameprince'/Lovell trees were planted in Mar. 1994, 6.1 m between rows and 5.5 m between trees in rows. The experiment was a split-plot design with four replications and three trees per treatment replication. Treatments consisted of no irrigation, 40% or 80% pan evaporation (PE) replacement in combination with berm or flat planting surface. Irrigation was supplied by means of emitters which applied 3.7 L per hour. Two emitters per tree were located in the row 45.7 cm either side of the tree trunk. During the first 4 years there was no significant difference between 40% and 80% PE irrigation treatments. Likewise, no significant interactions occurred. Tree trunk caliper, canopy area, and height were greater in irrigated plots and the same or greater from trees in flat plots in all cases.

Soybean Oil as a Prebloom Flower Bud Thinner for Peaches

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Survival of peach flowers during spring or winter freezes and large fruit size at harvest are critical for profitable peach production in the Southeast. Delaying both bud swell in late winter and flower phenology in spring reduces the risk of flower bud death from cold temperatures. Preliminary research in Tennessee using soybean oil (SO) as a dormant oil spray in place of Superior oil showed SO delayed peach bloom, thinned flower buds, and increased fruit size. In 1997, a 'Harvester' peach orchard in Monetta, S.C., and a 'Redhaven' orchard near Clemson, S.C., were sprayed in early February with 0%, 6%, 8%, 10%, and 12% SO mixed with 1% (by volume) Latron B-1956. Number of dead flower buds and the flower bud stages for each SO treatment were recorded during the first pink to full bloom flowering period. Excess fruit were hand-thinned in late April. Fruit set, maturity date, weight, and yield/tree were taken. Bud death increased from 14% (control) to 17% to 20% at the 8%, 10%, and 12% SO rates for 'Redhaven' and from 13% (control) to 21% at the 10% and 12% rates for 'Harvester'. Phenology was delayed 3–4 days for 'Redhaven' at 8%, 10%, and 12% SO, but no differences were noted in the 'Harvester' trees. No differences in fruit maturity occurred. Fruit weight and yield/tree was higher for all 'Harvester' SO treatments and the 'Redhaven' 10% and 12% SO treatments. No shoot phytotoxicity was observed.

Effect of Nitrogen Levels on Fruit Firmness and Plant Response of Hydroponically Grown 'Chandler' Strawberries

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'Chandler' strawberry plants were established in a recirculating nutrient flow hydroponic system under six nutrient solution N levels (35, 70, 140, 210, 280, and 350 ppm). Various morphological and fruiting responses were measured. Average berry weight was greatest in the 280 ppm range and lowest in the 350 ppm solution N treatments. Percent soluble solids were greatest in the 35 ppm and lowest in the 140 ppm N treatments. Titratable acidity was greatest in the 75 and 210 ppm treatments and lowest in the 140, 280, and 350 ppm N treatments. Nitrate N was greatest in the juice of the 280 and 350 and lowest in the 35 ppm N treatment. Interior and exterior fruit firmness followed a general trend of the greatest firmness being found at 35 ppm and the least firm berries being from the 350 ppm treatment.

Four Grape Canopy Systems in Texas

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I. Chennin Blanc 107-cm bilateral cordon spaced 3.6 × 2.4 m, 1119 vines/ha, 14 spurs with 32 buds/vine. Yields were 8.8 $t \cdot ha^{-1}$ in the third leaf; 9.7 in the fourth, and 12.8 the 5th year, 1990, at the Jane Terrell Vineyard, Navasota, Tex. II. Cabernet Sauvignon with a two-trunk 122 cm bilateral cordon spaced 3.3 × 1.2 m, 2445 vines/ha with 48 buds/vine. Yields were 9.7 $t \cdot ha^{-1}$ for 1994 through 1997 at the mechanically harvested Newson Vineyard, Plains, Tex. III. Le Noir with a 91-cm trunk and a two-cane canopy; spaced 3 × 2.1 m, 1536 vines/ha, with 14 buds/vine. Yields were 13.3 $t \cdot ha^{-1}$ in 1996 and 11.2 in 1997 at Messina Hoff Vineyard, Bryan, Tex. IV. Merlot/110R with a 45° slanting cordon, 30 cm at south to 152 cm at north, spaced 1.5 × 1.5 m, 4308 vines/ha with 10 spurs and 20 buds/vine. Yield of 10.8 $t \cdot ha^{-1}$ in the third leaf, 1997, at Wolf Vineyard, Valley View, Tex. Four very different canopy systems were successful; the ideal system is yet to be determined.

Breeding and Improvement of Chinese Chestnut

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The Chinese chestnut (*Castanea mollissima* Blume) is a valuable germplasm resource for horticultural traits such as resistance to chestnut blight (*Cryphonectria parasitica),* excellent quality, wide adaptation, and consistent high yield. The Chinese chestnut breeding program was established at Auburn Univ. in 1933 from nuts directly introduced from China by the USDA. A recurrent selection breeding program with progeny from the 1933, 1953, and 1991 plantings with selection for blight resistance, precocity, nut size, and storage quality, yield, and pest resistance. Cultivars released from the 1933 planting were 'Alaling,' 'Alamore', and 'Black Beauty'. 'AU-Cropper', 'AU-Leader', and 'AU-Homestead' were named from the 1953 planting. Two blight-resistant, precocious seedlings, AU-91-P1-26 and AU-P4-26, appear to be very promising selections for improvement of all Chinese chestnut cultivars for nut size and other selection traits. Since there is little information available regarding heritability of certain traits in perennial tree species, results of 65 years of breeding at Auburn Univ. should provide us with guidance for further improvement of selection traits in chestnut breeding.

Resistance to Chestnut Blight in the American Chinquapin

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The American or Allegeny chinquapin (*Castanea pumila)* is native to the same area of the United States as the American chestnut (*C. dentata)* from Florida to Canada and westward to Arkansas. The high-quality nuts are an excellent source of food for wildlife and humans. Resistance to chestnut blight *(Cryphnuectria parasitica)* was discov-

ered in seedlings in virgin forest at Elgin Air Force Base, Fla., with observations of plants for 35 years. A recurrent selection breeding program was established at Auburn Univ. to improve the blight resistance, precocity, dwarfism, pest resistance, cold hardiness, yield, and quality. A number of seedlings appear to be very promising selections for improvement of the American chinquapin. Since there is little information available regarding hereditability of certain traits in perennial tree species, results of breeding at Auburn Univ. should provide us with guidance for further improvement of the American chinquapin.

Light Distribution in Three Apple Training Systems as Affected by Cultivar and Rootstock

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Light distribution in two cultivars on three dwarfing rootstocks in three high-density apple tree training systems was measured in the sixth leaf beginning at full bloom and continuing through the season. Training system had a significant effect on light penetration into the lowest point of the canopy (measured at 0.5 m), with the slender spindle being significantly darker than either the central leader or the vertical axis, although all three systems were below the threshold value of 30% full sun (FS) needed to maintain productivity for most of the season. Cultivar had no significant effect; however, trees of both 'Jonagold' and 'Empire' fell below 20% FS early in the season and remained there until late in the season. Rootstock had the greatest effect, with trees on M9 and M26 being significantly darker in the lower canopy than trees on Mark. Trees on M26 and M9 fell below 10% FS early in the season and remained there, while trees on Mark never fell below 20% FS.

Gas Exchange Characteristics of Apple at Various Light Intensities under Two Levels of European Red Mite Damage

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Single leaf gas exchange measurements were taken at a range of light intensities from 20 to 1500 $\mu mol \cdot m^{-2} \cdot s^{-1}$ *PAR* under greenhouse conditions on 'Washington Spur'/EMLA seven potted apple trees subjected to either 1500 cumulative mite days (CMD) European Red mite (ERM) damage or no mite damage. 1500 CMD ERM damage significantly reduced assimilation (A) over all light intensities for leaves present during mite damage at 6 days after the mite population had reached the 1500 CMD level and the mites were killed. Mite damage did not significantly affect A of either leaves present during mite damage or leaves produced after the mites were killed on any other sampling date. However, a trend of reduced A of leaves present during mite infestation on the mite-damaged trees was apparent on all sampling dates after the mites were killed. Evapotranspiration (E) was not affected by mite damage. The mite damage by light intensity interaction did not have a significant effect on A or E on any sampling date.

The NE-183 Project: Multidisciplinary Evaluation of New Apple Cultivars—A Preliminary Report from Arkansas

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The NE-183 project was established in 1993 and the first trial planted in 1995 with the objective of evaluating new apple cultivars for horticultural, pest and disease resistance, and qualitative characteristics. Arkansas (AR) is the southernmost location for the initial planting. The following cultivars are in AR trial: 'Arlet', 'Braeburn', 'Cameo', 'Creston', 'Enterprise', 'Fortune', 'Fuji', 'Gala Supreme', 'Ginger Gold', 'GoldCrisp', 'Golden Delicious', 'Golden Supreme', 'Goldrush', 'Honeycrisp', 'NY75414-1', 'Orin', 'Pristine', 'Sansa', 'Shizuka', 'Suncrisp', 'Sunrise', and 'Yataka'. Bloom of 'Braeburn', 'Yataka', 'Orin', 'Gold Supreme', 'Fortune', and 'Enterprise' were early and may be exposed to annual spring frosts. The following cultivars ripened in July or August and may be too early for southern markets: 'Pristine', 'Sunrise', 'Sansa', 'Ginger Gold', 'Arlet', 'Honeycrisp', 'Golden Supreme', and 'Orin'. The following cultivars were very precocious and had yields >7.5 kg/tree in the third growing season: 'Fuji', 'Enterprise', 'Creston', 'Golden Delicious', 'Ginger Gold', 'Suncrisp', and 'Goldrush'.

Response of Highbush Blueberry to Nitrogen Rate and Methods of Delivery

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A planting of sawdust-mulched highbush blueberries (cv. Bluecrop) was established on a Captina silt loam at the Univ. of Arkansas Research and Extension Center, Fayetteville, in 1994. Nitrogen rate and method of delivery treatments were begun that year and continued through the first two fruiting years (1996 and 1997). Rates included 0, 67, 134, 201, and 268 $kg \cdot ha^{-1}$ N using ammonium sulfate during the fruiting years (one-half and two-thirds these rates in 1994 and 1995, respectively), and methods of delivery included dry, surface-applied, and fertigation. Total N for the year was applied in three applications for the dry application and in 12 applications using fertigation. Neither yield nor berry mass were statistically significantly affected by N rate or method of delivery. Also, method of delivery had little effect on foliar levels of any macro- and microelements. Rate of N influenced foliar N most years, with the highest N rate increasing foliar N the greatest. The N rate required to consistently achieve adequate foliar N levels (minimum of 1.6% N) was 134 $kg \cdot ha^{-1}$. Foliar levels >2.0% were common with the two highest N rates. Foliar Mg and Mn were also influenced by N rate, with the lowest Mg level found for the highest N rate, while excess foliar Mn (800 to 100 ppm) was common with the higher N rates in 1997.

The Effect of Timing of Dormex Application on Blueberry Leafing and Flower Mortality

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Leaf bud development is a problem on many blueberry cultivars grown throughout the Southeast. Dormex (50% hydrogen cyanamide) has shown potential in accelerating leaf and floral bud development of some fruit crops, but its usage on blueberries has not been thoroughly explored. A greenhouse experiment was conducted to examine the effects of timing Dormex applications on 'Climax' rabbiteye blueberry *(Vaccinium ashei)* and 'Oneal' southern highbush blueberry *(V. corymbosum)*. Plants were subjected to low and moderate chilling conditions and were forced under greenhouse conditions. Dormex timings were: 1)1 day after forcing (DAF), 2) 3 DAF, 3) at 10% stage 3 floral buds, 4) at 30% to 50% stage 3 floral buds, 5) at 10% to 30% stage 4 floral buds, 6) control (no Dormex). All Dormex applications were applied at a rate of 2% product. Results showed that Dormex both increased and accelerated leaf bud break as compared to the control. However, flower buds at stage 3 of development or beyond were very susceptible to chemical burn by the product. The data indicate that timing of Dormex applications on blueberries should be based on rate of plant development rather than calendar time. Additional research is needed to most effectively use the product to aid blueberry leaf development.

Effect of ABA and Paclobutrazol on Cold Hardiness of Blueberries

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Growth regulators ABA and paclobutrazol were used at different concentrations to induce hardiness in blueberry flower buds and floral parts. Critical freezing temperatures and the effectiveness of the treatments were determined by differential thermal analysis (DTA), electrolyte leakage, visual browning, and tetrazolium staining. Treat-

ment effects of growth regulators were nonsignificant on whole flower buds, but treatments induced hardiness in floral parts on the second flush of flowers at stage six produced in April. Induction of cold hardiness by ABA and paclobutrazol was concentration dependent. The higher the concentration, the greater the response. Viability test results on each floral part showed a close relationship with the critical freezing temperatures recorded by DTA. Control treatments showed that floral parts at stage six developed in April were more prone to freezing injury compared to floral parts at stage six developed in early March.

Adaptation of a Close-focus Pyrometer for Rapid Collection of Blackberry Fruit Temperature Data

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The analog output of a portable battery-powered infrared pyrometer capable of nondestructive measurement of blackberry fruit temperatures was collected, formatted, and stored by a Polycorder in the field during the 1996 and 1997 harvest seasons. The program written for the data recorder allowed collection of ≈10 temperatures per plot per minute. Download and analysis of the information gathered during a typical survey of 24 rep × treatment combinations was easily completed prior to subsequent surveys in the field at noon and midafternoon.

Temperatures Differ Between Fronts and Backs of Shaded and Sunlit Berries

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Close-focus pyrometers were employed to measure temperatures among blackberry fruits at sunlit and shaded locations on static and one-sided shift trellises with westward leaning (20 to 25° from vertical) crop support arms. About 85% of the static trellis' fruits were located on its eastern face while essentially all of the shift trellis' berries were westward-oriented. During cloudless weather, east-facing berries at 9:30 AM were 5 to 8 °C warmer than either ambient air or berries on western trellis faces. West-facing berries were at or near air temperature until 2 or 3 PM; east-facing berries remained above air temperature until 4:30 or 5 PM. Temperatures at the sunlit sides of healthy, east-facing 'Arapaho' berries averaged 8 °C warmer than at shaded sides of the same berries.

Differential Interaction of Apple Cultivars and Spider Mites (Acari: Tetranychidae)

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In 1995, greenhouse and orchard experiments of 11 apple cultivars were conducted in Fayetteville and Clarksville, Ark. Weekly cumulative mite days (CMD) were regressed against leaf bronzing (colorimeter value L) and compared among cultivars. European red mites, *Panonychus ulmi* and two-spotted spider mites, *Tetranychus urticae,* were found on leaves. 'Liberty', 'Royal Gala', and 'Stark Spur Red Rome Beauty' had significantly more mites (>1940 CMD) than did 'Arkansas Black' (1303), 'Jonafree' (1150), and 'Northern Spy' (973). A low CMD on 'Northern Spy' caused leaves to bronze faster [$y = 29.04 + 0.006(x)$; $R^2 = 52$, $P = 0.0002$] than did a high CMD on 'Liberty' [$y = 30.41 + 0.0027(x)$; $R^2 = 70$, $P = 0.0001$]. Field estimates were made of spider mites/leaf and bronzing from 20 June to 7 Aug. 'Stark Spur Red Rome Beauty' and 'Stark Spur Law Rome' had significantly more CMD than did 'Northern Spy' and 'Arkansas Black'. Apple cultivars differed in carrying capacity to mites (susceptibility) and how fast leaves bronze in response to mite feeding. Cultivar differences in hairiness of the lower leaf surface were not correlated to CMD.

Floriculture/Ornamentals

Effect of Auxin and Wounding on Adventitious Root Formation of (*Opuntia amyclaea*) Cladodes

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Mature cladodes of prickly-pear cactus (*Opuntia amyclaea* Tenore. cv. Reina) were treated with five wounding methods and four concentrations of potassium salt indolebutyric acid (K-IBA) to stimulate adventitious root formation. K-IBA from 4144 to 41,442 μM (1000 to 10,000 mg·L^{-1}) increased root number and root dry weight; however, root length was decreased at 41,442 μM (10,000 mg·L^{-1}). Root number and root dry weight were higher with wounding methods that had larger wounded surface areas. K-IBA altered rooting polarity and stimulated adventitious root formation along the wounded cladode surfaces. Treatments without suberization had a higher percentage of rotted cladodes. This research validates the commercial practice in Mexico of suberizing cladodes early in the propagation cycle. Auxin application could be of commercial benefit for enhanced rooting in the clonal regeneration of new selections for prickly-pear cactus orchards. The wounding methods and auxin treatments utilized make an excellent classroom demonstration for manipulating rooting polarity.

Production of Landscape-sized Annuals Using Five Media

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The influence of media on plant growth was investigated for five annual species. Uniform 164-cm^3 liners of *Tagetes erecta* 'Discovery Orange', *Impatiens wallerana* 'Accent Orange', *Melampodium paludosum* 'Showstar', *Scaevola aemula* 'New Wonder', and *Petunia axillaris* 'Surfinia White' were planted into 2.8-L containers on 4 Apr. 1997. The experiment was terminated after 90 days. Media included Metro-Mix 366 peat or coir, Metro-mix 700 peat or coir, and 4 pine bark : 1 sand (by volume, amended with 1.2 kg·m^{-3} dolomitic limestone). Plants were top-dressed with 9 g Osmocote Plus 15–9–11. Substituting coconut coir for peat moss in commercial media reduced *Petunia* 90 DAT foliar color ratings, *Impatiens* shoot dry masses, and *Melampodium* and *Scaevola* root ratings. Utilization of pine bark did not influence foliar color ratings of *Tagetes, Melampodium, Petunia,* or *Scaevola* 90 DAT. Utilization of pine bark reduced shoot dry masses of *Impatiens*, *Melampodium*, and *Scaevola*, and root ratings of *Melampodium* and *Tagetes.*

Plant Growth Retardants Reduce Peduncle Length of *Achillea* x 'Coronation Gold'

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Vegetative offsets of *Achillea* x 'Coronation Gold' were rooted under mist for 3 weeks and potted into 10-cm pots in a greenhouse. Plants were grown under short photoperiods for 6 weeks before being vernalized for 6 weeks at 6 °C. Plants then were provided long photoperiods from night-break lighting. Foliar sprays of daminozide at 0, 2550, 5100, or 7650 mg·L^{-1}, chlormequat at 0, 767, 1534, or 3201 mg·L^{-1}, daminozide + chlormequat at 0, 1275 +, 2550 + or 3825 +1534 mg·L^{-1}, flurprimidol at 0, 40, 80, or 120 mg·L^{-1}, paclobutrazol at 0, 32, 64, 96, 128, or 160 mg·L^{-1} or uniconizole at 0, 11, 22, 33, 44, or 55 mg·L^{-1} were applied as a spray 1 week after vernalization. Highest market quality ratings were achieved with paclobutrazol at 96 or 128, uniconizole at 22 or 33, daminozide + chlormequat at 3825 +1534, chlormequat at 2301 or flurprimidol at 40 mg·L^{-1}. Peduncle length and growth index decreased linearly for daminozide, chlormequat, and daminozide + chlormequat, and decreased quadratically for flurprimidol, paclobutrazol, and uniconizole with increasing rate.

Time to flower increased most in treatments receiving high rates of daminozide. Flower diameter was reduced by the highest rates of flurprimidol and paclobutrazol.

Application Timing of Daminizide and Flurprimidol after Shearing Affects Growth and Flowering of *Coreopsis verticillata* 'Moonbeam'

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Vegetative cuttings of *Coreopsis verticillata* 'Moonbeam' were rooted under intermittent mist, pinched, and potted into 10-cm pots in a greenhouse. Plants were sheared to 6.5 cm above the pot rim 2 weeks after potting and given foliar sprays of daminozide at 0, 2550, 5100, or 7650 mg·L^{-1} or flurprimidol at 0, 50, 100, or 150 mg·L^{-1}. Night-break lighting to provide long photoperiods was started the day of shearing. Growth retardants were applied at 0, 3, 6, 9, 12, or 15 days after shearing. Daminozide reduced shoot height, growth index, and lateral shoot length compared to the control by 69.3%, 69.2%, and 70.0%, respectively, while increasing quality rating by 67.3% and time to flower by 8 days at 5100 and 7650 mg·L^{-1}. Response surface regression predicted that minimum plant size and maximum quality rating occurred when growth retardants were applied 5.7 to 8.3 days after shearing. Application timing had no effect on responses to flurprimidol. Shoot height, growth index, and lateral shoot length decreased quadratically with increasing rate while quality rating only improved compared to control. Flurprimidol did not cause a flowering delay.

Growth of Tree Species in Response to Controlled-release Fertilizer Sources and Application Rates in a Commercial Nursery Setting

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A study was initiated at Bracy's Nursery, Amite, La., in Apr. 1997 to evaluate the influence of seven controlled-release fertilizer sources and three top-dressed application rates in production of 4-gal (15.7-L) containers of 'LaFeliciana' peach and swamp red maple. The fertilizers tested were Osmocote Plus 15–9–11, Osmocote Plus 16–8–12, Woodace 20–5–10, Woodace 20–4–11, Customblen 24–4–6, Nutricote (Type 270) 17–7–8, and Nutricote (Type 360) 17–6–8. Application rates were 1.75, 2.25, and 2.75 lb N per cubic yard. The experiment was completely randomized within blocks (species) and each treatment was replicated five times. A control treatment was also included. For 'LaFeliciana' peach, Nutricote and Osmocote yielded the superior results when shoot height and visual quality ratings were determined in October (6 months after initiation). Increases in application rate did not significantly increase shoot height or visual quality ratings in most cases. For swamp red maple, shoot height was not affected by fertilizer source or application rate. Caliper ranged from 19.2 to 23.0 mm but was only slightly influenced by fertilizer source and application rate. Visual quality ratings were significantly higher for Osmocote Plus 16–8–12 when compared to some of the other fertilizer sources.

Nutrient Availability in Mulched Landscape Plantings

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To examine the effects of mulching and fertilization on nutrient availability and plant growth in landscape beds, plots were established using four mulches (cottonseed hulls, cypress wood, pine bark, pine straw) and three fertilizer application methods (granular, liquid, time-release). Fertilizer was applied either below the mulch on the soil surface or over the mulch surface. Marigolds, *Tagetes erecta* L., were planted during the summer, followed by pansies, *Viola ×wittrockiana* Gams, during the winter. Applied fertilizers, existing soil nutrients, and water-soluble nutrients from the new mulch provided an adequate supply of nutrients for marigold growth. Placement of fertilizer above or below the mulch did not affect marigold growth. Pansy growth was limited by depletion of soil N during the marigold season and by leaching of applied nutrients in the winter while plants were not actively growing. Mulch lowered soil temperatures and slowed pansy recovery in the spring. Pine straw allowed soil temperatures to rise earlier in the spring and improved pansy growth.

Spring Recovery of Wetland Plants Affects Efficacy of Nutrient Removal from Nursery Runoff

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The nursery/greenhouse industry is the fastest growing segment of U.S. agriculture. Consumer demand for excellent product quality requires luxury applications of water and agricultural chemicals. These cultural practices tend to yield significant volumes of runoff rich in nutrients and pesticides. A capture and recycle system at the Nursery/Floral Crops Research and Education Center at Texas A&M University was fitted with 12 subsurface flow (SSF) and 12 free-surface flow (FSF) wetland cells. Constructed wetland cells provided substantial reduction of runoff nutrient concentrations without increasing electrical conductivity, an indicator of salinity. Growth of *Iris pseudacorus* L. and *Canna ×generalis* L.H. Bailey during spring growth was greater in the FSF wetland cells, while that of *Colocasia* sp. Fabr. was greater in the SSF wetland cells. *Equisetum hyemale* L. grew equally well in both cell types. Direct reuse of nursery runoff reduced the number of *Ilex vomitoria* Ait. 'Nana' reaching marketable size in 2.3-L containers. Interactions among irrigation water sources and container media types for growth indices occurred for *Juniperus procumbens* 'Green Mound' and *I. vomitoria* 'Nana', but not for *Raphiolepis indica* L. 'Carmelita'.

Assessment of the Native Plants Market in the Southeastern United States

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Recent trade journals and magazines report a widespread and increasingly popular trend encouraging the use of native plants in the landscape. A random sample of 528 Southern Nurserymen's Association 1996 members were surveyed to determine 1) if they had perceived the trend reported in trade and consumer publications towards the selection of native plants, and 2) if there are consistencies in demographic characteristics and aspects of advertising plans among the respondents. Forty-two percent of those surveyed responded. Respondents perceived an overall interest in native plants higher in 1996 than in 1991. Almost half of the respondents had increased quantity and variety of native plants in response to their perceptions; 28% had not responded in any way. Plant professionals who had responded to the perceived trend did not differ significantly from those who had not on selected demographic characteristics. Selected aspects of advertising did not differ significantly except for the extent to which consumer magazines were used as references for marketing strategies.

Louisiana Select: Taking the Plants to the People

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The LSU Agricultural Center and Louisiana Association of Nurserymen initiated an ornamental plant promotion and recommendation program in 1996. Called 'Louisiana Select', this program is intended to actively promote outstanding ornamental plants to Louisiana's gardening consumers. Plants are promoted in the spring and fall of each year and have included 'New Orleans Red' coleus, mayhaw, 'Henry's Garnet' Virginia willow, 'Homestead Purple' verbena, 'Watchet' azalea, 'Telstar' dianthus, bald cypress, 'New Wonder' scaevola, "Fall is for Planting Native Trees", and lantana ('New Gold', 'Dallas Red', 'Confetti', 'Trailing Purple', and 'Silver Mound'). Point of purchase signs and banners promoting the 'Louisiana Select' program and individual plants are provided to retail garden centers. Significant sales increases ranging from 300% to 2500% have been

reported for the selected plants, with annual bedding plants and perennial flowers enjoying the greater sales increases. Plants for promotion are selected by a committee of wholesale greenhouse producers, retailers, landscape contractors, and cooperative extension service personnel.

Recycled Waste Paper Mulches Influence Moisture Retention in Greenhouse Containers

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Excessive moisture is a problem in evaluating recycled paper products as mulch to replace other common mulch materials and in landscape and container uses. To isolate the water associated with soil and/or media, two recycled paper products, pellets or crumble, were used as mulches in trade gallon containers in a greenhouse. Pine bark, pellets, and crumble needed to obtain standard mulch depth were enclosed in plastic mesh. These mulches were placed in containers that contained 1 kg of a 7 pine bark : 1 sand media. All containers were saturated with tap water for 24 hours. Mulches were placed on each container and allowed to drain for 1 hour. Weights of media, mulch, and media and mulch were obtained every 24 hours for a total of 312 hours. Water content of the media was not influenced by any of the mulch treatments. Water content of the paper products was increased by a factor of two. Pine bark mulch water content was zero 96 hours after an initial dry down cycle began, while the water content of pellet and crumble were 100 and 90 cm of water. Total water content of the media plus the mulch was increased by 30% to 35% when compared to pine bark mulch alone. However, the increase was associated with the water content of the waste paper mulch.

The Use of Recycled Waste Paper as an Al Source for Blue-flowering Hydrangea

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Blue color development in *Hydrangea macrophylla* is usually accomplished by applying Al as an alum drench. Drenches are applied during forcing 10–14 days after transplanting at a rate of 17,500 $mg \cdot L^{-1}$. Cultivars Blue Wave and Nikko Blue were used to evaluate if the Al contained in waste paper can provide the necessary Al for blue flower development. Two waste paper forms, pelletized and crumble, were used as surface mulches and as media amendments. The amendments were incorporated into the media at transplanting and mulches were applied either at transplanting or 28 days later. Alum drenching was initiated at transplanting as a control. Leachates were collected weekly using the VTEM. Total Al, electrical conductivity, and pH were determined on all samples. All waste paper treatments resulted in pink flowers in both cultivars. Leachate pH, from plants in this test, was >6.5. Aluminum concentration was greater than the 15 $mg \cdot L^{-1}$ Al needed for blue color development in flowers, but Al concentration decreased with time. Control of pH at the waste paper surface and in the media is critical for increasing the availability of labile Al for uptake by hydrangea.

Postharvest/Biotechnology

Micropropagation of *Camptotheca acuminata*

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Camptotheca acuminata (Chinese happy tree, Nyssaceae) is a source of the anticancer phytochemical, camptothecin. An endangered species in its native China, *Camptotheca* has been grown in this country on an experimental basis, but the germplasm base is extremely narrow. As a prelude to the establishment of a plant improvement effort designed to increase the efficiency of camptothecin production, in vitro studies that will enable plant regeneration and shoot proliferation from selected clones have been undertaken. Shoot proliferating cultures were established from shoot tip explants and were maintained on WPM medium containing 4 μM BA. MS medium and nodal explants proved unsatisfactory. Shoot proliferation was highest when in vitro shoot tips were cultured on 4 μM BA compared to media containing no growth regulator or the cytokinins zeatin, thidiazuron, or kinetin. In vitro–produced shoot tips were rooted by direct sticking in plastic containers filled with RediEarth mix, and were successfully adapted to the greenhouse environment.

Genotypic Response of Cowpea *Vigna unguiculata* (L.) to In Vitro Regeneration from Cotyledon Explants

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Cowpea (*Vigna unguiculata* L.) is an important grain legume, which in developing countries provides much of the protein in human diets. A plant regeneration system for cowpea was developed. Cotyledons were initiated on MS medium containing 15 to 35 $mg \cdot L^{-1}$ benzylaminopurine (BAP) for 5 to 15 days. For shoot regeneration, the explants were transferred to a medium containing 1 $mg \cdot L^{-1}$ BAP. Regeneration percentage (1% to 11%) and the number of shoots (4 to 12 shoots per explant) were significantly influenced by genotype. The duration of culturing and BAP concentration in the initiation stage significantly affected the regeneration capacity. Explants initiated on 15 $mg \cdot L^{-1}$ BAP for 5 days resulted in the highest regeneration percentage. Conversely, the highest number of shoots was obtained from explants initiated on 35 $mg \cdot L^{-1}$ BAP. This is the first report of plant regeneration of U.S. cowpea cultivars.

A Mechanism for Rancidity Retardation by Partial Oil Extraction of Pecans

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Shelf life is a major problem in the marketing of pecans, particularly at the retail level. A procedure to extend the shelf life of pecans was described. The full-oil and supercritical carbon dioxide extracted (22% and 27% reduced-oil) native pecan kernels packaged in standard air mixture (21% O_2, 79% N_2), stored for up to 37 weeks at 25 °C and 55% RH, were subjected to hexanal analysis, sensory analysis, and determination of lipid class changes, that occur as the pecans age. Hexanal concentration of reduced-oil pecans was negligible throughout the storage, while full-oil pecans reached excessive levels by 22 weeks. Hexanal analysis was in agreement with the sensory scores. Free fatty acid lipid class was selectively extracted during the partial oil extraction process. Reduction in free fatty acids, and an overall reduction in lipid content on a per kernel basis, decreased the sites for oxidative deterioration and contributed to enhanced shelf-life of pecans. Work was supported by OCAST grant AR4-044 and the Oklahoma Agricultural Experiment Station.

Retaining Quality in Cut Watermelon: Effects on Sanitizing Wash, Storage Time, and Storage Temperature

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Watermelons were dipped in either 1000 ppm sodium hypochlorite solution or in deionized water, dried, then cut into chunks of ≈83 × 152 × 51 mm. These were sealed into plastic containers and stored at either 2, 4, or 8 °C. Samples were removed after 3, 7, and 10 days for microbial and quality tests. Chlorine dip reduced average aerobic plate counts by ≈3 log cycles and average coliform counts by nearly 2 log cycles. This may have significant implications for food safety and off-flavor development. The difference in microbial counts persisted for

≈7 days. No clear effect from storage temperature was seen. A trend for lower temperatures to preserve red hue was observed in objective color tests. Texture tests revealed a trend for all melons to become firmer during storage. No clear patterns with respect to storage temperature or sanitizing dip were seen.

An Alternative and Inexpensive Assay for Plant Invertases

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The glucose-6-phosphate dehydrogenase (G-6-PDH) and glucose oxidase methods are commonly adapted for plant invertase assay. A disadvantage of the G-6-PDH assay is the relatively high cost of the coupling enzymes and cofactors. A disadvantage of the glucose oxidase method, which uses a glucose kit (Sigma, 510-A), is the presence of high activities of acid invertase and alkaline invertase in the PGO enzyme formula (peroxidase and glucose oxidase), which gives a falsely high invertase activity value. An alternative and inexpensive coupled assay was developed for enzymatic assay of plant invertases. In this assay, ADP produced from phosphorylation of glucose and fructose (hydrolysis products of invertases) is coupled to oxidation of NADH by the enzymes pyruvate kinase and lactate dehydrogenase in presence of phosphoenolpyruvate and NADH. This method was compared with the glucose-6-phosphate dehydrogenase method by using protein preparations derived from plant materials of three different species. Statistical analysis indicated that the alternative assay was similar in accuracy to the glucose-6-phosphate dehydrogenase method, with an advantage of reducing the cost from $0.85 to $0.35 per assay.

Shelf Life of Minimally Processed Watermelon

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In the United States, as much as 10% of the watermelon sold is as a minimally processed product. These products are prepared at the retail level as cubed flesh in plastic food containers or as halved slices wrapped in plastic film. The shelf life of these products at different temperatures is not known. In this study, 'Allsweet' and 'Jubilee' ripe watermelons were washed, wiped with a 5% bleach solution, and cut into transverse slices using surface-sterilized knives. Halves of these slices were sprayed with distilled water (pH 7.0) or with Natureseal plus 5% ascorbic acid (pH 4.5), wrapped with plastic film (0.05-mm thickness), and stored at 2 and 5 °C for 4 to 6 days. Weight loss of wrapped slices was 0.1% at 2 and 5 °C after 4 days of storage and 0.5% of slices sprayed with Natureseal. Watermelon flesh became slimy after 3 and 5 days of storage at 5 and 2 °C, respectively, especially in slices treated with Natureseal. Fruit rinds developed brown stains and became very soft. In a separate study, watermelon slices (flesh and rind) placed in jars at 10 °C lost the characteristic watermelon odor after 2 days and a more pumpkin-like odor developed. Respiration after 1 day at 10 °C was 6 to 8 mL CO_2/kg-h and increased after 5 days of storage to 13 and 25 mL CO_2/kg-h for 'Allsweet' and 'Jubilee', respectively. Ethylene production was 0.04 to 0.06 µL/kg-h after 1 day of storage, increasing to 0.55 µL/kg-h after 5 days of storage. Results indicate that cut watermelon should be held at temperatures of 2 °C or less for no more than 3 days.

Sensory and Storage Evaluation of Nectarine and White Peach Breeding Lines

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Promising white peach and nectarine selections, many with nonmelting flesh, from the Univ. of Arkansas breeding program were evaluated for fruit quality and flavor. About 20 kg of fruit, consisting of mature ripe and ripe stages, were harvested from 4- to 7-year-old trees in Arkansas and transported to Lane, Okla. Fruit were divided into two boxes per selection. One box was held at 5 °C for 8 days, then transferred to 20 °C for 4 days to induce chilling injury and was evaluated for storage quality. The other box was held at 20 °C for 4 days and fruit used for taste panels. Of the 14 nectarine and 12 white peach selections evaluated, one nectarine and four white peach selections had slight chilling injury. Flesh firmness of selections after storage ranged from 6 to 50 N. Taste panelist scores indicated that sweetness was associated with peach flavor in both nectarines and white peaches and that overall acceptability was dependent on sweetness, peach flavor, and low tartness. Ten of the white peach selections were equal to or better in overall acceptability compared to 'Summer Pearl' and 'Carolina Belle' cultivars included in the study. Panelists did not consider firm texture to be detrimental to overall acceptability. Results indicate that many of the breeding lines used in this study had fruit equal to or better than currently available cultivars in storage life, firmness, and sweetness.

Cell Wall Hydrolases in Association with Pasty Texture Development in Peach Fruit

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The Stonyhard peach fruit mutation has been used to study softening and textural changes during ripening. Without ethylene exposure, firmness of Stonyhard remains fairly constant at room temperature. When exposed to 1 or 100 ppm C_2H_2 for 48 hours, fruits soften at a rate consistent with control fruit ('Cresthaven') to a similar firmness. However, 1 ppm–treated fruit attains a normal juicy texture, while 100 ppm–treated fruit attains a pasty texture. Control fruit softened to a normal juicy texture with either ethylene treatment. Cell wall endopolygalacturonase (endo-PG) was not detectable in Stonyhard fruit without C_2H_2 exposure; it increased at a rate similar to control fruit when exposed to 1 ppm C_2H_2, and was double that of 1 ppm for fruit exposed to 100 ppm for up to 48 hours. Low levels of endo-PG were detected in control fruit not exposed to C_2H_2; 1 ppm treatment led to a normal increase, which was comparable to that in Stonyhard. However, endo-PG in 100 ppm–treated fruit was very similar to that of 1 ppm for up to 24 hours, though high levels of endo-PG were observed at 48 hours. Attainment of the pasty texture in 100 ppm–treated Stonyhard fruit may have been related to release of large quantities of pectic polysaccharides as a result of the sudden increase in endo-PG activity. Work was supported by USDA grant 96-34150-2540 and the Oklahoma Agricultural Experiment Station.

Postharvest Waste is a Serious Problem in Developing Countries

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Postharvest waste constitutes major problems in developing countries and usually results in significant waste of produce valued in the millions of dollars. Lack of disease control, proper fertilization, irrigation and improper cultural practices during the growing season followed by faulty handling methods during and after harvest are different factors contributing to poor quality, short shelf-life, and fast deterioration of the produce. In spite of the utilization of advanced technologies, postharvest loss in developing nations may range from 20% to 80%, depending on the commodity and the producing country. Due to the magnitude of the problem, serious efforts must be directed to improve production and reduce postharvest waste in nonindustrialized nations.

National Sweetpotato Collaborators

Photosynthetic Light Response of Six Clonal Selections of the Sweet Potato Cultivar 'Beauregard'

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Eight individual potatoes, exhibiting a wide range of quality characteristics, were cloned at the Texas A&M Vegetable Improvement Center, College Station, Tex., in order to produce a large number of slips for field trials. Leaf photosynthetic light response for six of these clonal selections was determined during a greenhouse experiment conducted at the Texas A&M Univ. Agricultural Research and Extension Center at Overton, Tex. Photosynthesis data were fit to a rectangular hyperbola in order to estimate light saturated leaf photosynthetic rate (A_{max}), quantum efficiency (QE), and dark respiration rate (R_d). Significant differences ($P \geq 0.05$) were detected in all three of these parameter estimates among the six clonal selections. Parameter estimates ranged from 23.4 to 28.8 μmol (CO_2) $m^{-2} \cdot s^{-1}$, 0.056 to 0.071 mol (CO_2)/mol (photons), and –0.9 to –2.0 μmol (CO_2) $m^{-2} \cdot s^{-1}$ for A_{max}, QE, and R_d, respectively. However, these differences were not clearly related to quality characteristics determined for these clones in field trials.

Influence of Sweetpotato Resin Glycosides on the Life Cycle of the Diamondback Moth

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Resin glycosides extracted from sweetpotato skins were bioassayed for their effects on survival, development, and fecundity of diamondback moths, *Plutella xylostella* (L.). Glycosides were incorporated into an artificial diet (Bio-Serv, Inc.) and fed to diamondback larvae. Neonatals were individually fed artificial diet with 0.00, 0.25, 0.50, 1.00, 1.50, and 2.00 $mg \cdot mL^{-1}$. There were highly significant negative correlations between glycoside levels and survival as well as weight of survivors after 6 days. A significant positive relationship existed between dosages and development time. Lifetime fecundity was negatively affected at sublethal doses. The glycosides are viewed as contributors to resistance to the wireworm, *Diabrotica* and *Systena* insect complex.

Effects of Irrigation on Sweetpotato Yields

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Sweetpotato (*Ipomea batatas* L.) is a drought-tolerant crop mostly produced without irrigation. Consequently, sweetpotato may be exposed to temporary water stress. In 1997, an irrigation scheduling model using a water balance and class A pan evaporation (E_p) was evaluated with 'Beauregard' on a loam sandy soil. The model was $(12.7\ DAT + 76) * 0.5\ ASW = D_{DAT-1} + [E_p\ (0.12 + 0.023\ DAT - 0.00019\ DAT^2) - R_{DAT} - I_{DAT}]$, where DAT is days after transplanting (DAT = 0 on 20 June), ASW is available soil water (15%), D is soil water deficit (mm), R is rainfall (mm), and I is irrigation (mm). Root depth expanded at a rate of 13 mm/day to a maximum depth of 305 mm. Irrigation rates ranging between 0 and 145% of the model rate were created with sprinklers. The model scheduled 10 irrigations between DAT = 26 and 116 (harvest). Irrigation did not alter storage root quality, but did influence all the marketable grades ($P < 0.01$; $R^2 > 0.87$). However, between 0 and 129% yield increases were linear and small, suggesting that the model overestimated sweetpotato water use. Thus, deficit irrigation between 50% to 70% of the model would have a limited effect on sweetpotato yields.

Comparisons of Greenhouse to Field Selection for Yield and Quality in Sweetpotato

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Seedling plants from the three parents 'Resisto', 'Southern Delight', and 'L86-33', along with three pot sizes (3.8-, 10.2-, and 17.7-cm diameters) were evaluated. Root characteristics evaluated in both the greenhouse and field included: number, length, diameter, length diameter ratio (L:D), size, skin color, flesh color, internal cambium ring (color and width), and the number of lateral and secondary roots. After greenhouse evaluation, plants were transplanted to the field. The 3.8-cm pot did not produce enough roots in the greenhouse for evaluation. In the 10.2-cm pots, greenhouse root number was correlated with the yield, root size, and L:D, and negatively correlated with skin color in the field. Flesh color was correlated with smoothness and flesh color in the field. In the 17.8-cm pots, flesh color, smoothness, and skin color in the greenhouse were correlated with the same character in the field. Skin color was also negatively correlated with smoothness in the field. No differences were found in field yield due to pot size. Results from one season showed that the 10.2-cm pot was effective for greenhouse selection of flesh color, skin color, and smoothness in seedling sweetpotato plants.

Economic Analysis of In-row Plant Spacing and Date of Harvest on 'Beauregard' Sweetpotato

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Yield in most crops can be increased with closer in-row spacing; however, the costs vs. benefits need to be assessed. A partial economic analysis was conducted at various plant spacings and harvest times to determine the best cultural management strategy. The effect of plant spacings (15.2, 22.9, 30.5, and 38.1 cm) and two dates of harvest (≈110 or 130 days after planting) were studied on 'Beauregard' sweetpotato in one planting in 1991 and two planting locations in 1992. Weights were obtained for the U.S. Number 1, canner, jumbo, and cull grades. The 30.5-cm spacing interval was used as the standard comparison for economic analysis. Yields of sweetpotatoes increased as in-row spacing decreased. Based on economic analysis, the 38.1-cm spacing was always inferior to the 30.5-cm spacing. The preferred in-row spacing of 'Beauregard' sweetpotato is 22.9 if a late harvest is anticipated, while the 15.2-cm spacing would be best if harvesting at ≈110 days after transplanting. As long as moisture is not limiting and planting is before mid-June, sweetpotato growers should place 'Beauregard' plants at an in-row spacing of 15.2 or 22.9 cm, depending on projected date of harvest, to obtain the best yields with the highest marginal return on investment.

Shelf Life of Sweetpotatoes under Tropical Conditions: Effect of Storage Time on Sensory Properties and Importance of Water Loss

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Sweet potato is an important staple food crop in East Africa, but under local marketing conditions it has a shelf life of generally no longer than 2 weeks. As a result, the potential for marketing over longer distances is limited. The role of changes in sensory properties and weight loss as limiting factors for shelf-life were investigated. The important sensory attributes of five sweet potato cultivars were determined in discussion sessions with four taste panels and were: floury, sweet, chestnutty, grainy, smooth, soft, fibrous, discoloration, and moist. The sensory profiles of the five cultivars (KSP20, Kemb10, Yanshu 1, Pumpkin, and SPK004) differed significantly ($P < 0.001$). However, after 4 and 8 weeks under simulated tropical storage conditions (26 °C, 80% to 90% RH) no significant changes in the attributes were detected in most cases ($P > 0.05$). Changes in sensory properties were therefore not considered to limit shelf life. Shelf life experiments in Tanzania under simulated marketing conditions (26 + 5 °C, 50% to 60% RH) with 29 local cultivars revealed that roots with high rates of weight loss also rot rapidly. It was found that weight losses (primarily due to water loss) were high and varied significantly among cultivars (12% to 45% loss in 21 days). Further studies will investigate the structure and strength of the periderm as the main barrier to water loss to facilitate future cultivar selection.