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THE GEOPHYTE, TM - A COMPUTER PROGRAM FOR BULBOUS, TUBEROUS, AND HERBACEOUS PERENNIAL PLANTS

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Much information has been accumulated on various aspects of ornamental geophytes. This knowledge has been published in research articles and bulletins, books, extension publications, etc. Thus, it is scattered and not easily accessible. The Geophyte TM software program was developed to aid in information access and transfer. It has been designed for IBM compatible systems. There are 7 major parts in each database. They are: 1) General Aspects (species origin, botanical classification, common names, etc.), 2) Flowering Requirements, 3) Production Information (production countries and acreage, major commercial cultivars, production methods, etc.), 4) Gardening Information (soil types, light, planting info, cultivation performance data, etc.), 5) Forcing Information (commercial cut flowers, potted plants, homeowner forcing), 6) References, and 7) In-Depth Information, a slot allowing the user to insert specific information on the genera provided.

IDENTIFICATION OF ROSE CULTIVARS BY RESTRICTION FRAGMENT LENGTH POLYMORPHISMS

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Restriction Fragment Length Polymorphisms (RFLPs) were investigated in rose cultivars as a means of reliable cultivar identification. A random genomic DNA library was generated by shotgun cloning HindIII digested fragments of DNA extracted from rose cultivar Confection into pUC8 plasmid of Escherichia coli strain JM 83. Compared to genomic clones carrying low or highly repeated sequences, clones with moderately repeated sequences were most effective in cultivar identification. These clones were identified by hybridizing rose DNA fragments from the library with genomic DNA from 'Confection'. Clones with moderately repeated copy sequences were used as probes to detect the presence of RFLPs by Southern hybridization of EcoRI digested genomic DNA of various rose cultivars. Several of these probes have revealed RFLPs useful in cultivar identification. By using a combination of two or more of these probes most of the rose cultivars compared at this time can be identified. A dichotomous key useful in identification of rose cultivars was prepared from RFLPs displayed by 3AP probe.

INFLUENCE OF R:FR RATIO ON CHRYSANTHEMUM GROWTH

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The response of chrysanthemum plants to varying R:FR ratios and phytochrome photoequilibrium values (D = Prh/Ptot) was evaluated by growing plants under 6%, or 40% CuSO4 and water spectral filters. Using a narrow band-width (R = 655–665 and FR = 725–735 nm) and a broad band-width (R = 600–700 and FR = 700–800 nm) for R:FR calculation, 0% CuSO4 filters transmitted light with greater R:FR (3.9) and grater D (0.81) than 40% CuSO4 or water filters. Light transmitted through 40% CuSO4 and water filters had a similar narrow band R:FR ratio (1.2), but the broad band R:FR ratio (2.1) of 40% CuSO4 filter was higher than water filter. Estimated D value was similar for both water and 40% CuSO4 filters. Final height of plants grown in CuSO4 chambers was about 30% less than the plants in control chambers. The results suggest that broad band R:FR ratio correlated more closely to plant response than the narrow band R:FR ratio.

CHARACTERIZATION OF LOW TEMPERATURE DAMAGE AND SUBSEQUENT REGROWTH RESPONSE OF FIELD GROWN ROSES

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Plants of field-grown rose cultivars Blaze, Gold Glow, Queen Elizabeth, Mr. Lincoln, Monetaraxa, Don Juan, Chicago Peace, and Pink Peace endured two major freezes. Temperatures fell to 13°C on 16 December 1989 and as low as -20°C during an extended period from 17 to 25 December 1989 when the highest temperature reached was 5°C. Grade 1 plants of each cultivar were harvested on 5 January 1990. At harvest, discoloration of the pith, xylem ray parenchyma and bud union tissues was assessed. Additional plants were then placed and forced in a greenhouse at 15°C night temperature with venting at 21°C during the day. At the end of the initial flush of growth, which was defined as either the opening of the first flower or the determination that all new shoots were blind, new growth was rated and measured. Blaze exhibited minimal damage with only slight pith discoloration. The total number of flowering shoots (TNSP) for Blaze was 5.5 per plant which is an expected number from a grade 1 plant. Of the other cultivars, Gold Glow and Pink Peace exhibited pith, xylem, and bud union damage with up to 50% cane dieback, but produced flowering shoots from the graft union. However, only half the expected TNSP per plant were produced. The remaining cultivars also exhibited higher damage levels than Blaze which resulted in reduced shoot numbers and flowering. Only Blaze plants received an acceptable plant marketability rating.

AMMONIA AND NITRATE FLUCTUATIONS IN STORED WATER SAMPLES

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Water samples containing 0, 2.5, 10.0, or 20.0 ppm nitrate and ammonia were evaluated under 3 temperatures (0, 6, 20°C) plus or minus sulfite acid (24H) for changes in concentration. Ammonia and nitrate levels were measured 0, 1, 2, 4, 8, 16, 24, and 32 weeks after storing. Response to storage conditions was the same regardless of acid or concentration of ammonia or nitrate. Nitrate concentrations in the storage locations were similar for the first 2 weeks. Afterwards, treatments stored at room temperature fluctuated from initial standards. With ammonia, frozen samples had the greatest deviation from initial standards during the first 4 weeks. By week 24, ammonia samples stored at room temperature had exceeded acceptable deviations from the standards. Nitrate and ammonia samples held in refrigeration had the least fluctuation during the 32 week storage period.

TRANSPANTING TO LARGE CONTAINERS TWO TREE SPECIES PRODUCED IN GROW BAGS AND BY TRADITIONAL FIELD PRODUCTION METHODS

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Lagerstroemia X 'Natchez' and Quercus Virginiana were planted into a sandy loam soil in grow bags and by traditional field planting methods. After 21 weeks, two seedlings from each of the six replicates were dug from the field in March. Root and top growth were measured. Half the remaining plants were dug and transplanted into 3.75 liter containers for 30 or 60 days. A two-way analysis of variance was used to test for differences in growth indices between the two tree species and the two production methods. No significant differences were found between the two species in any of the growth indices. The two production methods did not significantly affect root growth. Optimum methods for transplanting pine saplings were used to transplant the Quercus species. Overall, the results were similar to those obtained in experiment 1.

CHEMICAL ROOT PRUNING OF SAWTOOTH OAK WITH COPPER SULFATE

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Interior surfaces of tubes were painted with white emulsion acrylic latex paint and white interior latex paint containing 0, 50, or 300 g/m² copper sulfate. Four 42-day-old seedlings were used to test root pruning effects and subsequent root regrowth. After 16 weeks, only 0.73 roots per seedling continued growing after the pruning treatment. The treatment was effective in reducing root length by 100 cm/m² compared with 3.67 for the control. Fibrous roots were reduced when in contact with Cu treated surfaces. Height and caliper were not affected by any treatment. Three weeks after transplanting to larger untreated containers, height and caliper were not affected by any Cu treatment. Time required for regrowth of roots was not affected by Cu treatments.

HEXICIDE USE IN PROPAGATION

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Two experiments were conducted to evaluate commonly used mulch materials and herbicides applied prior to the sticking of cuttings in propagation. Rooting percentage of the three cultivars, 'Trouper' azalea, 'Hines-Crimson' azalea, and 'August Beauty' gardenia, was not affected in experiment 1. However, summer, all three species exhibited some reduction in root quality or root length with all herbicides. In general, the herbicides with the least suppression were 4-MCPA, Settanta, Southern Weedgrass Control Oil, SA, and Baro. The second experiment with 'August Beauty' gardenia evaluated the effect of cutting depth in overcoming the negative herbicide effects on root development. The results were similar to those obtained in experiment 1.
fatty acid. The former is undesirable because of poor consumer appeal and the latter is desirable because of superiority of oleic acid in reducing low density lipoprotein in the blood plasma of consumers and a longer shelf life. The drying temperature of 35°C and an air volume of 45 CFM was superior in 1989 to 75 CFM at the same temperature and an air dried control. Lower air volumes in 1990 proved to be no better than 45 CFM at 35°C. The best compromise drying regime was determined to be 45 CFM at 35°C.

ADVANCED APPLE SELECTIONS IN THE ARKANSAS APPLE BREEDING PROGRAM: FRUITS FOR THE MID-SOUTH
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The Arkansas apple breeding program began in 1956 with objectives to develop high quality, dual purpose, adapted cultivars with a range of harvest dates and resistance to spring diseases. The program has two goals: 1) to develop red colored apples which are large, tart, firm and ripen between June and August; and, 2) develop yellow apples as a replacement for 'Golden Delicious' which are large, juicy, and sweet, with a range of maturities from July through September. Apples with commercial potential are AA-18 (red, ripens 1-July), AA-44 (red, ripens 15-July), AA-58 (yellow, ripens 29-Aug.), AA-65 (yellow, ripens 11-Sept.) and AA-62 (yellow, ripens 15-Sept.). Data on time of bloom, harvest size, and fruit storage tests will be presented.

EARLY PERFORMANCE OF 'REDHAVEN' PEACH ON 10 PRUNUS ROOTSTOCKS
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'Redhaven' trees on 10 rootstocks planted in 1984 were annually evaluated for growth and cropping as part of the NC-140 national cooperative rootstock trial. All trees on Citation have died, 60% of trees on GF-43 have died and only a single tree of Lovell, Halford, and GF-677 have died. Trees on Damas GF-1869 and GF-655.2 showed most root suckers than other trees. Redhaven own-root, Halford and GF-677 were largest in height, spread, canopy volume of TCSA while the smallest trees were GF-43, Damas, and GF-655.2. Damas, GF-43, and GF-655.2 bloomed 3-4 days before trees on Lovell. Fruit on Redhaven own-root matured 4 days before fruit on Lovell while fruit on Halford, GF-677 and GF-43 ripened 2 days later than Lovell. Trees on Halford had the highest annual yield and accumulated yield while GF-655.2, Damas and GF-43 had the lowest yields. Redhaven own-root and Halford had the highest yield efficiencies (kg/cm TCAS). Trees on Lovell consistently produced the largest individual fruit size.

USE OF CRYOPROTECTANTS FOR FROST PROTECTION IN PEACHES
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Late spring freezes often result in significant flower bud kill in deciduous fruit trees. Some products have been marketed as frost protectant compounds which purportedly protect flower stigmas and ovaries from freezing injury and death. Two of these compounds, Frost Free and Frostgard, were tested at two locations in South Carolina over three years. Varieties 'Junegold', 'Loring', 'Redhaven', and 'Jefferson' were treated with Frost Free (FF) in years 1989-1990 and with Frostgard (FG) in 1990. Significant differences in fruit yield and vegetative growth occurred during this period, but no consistent trends were evident. In 1989, FF-treated 'Redhaven' and 'Jefferson' trees averaged 15.6 and 21.8 kg more fruit/tree than the control trees. However, no lethal cold temperatures occurred during the bloom period. In 1990, FG-treated 'Redhaven' trees averaged 8.0 kg more fruit/tree than the control trees. These data suggest that Frost Free may have plant growth regulator properties.

EFFECT OF GIBBERELLIC ACID ON SEED TRACES OF ARKANSAS TABLE GRAPES
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Gibberellic Acid (GA3) was applied to 'Venus' table grape flower clusters seven days after full bloom at 0, 150 and 300 ppm in 1987 and 1988. For both years, berry, cluster and average individual seed trace weights were not significantly affected by GA3 treatment. Total seed traces/berry were reduced an average of 50%, resulting in one seed trace/berry for GA3 treated clusters compared to two seed traces/berry for the control. Yield was increased in 1988 with the 300 ppm rate.

THE EFFECT OF SOIL SOLARIZATION ON GROWTH AND UNEVEN RIPENING OF CARLOS MUSCADINE GRAPES
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In 1988 and 1989 a muscadine vineyard at Tuskegee, Alabama was treated by post soil solarization (PSS) (covering soil with around muscadine plants with clear polyethylene plastic mulch to achieve high soil temperature) for 30 and 120 days, respectively. The average soil temperature in 1989 of 30 and 35°C at 5 cm depth for solarized and bare soil, respectively. During the 120 days, no detrimental effect on 'Carlos' muscadine (Vitis rotundifolia) from the increased heating of the soil. The grape plants grown in solarized soils showed increase in grain reservoir e.g. a new shoot growth, yield, reactivation of new shoot vines, vine weight/plant, etc. Uneven ripening of muscadine grapes was reduced on plants grown in PSS over bare soil as indicated by the increases in the percent soluble solids content of grape berries.

EFFECTS OF EVAPORATIVE COOLING ON COLD HARDINESS OF CHARDONNAY AND CABERNET SAUVIGNON BUDS DURING DEACCLIMATIZATION
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Freeze losses to grapes in March, after mild deacclimatizing winters, is the major production risk on the Texas High Plains. Earlier studies indicated the effectiveness of evaporative cooling in reducing grape bud heat summation with a correlated delay in budbreak. Parameters relating to water-use-efficiency were identified. In the current study, these parameters were incorporated to minimize water use. Water was applied through sprinklers for 25 seconds every 4 minutes. Temperatures exceed 10°C, 15°C, and Control. Bud temperatures were monitored continuously by thermocouples and data logger, and correlated with budbreak and plant development. Random bud samples were taken weekly prior to budbreak and subjected to differential thermal analysis. A freeze on March 23 (3.3°C) resulted in differential primary bud losses to Chardonay during budbreak, and to Cabernet Sauvignon 15 days prior to budbreak. Evaporative cooling significantly increased yields in both cultivars. Differential thermal analysis verified differences in cold stress tolerance in Chardonay prior to budbreak.

THE INFLUENCE OF SELF- AND CROSS-POLLINATION ON FRUITING IN SOUTHERN HIGHLUSH BLUEBERRIES
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Southern highbush ('low chill tetraploid') blueberries are an earlier ripening, self polen-compatible alternative to rabbiteye blueberries. 'Sharpblue', the first southern highbush cultivar planted on a commercial scale, has been shown to require cross-pollination for optimal fruit size and earliness of ripening. 'Gulfcoast', a recently released cultivar for Gulf states growers of about latitude 30 to 32 N, differs in heritage from 'Sharpblue', incorporating about 50% more self-compatible northern highbush germplasm. 'Gulfcoast' fruit development after honey bee-mediated self- or cross-pollination with 'Sharpblue' was similar in terms of set (85.5 vs. 82.2%), weight of set (1.26 vs. 1.18g), and seed number (35.2 vs. 33.6), respectively. Cross-pollination did not result in significantly earlier ripening. Thus, 'Gulfcoast' appears to be more self-fertile than 'Sharpblue'. Other closely related cultivars are being examined to determine the genetic influence on potential for self-fruittfulness.

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INHERITANCE OF TOLERANCE TO MINERAL ELEMENT INDUCED CHLORosis IN RABBITEYE BLUEBERRY

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A study was conducted to estimate heritability of the content of Mn, Fe, and certain other mineral elements which have been associated with leaf chlorosis and to determine the genetic relationships among shoot dry weight, visual rating, and the mineral elements in rabbiteye blueberry (Vaccinium ashei Reade). Plants from a 10-parent dialled set of crosses were grown in sand culture to which 200 ml of 250 ppm Mn solution were applied five days per week. Visual ratings (1 = dead plant - 11 = no toxicity symptoms) were made after six weeks and shoot weight and mineral element contents were determined after 10 weeks of treatment. Heritability estimates were high for all variables except Fe, suggesting that change in Mn, Zn, Ca, Mg, or K content could be expected from phenotypic recurrent selection. However, manipulation of several conditions probably would ameliorate the chlorosis. The high heritability of shoot dry weight and visual rating and the high genetic correlation between the two variables suggest that plants resistant to mineral effects on Fe metabolism can be selected on the basis of visual rating.

MONITORING AS AN ESSENTIAL TOOL FOR FERTIGATION MANAGEMENT

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Blueberry growers are encouraged to monitor soil, leaf tissue, and irrigation water on a regular basis. Recommendations are based on soil, leaf, and water guidelines established from previous studies. A 1986-1988 blueberry field study in east Texas and Louisiana revealed the following significant associations with low vigor fields: 1) high soil pH, Ca, Mg and low Zn; 2) high leaf Na and irrigation water conductivity and bicarbonates. The findings will be compared to other benchmark studies. pH, conductivity, and nutrient monitoring procedures of a large east Texas rabbiteye blueberry field are described. Careful record-keeping allows blueberry growers to fine-tune fertilization performance by altering nitrogen source and rate, depending on changes in soil pH and conductivity.

SELECTION OF MAYHAW, CRATAEGUS OPACA L. FOR SUSTAINABLE AGRICULTURAL ECOSYSTEMS

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In North America, cultivation of Mayhaws (Crataegus opaca L.) is rare; most commercial harvest is taken from the wild. Crataegus opaca is distributed in the eastern United States and can grow in a wide range of conditions. It is used as an ornamental and as a source of food and medicinal products. The fruit is edible and rich in nutrients. The leaves are also used for various medicinal purposes.

Vegetable Crops

HARVEST TIMING AND HEIGHT OF CUT EFFECT ON SAGE (SALVIA OFFICINALIS)

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Dill pickle sage was transplanted in rows 92 cm apart with in-row spacing of 30 cm on 12 April 1989 at the Vegetable Research Station, Bixby, Oklahoma. Plants one row by 55 m long were established to determine the best timing for harvest and to observe the effect of cutting height and date on yield and regrowth in the fall and regrowth the following season. Four harvest dates in 1989 were 15 August, 25 August, 18 September and 8 November. In addition, one half of the plots harvested 15 August were cut on 5 November. Cutting height was 30 cm on 15 August, 15 cm on 25 August and 15 cm at all other harvest dates in 1989 and 1990. Four harvests were made on all plots during the 1990 season except those cut or cut in November 1989. Spring 1990 regrowth was very poor and no harvest was possible in April 1990 or November 1989 harvested plots. Highest total dry weight yields for the 1989 and 1990 seasons were produced by the 15 August initial cut with 8 November recut (11,522 kg ha^-1) and the 8 November 1989 cut plots (10,881 kg ha^-1). Other plots that were harvested once in August or September 1989 plus four separate harvests in 1990 produced a total yield near 9,500 kg ha^-1. The 15 cm height of cut appeared to be superior to cutting closer to the soil.

PROPAGATING ROSEMARY (ROSEMARIUS OFFICINALIS) BY CUTTINGS

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'Arp' rosemary cuttings were treated with indole butyric acid (IBA) using three different application procedures to determine speed and quality of rooted cuttings produced at three weeks under mist. Five concentrations of IBA, 0.0%, 0.6%, 1.6%, 5.0%, and 4.5%, were evaluated. Application treatments were replicated once, divided into two groups, and treated with solutions containing IBA, capon, benomyl and streptomycin applied as a one minute soak or 2) as a post plant drench or 3) cuttings soaked for one minute in a solution of capon, benomyl and streptomycin and then dipped into IBA + talc mixture. After the treatments were applied, the cuttings were placed in mist beds for three weeks. Visual shoot ratings were made weekly and visual root ratings were made at three and four weeks after treatments were applied. Root dry weights were determined. Results indicated the one minute soak in a capon, benomyl, and streptomycin solution then dipped in 0.6% IBA + talc consistently resulted in a higher quality rooted cutting.

EFFECT OF THREE PLANTING DATES, PLASTIC MULCH AND ROW COVER ON YIELD OF SHEEP'S CLOVER GRASS

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Clear (CM) and black (BM) plastic mulches and bare soil (BS) were evaluated during three planting dates (January 3rd, February 16th, and March 16th, 1990). Clear (CM) and black (BM) plastic mulches and bare soil (BS) were used to evaluate the yield of 'Georgia' collard greens. At the 1st planting date, both mulches and row cover treatments had significantly higher yield. At the 2nd and 3rd planting dates there were no significant differences in yield and row cover. The interaction at the 2nd planting date showed that yield was highest with VCM and VBS treatments and at the 3rd planting date CM, BM and VBS increased yield, respectively. The differences of days to harvest increased with each planting date and bolting was not observed for any planting date or treatment combination.

EFFECT OF AGE OF TRANSPLANTS, PLASTIC MULCH AND ROW COVER ON OOKA YIELD

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Clear (CM) and black (BM) plastic mulch and bare soil (BS) were evaluated during three planting dates (January 3rd, February 16th, and March 16th, 1990). Clear (CM) and black (BM) plastic mulches and bare soil (BS) were used to evaluate the yield of 'Georgia' collard greens. At the 1st planting date, both mulches and row cover treatments had significantly higher yield. At the 2nd and 3rd planting dates there were no significant differences in yield and row cover. The interaction at the 2nd planting date showed that yield was highest with VCM and VBS treatments and at the 3rd planting date CM, BM and VBS increased yield, respectively. The differences of days to harvest increased with each planting date and bolting was not observed for any planting date or treatment combination.

INFLUENCE OF SEVERAL ROW COVERS ON YIELD OF BROCCOLI AND CABBAGE IN SOUTHEAST MISSOURI

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Four row covers were evaluated on fall production of 'Packman' broccoli and 'Gourmet' cabbage at Cape
Girard, Missouri. Row covers used were spunbonded polyester, insular and clear slitted polyethylene and VisPor. The mean afternoon soil temperature for row covers were higher than the bare soil control. There were no significant differences among treatments with respect to head size, total numbers and yield of marketable broccoli. The number of broccoli heads per thousand between the bare soil control vs. row cover treatments were significantly different. Data for number of broccoli heads per thousand and marketable yield (kg/ha) were significant among row covers. Marketable yield (kg/ha) was significant among row covers for 'gourmet' cabbage.

A RAINFALL CAPTURE SYSTEM FOR DR YLAND CANTALOUPE PRODUCTION
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Rainfall capture system for collecting rainwater was used for crops in the spring and summer without irrigation. The rainfall capture system is located on the landscape to collect an average of 15 cm by 50% and in the top 60 cm by 20%. Plant stands were increased from 120 to 160% in uncovered plots to nearly 70% in the uncovered plot with 60% in the uncovered plots, although not necessarily commercially. In the wet season, similar differences were noted and good commercial yields were obtained with the system. The rainfall capture system in conjunction with supplemental irrigation has the potential to allow excellent cucumber production with limited water.

EFFECTS OF GROUND COVER, PLANTING METHOD AND IRRIGATION LEVELS ON CANTALOUPE PRODUCTION
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A field study was conducted in south Texas in the spring of 1990 to evaluate the effects of ground cover, planting, and drip irrigation systems on cantaloupe growth, yield, and quality. Transplanting vs. direct seeding enhanced early yield, although direct seeding later caught up resulting in comparable final cumulative yields. Black polyethylene mulch also improved earliness but at the lower irrigation rate total yields were reduced due to deflection of rainfall by the mulch. Irrigation at 1.3, 0.7, and 0.3 times evapotranspiration had little effect on final cumulative yields with exception to the 1.3 rate. Melon sugar content was highest for transplants with direct seeding and lowest at only 1/4 of final harvest. The combined practices of transplanting and black polyethylene mulch resulted in a 14 day earlier advantage over the treatments that were direct seeded on bare soil although final yields were unaffected. No appreciable increase in soil salinity was found as a result of drip irrigation usage.

THE ROLE OF A THERMOPHILIC FUNGUS IN THE ROOT ROT / VINE DECLINE DISEASE OF MUSKMELON IN TEXAS
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A disease of muskmelon (Cucumis melo L.) characterized by a vine decline and a cortical root rot was first observed in the Lower Rio Grande Valley of Texas in 1986. In 1990, isolations from diseased plants collected from four commercial production fields yielded the fungus Monosporascus cannonballus. Pathogenicity tests with eight isolates confirmed Koch's postulates; however, there were differences in aggressiveness observed among isolates. M. cannonballus is an ascomycete fungus that typically produces only one ascospore type. The fer-black ascosporangia per ascus is there is no known sexual stage. Temperature optimum of one isolate was 35 C. The optimum pH for growth was 6.7, but it grew well up to pH 9. M. cannonballus was first reported on muskmelon in 1970 from Arizona and recently was found in Japan under house culture. The presence of this fungus in Texas marks only the third report of this species worldwide, although a similar species (M. eutypoides) is the cause of a collapse of melon plants in Israel.

THE RELATIONSHIP BETWEEN THE FUSARIUM YELLOWS DISEASES OF SUGAR BEET AND SPINACH
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Twenty isolates of Fusarium oxysporum recovered from diseased sugar beet and spinach (Chenopodiaceae) or red-root pigweed (Amaranthaceae) were examined using pathogenicity, isozyme, and mtDNA RFLP markers to determine genetic similarity among isolates from different hosts. Pathogenicity tests defined several levels of host specificity. Most isolates were specific to their original hosts; however, a few isolates were pathogenic to their original host but also caused some wilt on other hosts. Two isolates were pathogenic on all three hosts and six were not pathogenic to any of the hosts. Differences in isozymes and mtDNA RFLPs corresponded with differences in pathogenicity. Three main polymorphic groups based on host specificity were identified along with three sub-groups corresponding to aggressiveness of the isolates. These data suggest that while most isolates display a high degree of host specificity isolates exist within the population that lack such specificity and cross over to other species.

OPTIMUM SPACING AND HARVEST TIME FOR 'INTERMEDIATE LEAF' HYBRID PICKLING CUCUMBERS FOR ONCE-OVER MECHANICAL HARVEST
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An 'intermediate leaf' hybrid pickling cucumber (TAMU 88304 X ARK H-19 'little leaf') was direct-seeded at four plant densities of 94,570, 48,285, 32,260, and 25,375 plants/ha respectively, four in each of four row spacings of 15, 30, 45, 60cm at two locations and two seasons. Optimum yield based on marketable fruit number, grade distribution and fruit quality occurred with 94,570 plants/ha. Optimum harvest time for all crops was recommended at 14 days after flowering and between 60cm in diameter and severely reduced browning quality. Fruit did not enlarge or enlarge slowly to oversize. This resulted in a mixture of fruit ages within the largest fruit in each plot. It is recommended that 'little leaf' lines and their hybrids such as 'intermediate leaf' be harvested when fruit 3.8 to 5.1cm in diameter appear and before oversize fruit are produced. Spacing did not significantly affect length/diameter ratio (LDR) but LDR was significantly greater for delayed harvests.

RESPONSE OF CUCUMBER GERRISPLA TO LOW MOISTURE STRESS
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Research was conducted to determine the reliability of several techniques for measuring the response of cucumber to low-moisture stress. Low and high moisture stress levels were imposed in field plots by differential irrigation. Plots under low stress had mean soil moisture at 60 cm measured tensiometer reading of 91.0 cm during the evaluation period, and plots under high stress had a mean tensiometer reading of 372.2 cm. Six genotypes of diverse background were evaluated for their stress response. The drought-tolerant cultivars 'Aldag', W421211, and W19381L (Little Leaf) showed least response to the imposed stress. Visual ratings and stress index were correlated with moisture stress levels and they detected differences in stress response among cultivars. Plant water content, stomatal conductance, and transpiration rate were least reliable for measuring moisture stress. Visual ratings appeared to be as reliable as the other more quantitative types of measurements for detecting stress tolerance.

BEE-SCENT® FOR IMPROVED POLLINATION OF WATERMELON
G. W. Elmore* and D. R. Haywood, Central Florida Research and Education Center, Leesburg, FL 34748 and Gulf Coast Research and Education Center, Bradenton, FL 34203.
Watermelon, Citrullus lanatus (Thunb.) Matsum. & Nakai, requires insects, most commonly honey bees, for pollination. Fruit set is dependent on the amount of pollen is essential to ensure fruit set, size, and shape. To encourage bee visits and the transfer of pollen, two applications of Bee-Scent®, a bee attractant, at 1 liter ha−1 were applied to watermelons in central and southeast Florida. Honey bee, Apis mellifera L., activity was monitored for two days following each application and yield and fruit quality were determined. On
only a few occasions was increased honey bee activity noted. Application of bee attractant increased total yield in one field in central Florida and resulted in an increase in early yield at all three locations in southwest Florida. Soluble solids content of mature fruit was not directly affected by treatment. Treatment increased the seed content of fruit from three of five farms.

YIELD OF TRIPLOID WATERLAVAS IS INFLUENCED BY POLLENIZERS AND INCIDENCE OF MATURE SEEDS BY PARENTS

D. N. Maynard* and G. W. Elsstrom, Gulf Coast Research and Education Center, Bradenton, FL 34201, and Central Florida Research and Education Center, Leesburg, FL 34748.

Mature seeds occur occasionally in triploid watermelon fruit. In one trial, the average number varied from 0.3 to 28.7 seeds per fruit in 30 entries and from 0.5 to 8.6 seeds per fruit in the cultivars with the same pollinizer. The incidence of mature seed in triploid fruit with the same tetraploid parent ranged from 0.3 to 3.0 and from 1.25 to 5.0 seeds per fruit in triploid fruit having the same diploid parent. Tetra A, with 151 seeds per fruit, produced triploids with only 1.3 seeds per fruit. Date-of-flowering of diploid watermelon cultivars used as pollenizers for triploids affected maturity date of the triploids. Icebox types that flower early produced higher yields of triploid fruit; whereas standard cultivars that flower later produced higher yields late in the season.

SWEET CORN YIELD AND INSECT DAMAGE AS AFFECTED BY COVER CROPS AND NITROGEN

Warren Roberts* and Bob Cartwright, Department of Horticulture & Landscape Architecture and Department of Entomology, W. Watkins Agricultural Research & Extension Center, Alabama State University, Box 128, Lake, Alabama 36755.

Cover crops and nitrogen on yield and insect damage of sweet corn were examined. In 1989, sweet corn was grown in bare soil plots, plots covered with soybean (Glycine max), and plots covered with hairy vetch (Vicia villosa) and black oat (Avena sativa) in a split-plot design with the cover crop as the sub-plot and the nitrogen treatment as the main plot. The sweet corn was fertilized with 43, 90, 134, or 179 kg/ha nitrogen (N) in 1989, and 34, 101, 168, 235, or 302 kg/ha N in 1990. Corn yields were measured for the first harvest in 1989 and the second harvest in 1989 and 1990. In 1989, corn yields were not significantly different among nitrogen treatments; however, in 1990, corn yields were significantly higher in plots with higher nitrogen rates.

SWEET POTATO TRANSPLANT PRODUCTION AS INFLUENCED BY BED COVERS

Wayne C. Porter*, Hammond Research Station, Louisiana Agricultural Experiment Station, LSU Agricultural Center, 5925 Old Covington Highway, Hammond, LA 70403.

Black polyethylene, perforated clear polyethylene, double-slitted clear polyethylene, spunbonded polyester, and a bare soil control were evaluated for their effects on the number, size, and distribution of production of sweet potato transplants. The perforated and double-slitted bed covers increased the weight and number of sweet potato transplants compared with the control. Black polyethylene was the best cover for the first harvest in 1986 and 1987. Seed roots covered with the spunbonded polyester bed cover produced more plants of greater weight than seed roots covered with bare soil at the first harvest. In 1986 only, the double-slitted bed cover produced the greatest weight and number of transplants at the second harvest (8 to 12 days later) in both years. There were no significant differences in total weight and number of transplants among black polyethylene, perforated or double-slitted clear polyethylene treatments in 1986. Total transplant number and weight from plots covered with spunbonded polyester were lower than those from plots with any other bed cover.

WATER RELATING TO SWEETPOTATOES

James R. Quarrell and Peg L. Thompson, Department of Horticulture, Mississippi State University, Mississippi State, MS 38772.

An experiment was conducted to determine the rate and frequency of irrigation needed for optimum yield in sweet potato (Ipomoea batatas L. Lam.). A line source irrigation system was used to provide continuously increasing amounts of water at each irrigation. The physiological responses of sweet potato to water application were measured. There was an increase in leaf water potential with increasing rates of irrigation. Leaf diffusive resistance decreased as total water rate increased and then increased with higher rates of irrigation. Marketable yields increased as total water rate increased to 76% of Epm and then decreased rapidly with higher irrigation rates. Irrigation measurements indicated that reduction in yield with higher amounts of water application was due to low soil oxygen content.

SWEET POTATO GROWTH IN RESPONSE TO RELATIVE HUMIDITY

E. Morley*, P. Loretan, C. Bonni, M. Hill and C. Bonni, George Washington Carver Agricultural Experiment Station, Tuskegee University, AL 36080.

An experiment was conducted in environmental growth chambers to study the response of sweet potato to relative humidity (RH). Twenty-four vine cuttings of 'Georgia Giants' were installed in a growth chamber that significantly affected the yield of corn but not sweet potatoes. Cropping method also influenced leaf area, dry matter and plant height of both sweet potato cultivars. Corn had higher yields in alternate-single row (45x30 cm) with sweet potatoes intercropped than within (90x15 cm) or alternate row (90x15).

Competition for light and nutrients may have accounted for the reduction in dry matter and leaf area of sweet potatoes in the intercrop. The average yield advantage, as measured by the land equivalent ratio, ranged between 1.39 and 1.70. Where area equivalent ratio was used to measure the yield advantage, the range was 1.42 to 1.67. 'Pink Lily' lily is more compatible with corn in intercropping than 'Mississippi Silver'.

NUTRIMENT UPTAKE OF SWEETPOTATO CULTIVARS

E. Nygonsaba, E. G. Rhodes and P. K. Biswas, G. W. Carver Agricultural Experiment Station, Tuskegee University, AL 36080.

The uptake of nutrients by sweetpotato (Ipomoea batatas) is critical in determining crop yield. Research was conducted to assess the effects of gysum application on the nutrient uptake in three sweetpotato cultivars; 'Carver II', 'Georgia Jewel', and 'Carver I' sweetpotatoes. Gypsum was applied at 10 tons/acre, and there was a similar increase observed in Ca and Mg content of the leaf. While rate of gypsum did not influence nutrient uptake, date of sampling significantly influenced leaf nutrient concentration. It was noted that leaf K for 'Jewel' and Ca for 'Carver II' were greatest at 60 days after planting. Overall, Mg content was decreased following the application of gypsum in both 'Carver II' and 'Georgia Jewel' cultivars.

INTERCROPPING OF SOUTHERNEPEES AND CORN

E. Morley, P. Loretan, C. Bonni, M. Hill and C. Bonni, George Washington Carver Agricultural Experiment Station, Tuskegee University, AL 36080.

Intercropping increases land use efficiency and provide prolonged yields between compatible crops. A study was conducted to evaluate the yield advantage of intercropping southernpeas (Vigna unguiculata) with corn (Zea mays) in addition to determining the yield advantage of corn, 'Yellow Truck', and two southernpea cultivars; 'Mississippi Silver' and 'Mississippi Purplebell', in a modified half hagland's solution using the nutrient film technique. Plants were exposed to constant T levels of 50% or 85% temperature regimes of 25/22 C were maintained during the light/dark periods with an

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irradiance level of 600 μmol m⁻² s⁻¹, and a 14 hr/10 hr photoperiod. Plants were harvested 120 days after planting and yield data was taken. High RH (85%) resulted in significant increase in the number of storage roots/plant, storage root fresh and dry weight, single leaf photosynthesis and stomatal conductance than at 50% RH. Vascular dry weight and leaf temperature was higher at 50% RH.

GENETIC VARIABILITY OF LEAF AND POLLEN PHOSPHOGLOCCOSE ISOMERASE IN IPOMOA BATATAS AND J. TRIFIDA
Zhigang Zhu* and Paul G. Thompson, Department of Horticulture, Mississippi State University, Mississippi State, MS 37962

The polymorphisms of phosphoglucoisomerase (PGI) in sweetpotato and J. trifida were examined. Horizontal starch gel electrophoresis was used to analyze leaf and pollen tissue of parents and progenies of 10 crosses. Analysis revealed 2 isoforms of PGI, a dimeric enzyme system controlled by 5 loci. The segregation ratio did not suggest that PGI was a duplicate system and therefore did not indicate hexaploidy. Only 1 locus appeared to be present in J. trifida. No observed band was related to different ploidy levels in J. batatas and J. trifida. No linkage was identified among the loci.

USE OF IN VITRO TECHNIQUES TO OVERCOME INCOMPATIBILITY IN SWEETPOTATO
Salvador Rojas* and Paul G. Thompson, Department of Horticulture, Mississippi State University, Mississippi State, MS 37962

To develop in vitro techniques to overcome incompatibility in sweetpotato the cross and self incompatible cultivars Regal and MD-708 were crossed pollinated and also crossed with the compatible 'Vardaman'. Polenation of pollen behavior in different crosses after 3, 7, and 24 hours, showed good germination and tube development in compatible crosses, but no germination in incompatibles. In a preliminary experiment using embryo rescue techniques plants were produced only from compatible crosses at 25 and 30 days after pollination. In subsequent experiments, immature embryos were rescued when cultured 15 days after pollination. The highest percent of rescued embryos resulted from Murashige-Skoog medium. Intraovarian, stigmatic and placental in vitro fertilization were investigated to overcome incompatibility. Embryos were not formed from any of these methods, but callus was produced with placental pollination.

EVALUATING SWEETPOTATOES FOR RESISTANCE TO THREE PATHOGENS SIMULTANEOUSLY
R. Mark Hurley*, Paul G. Thompson, and Gary W. Lawrence Department of Horticulture, Mississippi State University, Mississippi State, MS 37962

A factorial test was conducted to evaluate the potential of screening sweetpotato plants to three pathogens simultaneously. The pathogens were Melodysnyr isporum, Fusarium oxysporum, and Breptoscyises Ipomoeae. The test also involved six sweetpotato cultivars and three evaluation times. Evaluation times were 3, 6, and 9 weeks post inoculation. The symptoms evaluated were vascular necrosis, fibrous root necrosis, and gall and egg number production. For each of the three pathogens, the ability to separate cultivars with intermediate levels of resistance is one of the criteria that can be used to determine the degree of resistance increased as post inoculation time increased. Simultaneous screening was practical if the goal was to screen plants for all three pathogens. Resistance to individual pathogens could not be identified in plants inoculated with all three pathogens.

PHYSIOLOGICAL CHANGES ASSOCIATED WITH HARDCROP DEVELOPMENT IN SWEETPOTATOES
Tonda Bardwell, Huang Jin wing, J. O. Garner, and J. L. Silva, Departments of Horticulture and Food Science, Mississippi State University, Mississippi State, MS 37962

Storage roots of 'Jewel', 'Centennial' and 'Beauregard' were chilled at 5°C for 0, 10, 20, 30 or 40 days. After chilling, the roots were placed at 21°C for two days to allow hardcrop development. Hardcrop was measured as weight of root that remained hard after boiling for 45 minutes. Hardcrop and fatty acid composition of total lipids were compared for the three cultivars. Hardcrop was present at 10 days in both 'Jewel' and 'Centennial' while 'Beauregard' showed no hardcrop at 20 days. 'Beauregard' had a higher fatty acid content of 'Beauregard' was higher for the 0, 10, and 20 day sampling periods, and decreased to a level equal to that found in 'Jewel' and 'Centennial'.

RESPONSE OF TWO SWEETPOTATO GENOTYPES (IPOMOEA BATATAS L. LAM.) TO CHILLING TEMPERATURE
Chana Phromtong* and James O. Garner, Jr., Department of Horticulture, Mississippi State University, Mississippi State, MS 37962

Ten day old potted rooted cutting of sweetpotato genotypes 'Travis' and MS 21-1 were exposed for seven days to cold (12°C) or 21°C (control) temperatures. Chemical changes that may accompany tolerance or susceptibility to chilling were monitored. No consistent differences in total fatty acid composition were found between the two genotypes. There was an increase in peroxidase activity of the crude enzyme extract of MS 21-1, the chilling tolerant genotype, when exposed to 12°C for seven days. No differences were found in POD activity for 'Travis', the chilling sensitive genotype. Superoxide dismutase (SOD) and catalase (CA) activity for crude enzyme extracts did not differ between genotypes and was not influenced by storage temperature.

THE EFFECTS OF WATER STRESS ON PLANT WATER STATUS AND GROWTH OF SELECTED SWEETPOTATO GENOTYPES
Thamasak Thongkiet* and James O. Garner, Jr., Department of Horticulture, Mississippi State University, Mississippi State, MS 37962

Responses of four sweetpotato genotypes ('Centennial', 'Travis', 'Vardaman' and 'MS 21-2') to water stress were studied. Two irrigation regimes (irrigation vs non-irrigation) were imposed on five-week old cuttings grown in a greenhouse environment. Transpiration and leaf diffusive resistance (LDR) were measured with a steady state porometer. Mid-day total leaf water potentials were determined with a thermocouple psychrometer. Leaf growth was inhibited earlier than root growth. Water stress caused a reduction of leaf size in Centennial and in leaf number in the other three. Storage root number of Vardaman was not inhibited by limited soil moisture but development of storage roots was retarded by water stress. Total growth under non-irrigation of MS 21-2 was inhibited more than Vardaman. Mid-day leaf water potential did not show promise as a good indicator of water status. Genotypic differences in the water stress sensitivity as measured by LDR were unexplained.

YIELD COMPARISONS OF SWEETPOTATO VINE CUTTINGS AND TRANSPLANTS PULLED OR CUT FROM THE PLANT BED
Melvin R. Hall, Department of Horticulture, University of Georgia Coastal Plain Experiment Station, P. O. Box 748, Tifton, GA 31793

Plots grown from 'Georgia Jet', 'Red Jewell', and 'Jewel' sweetpotato [Ipomoea batatas (L.) LAM.] plants cut out from the propagating bed (cut-plants) yielded more than plots grown from plants pulled from the bed (plants). Presence or absence of the shoot apex had little influence on yields of 'Georgia Jet' and 'Red Jewell' when evaluated in combination with plants or cut-plants or when evaluated in combination with various cuttings in inverted position. Chlorine dips did not influence yield of 'Jewel' plants or cut-plants. Plots grown from 'Red Jewell' vine cuttings transplanted in an inverted position generally yielded slightly less than plots grown from vine cuttings transplanted in an upright position, but these differences were not significant.

EFFECT OF NITROGEN SOURCE, RATE, AND APPLICATION FREQUENCY ON YIELD AND QUALITY OF ONION
K. M. Batal, Dept. of Horticulture, University of Georgia Coastal Plain Experiment Station, P. O. Box 748, Tifton, GA 31793

Commercial N fertilizer formulations, ammonium nitrate, calcium nitrate, sodium nitrate, potassium nitrate (15-0-0-14 and 13-0-4-44) applied at 84 and 160 kg N/ha in 3 or 5 split

applications did not affect total marketable yield of dry onion. Application frequencies causing an increase in total amount of N applied during the spring months (Feb.-Apr.) increased marketable yield by 5 MT/ha. Bulk decay was the highest when ammonium nitrate was applied, whereas the least number of decayed bulbs resulted from sodium nitrate applications. Plants grown with potassium nitrate (13-0-44) were most susceptible to bulk decay. Ammonium nitrate and sodium nitrate applications produced the highest percentage of onions that bolted. The lowest percentage of plants showing bolting incidence resulted from calcium nitrate applications. Bolting of onions was closely associated with rapid growth and increased onion size. However, cold injury and bulk decay were not influenced by these growth factors.

GUAR BEAN PRODUCTION IN GEORGIA
Harshin Bharadwaj and Ron Hineritter, Agricultural Research Station, Fort Valley State College, Fort Valley, GA 31030-3298 and Department of Food Science and Technology, University of Georgia, Athens, GA 30602

Guar or clover bean (Cyamopsis tetragonoloba (L.) Taubert), a leguminous plant, is grown in many parts of the world for consumption as green beans. However, information on green bean yield and their nutritional quality is lacking. Our objectives were to determine yield potential, optimum harvesting time, and nutritional quality of green guar beans. We planted 10 guar varieties in a RCBD with 4 replications on 1 June 1990 at Fort Valley, Georgia. The guar beans were harvested in July. Significantly higher yield (kg/ha) varied from 9549 (Kimman) to 1629 (HG-75), at 85 DAP. The highest yield at 100 DAP was recorded for Lewis. The ideal harvesting time, based on degree of yellowing and bean texture, for Durga Jay, Esser, Hall, SPS-119, and Lewis seemed to be 100-115 DAP whereas the beans of Brooks, HG-75, HS-190, Kimman, and Santa Cruz became tougher and yellow by 100 DAP. A comparison with published results of snap beans and edible-pod peas indicated that green guar beans contained greater amounts of protein, total carbohydrates, vitamin C, calcium, iron, manganes, phosphorous, potassium, and sodium. These results indicate that green guar beans can be a potential alternate source of income for farmers in Georgia and other states.

THE EFFECTS OF UNDERGROUND DRIPLIGATION ON SWEET CORN PRODUCTION
James J. Brunt, Daniel W. Birch, Ronald L. Shumaker, Charles H. Williams, Department of Horticulture, AAE, and Larry Curtis, Department of Agricultural Engineering, AAE, Auburn University, AL 36849

In sweet corn field plots in Alabama, urea-ammonia nitrogen was applied to the soil through underground and aboveground drip irrigation systems. Dry nitrogen in the form of ammonium nitrate was surface band-applied as a control. Dry nitrogen rates of 36, 67, 102 and 135 kg/ha were applied in either 2 or 4 applications by each of the 3 methods. P and K fertilizers were applied to all treatments in a dry form according to soil test recommendations. The underground drip pipe was placed 23 cm beneath the soil surface in each row. Nitrogen (60 or 70) rate of 135 kg/ha produced greater sweet corn yield than the 67 kg/ha rate with no effect of application number on yield in 1988, when rainfall was less than adequate. In 1989, when rainfall was adequate, no differences occurred in yields regardless of number, rate, or method of application of nitrogen.

Extension

APPLICATION INDUSTRY PARTNERSHIP RESULTS IN EMPLOYEE TRAINING VIDEOS FOR LANDSCAPERS
Gary L. Wade*, Joan E. Marsh, and Mark Banta, Cooperative Extension Service, The University of Georgia, Athens, GA 30602

In June 1988, an Extension advisory committee of landscape professionals met in Atlanta to discuss educational needs of the industry. Representatives from commercial, municipal, institutional, recreational and private landscape operations present unanimously identified the need for employee training materials as a top priority. A sub-committee composed

EXTENSION'S ROLE: A NEW AGRICULTURAL WEATHER PROGRAM

An agricultural weather program has been developed in Alabama and is available on the ACNET computer network of the Alabama Cooperative Extension Service (ACES). This program involves the coordinated efforts of the National Weather Service (NWS), ACES and grower organizations. The program began in March 1987 and has been upgraded several times. Hardware now being used includes a Sun Microsystems SPARC station by NWS and a Sun Microsystems Server Model 4/220 by ACES. Existing and experimental NWS forecast products are disseminated to each of Alabama's 67 county offices (CEAS) and to local producers using ACES' computer network. A comprehensive collection of climate and weather related information is available to ACES staff including a wide use of climate alert program. Very detailed forecast changes and related information is available to users of ACES' network. A user prepared commentary further enhances use of information during each forecast event. Considerable cost savings have been realized by producers. A pilot program is being initiated in 1991 to incorporate data from several real time weather stations into the system.

ALTERNATIVE MARKETING AND CULTURE SYSTEMS FOR TEXAS HIGH PLAINS ONIONS
Roland Roberts*, David Bander and Samuel Field, Texas A&M University, Agr. Exp. Cir., Rte 3, Box 9135A, Inahven, TX 79040

Extension-research teamwork supports Texas High Plains onion grower-shippers in transition from unprofitable labor intensive marketing and culture to profitable mechanical systems that are less stressful to workers. System comparisons include machine harvest vs. lifting and hand clipping; stationary seed grading and bagging vs. mobile field grading and bagging; transplant vs. full seeding, spring seedling and dry set production. Old marketing systems cost growers $4.30/50-lb sack, and the innovative system costs $2.59 to $3.00/sack. Old transplant systems average $450 to $550/acre and direct seeding costs $270/acre. Net increase in return to grower management from adoption of new systems range from $1,300 to $1,700. Extension and research conduct economic analysis, cultivar performance trials, seeding technique studies and on-farm demonstrations.
Postharvest

POSTHARVEST PERFORMANCE OF WHITE AND GREEN ASPARAGUS SPEARS
D. J. Makouk and A. R. Gonzales
USDA-ARS, Booneville, AR 72927 and Dept. Food Science, University of Arkansas,
Fayetteville, AR 72703

Black and white plastic row covers were established over 4 yr old field-grown "Jersey Giant" asparagus in March 1990 to produce white asparagus spears. Control or green spears were grown without row covers. Spears harvested between Apr 27 and Aug 18 were used in subsequent experiments. Spears grown under white, black or no row cover were trimmed to 15 cm, weighed, then stored in perforated polybags at 0 or 7°C and removed from storage weekly to determine water loss and color change. Weight loss was greater in spears held at 7 than 0°C but row cover treatment had no effect on water loss. Hue (color) and CIE "a" values (greenness) decreased in green spears stored at the higher temperature. After 21 days in storage, decay was 0 and 21% in spears stored at 0 and 7°C, respectively. Decay in white and green spears were 6% and 20%, respectively. White spears, harvested May 2 and May 9 and held at 21°C for 3 days, had significantly lower rates of CO2 evolution than did green spears. White spears grown under either row cover treatment had similar postharvest attributes.

A METHOD TO MEASURE SULFUR-CONTAINING VOLATILES IN ONIONS USING A GAS CHROMATOGRAPHY
K. J. Byun, D. H. Bower and M. P. Pike
Department of Horticultural Sciences, Texas A&M University,
College Station, TX 77843-2133

A 50 g sample, taken as a horizontal section from the middle height of an onion bulb was blended with 100 g water for 1 min in a closed plastic mason jar. A 0.5 ml of a headspace sample was drawn and injected into a Perkin Elmer 8800 GC equipped with a FPD for detection of sulfur containing compounds. The major volatile tentatively identified in onion were thiopropanal S-oxide, methyl propyl disulfide, dipropyl disulfide, and propyl allyl disulfide.

We observed significant variation of peak pattern and height depending on position in a bulb, among bulbs within variety, and between varieties. These results seemed to comply well with taste test. There were no significant correlations between total peak height and bulb weight, soluble solids, or pyruvic concentration in juice extract. Our investigation suggested that this procedure provided better understanding and measurement of onion pungency than pyruvic analysis.

STORAGE TEMPERATURE AND DURATION INFLUENCE DETERIORATION OF FILM-BAGGED AND NONBAGGED MUSTARD
Regina P. Breshears, J. J. Fonteno and R. J. Constantine, Hammond Research Station, Louisiana Agricultural Experiment Station, ISU Agricultural Center, 5925 Old Covington Highway, Hammond, LA 70403

Brassica juncea var. crispa (oilseed) was stored in perforated polyethylene bags, polyethylene shrinkable film, and nonbagged at 1, 4, or 10°C during three experiments in the spring of 1989 and 1990. Baggled mustard was stored in polyethylene film of Craven D-955 50-gauge or Craven D-955 100-gauge. Significant low temperature at 4°C slowed reduction of weight loss over nonbagged mustard. Bag type had a high significant effect on CO2 concentrations in the atmosphere within bags of mustard with highest CO2 concentrations occurring in the bags made of Craven film. Mustard stored in all bags retained marketable quality significantly better than nonbagged mustard. Bagged mustard was stored for 12 days at 1 or 4°C with excellent quality, whereas nonbagged mustard was unacceptable after only 5 days in storage. Color, texture, and appearance of all mustard were poor after 5 days in storage at 10°C. Sensory evaluations indicated bagging and storing mustard for 12 days at 1 or 4°C did not affect the flavor and quality of cooked mustard.

SWEETPOTATO COLLABORATORS & COWPEA MEETING

EVOLUTIONARY BIOLOGY OF THE SWEET POTATO AND ITS RELATIVES: OPPORTUNITIES FOR MOLECULAR GENETIC STUDIES
G. S. Varadarajan and C. S. Prakash, School of Agriculture, Tuskegee University, Tuskegee, AL 36088
The sweet potato (Ipomoea batatas) and its relatives (the batatas complex) appear to have evolved in the New World and radiated over several geographic centers in the tropics and sub-tropics. Traditional studies on anatomy, cytogenetics, and reproductive biology have enabled us to investigate certain evolutionary aspects. We conclude that this complex is a monophyletic, "polyphyletic" group, and suggest that intraspecific hybridization is one of the major factors in the origins of the species. We are currently using molecular genetic techniques to determine variation in the complex. For example, we have detected variation in the complex, and have used DNA fingerprinting analyses to examine some of the evolutionary issues that could not be satisfactorily addressed by morphological and morphometric approaches.

In addition, we are investigating the polymorphism of unique low copy regions using a battery of DNA sequences from homologous as well as heterologous sources. The success of this study will hopefully lead to a new insight on the evolution of the complex.

FOREIGN GENE TRANSFER TO SWEET POTATO (IPOMOEA BATATAS) C. S. Prakash, U. Varadarajan, and A. S. Kumar, School of Agriculture and Home Economics, Tuskegee University, Tuskegee, AL 36088, and Hawaiian Sugar Planters Association, Aina, HI.

Development of a gene transfer system will enable rapid integration of new structural and regulatory genes into elite cultivars of sweet potato. We have used a recombinant plasmid method to introduce foreign genes into the genome of two sweet potato cultivars. Chimeric marker genes (gusA and kan) were successfully introduced into cv. Juelo and TIS-70537 using both approaches. However, transgenic plants were generated in vitro using only the Agrobacterium approach. Cellul and root isolates with stable expression of gusA gene were obtained using the microprojectile method. Expression of the selectable marker gusA gene was detected by Northern analysis. Integration of the introduced gene into the genome of sweet potato was confirmed by Southern blot analysis. Transgenic sweet potato plants from both cultivars are being raised and studied for quantitative expression and localization of the introduced genes. These results show that foreign genes can be successfully introduced and expressed in sweet potato. Current efforts are directed at optimizing several variables to increase the transformation efficiencies and to generate transgenic cultivars with foreign genes of agricultural importance.

INCORPORATION OF GLANDULAR TRICHOMES INTO AN ADVANCED SOLANUM PHUREJA-X SOLANUM STENOTOMUM HYBRID POPULATION
Roger L. Vallejo, Manda W. Collins and Rocco Schiave, Department of Horticultural Science, North Carolina State University, Raleigh, NC 27605

A hybrid diploid potato population (Solanum phureja x Solanum stenotomum) with superior horticultural traits has been developed for breeding purposes. Because this highly advanced population has no resistance to potato virus Y (PVY), and because PVY pressure is very high in North Carolina, glandular trichomes from another diploid species, Solanum berthaultii, were introduced as a defense against aphids, the PVY vector. Two types of glandular trichomes, A and B, were transferred. Preliminary results show that genetic diversity and broad-sense heritability are adequate to transfer these traits; however, non-additive gene action was indicated in narrow-sense heritability estimates. Spearman's coefficients of rank correlation showed a low level of association between A and B trichomes; density of both types is postulated to be under the control of a small number of genes.
MANAGEMENT OF SOIL INSECTS AND THEIR DAMAGE TO SWEETPOTATO THROUGH THE USE OF INSECT RESISTANT CULTIVARS, INSECTICIDE AND BIOLOGICAL CONTROL.

J. M. Schultz, A. Jones, P. D. Dukes, and D. R. Seal, U.S. Vegetable Laboratory, 2875 Savannah Highway, Charleston, SC 29414-5334

The text involved the use of a control (untreated), an entomopathogenic nematode (Steinernema carpocapsae), a granular insecticide (Dyfonate 2.24 Kg ai/ha) in combination with 7 sweetpotato cultivars having varying levels of resistance and susceptibility to soil insect damage. The parasite was applied three times at monthly intervals (67 cm²). The parasite or insecticide did not reduce root injury by soil insects as compared to the control (untreated). Wireworm, Diabrotica spp. and Southern Redmange were not less than for the susceptible cultivars (SC-1149-19, Jewel and Centennial). Sweetpotato flea beetle resistance was observed for in 2 cultivars (Gulf and Imperial). In this test resistant cultivars were more effective in reducing soil insect damage than the biological or chemical control methods.

WEED CONTROL IN SWEET POTATOES WITH OXYFLUORFEN

Wayne C. Porter*, Hammond Research Station, Louisiana Agricultural Experiment Station, LSU Agricultural Center, 5925 Old Covington Highway, Hammond, LA 70403

Oxyfluorfen was evaluated for weed control in sweet potatoes. In 1980 applications were made to prevent transplants immediately after transplanting. The 1980 applications were made to prevent transplants. Oxyfluorfen applied post-transplant at 0.28 lb ai/acre and greater rates caused a significant reduction in crop vigor. A 1.0 lb ai/acre rate of oxyfluorfen reduced crop vigor when applied pretransplant. All rates of oxyfluorfen controlled Brachiaria platyphylla, Digitaria sanguinalis, Cyperus iria, and Sphenstachys oryzae. Oxyfluorfen rates of 0.5 lb ai/acre and greater were good to consistently control Sida spinosa and Echinocloa crus-galli. Holloconvittata was controlled at all rates in 1989 but not controlled at all in 1990. Yields of all grades of sweet potato roots from plots treated with oxyfluorfen were not different from yields from plots treated with currently labeled herbicides. However, in 1989 yields from all oxyfluorfen-treated plots were lower than yields from the check plots. In 1990, plots treated with oxyfluorfen at 0.25 or 0.36 lb ai/acre had lower yields of No. 1 grade roots than the check plots.

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GENETIC VARIANCE FOR RESISTANCE TO SWEETPOTATO WEEVIL

Paul G. Thompson*, John Schneider, and Boyett Graves, Mississippi State University, Mississippi State, MS 37762

A breeding population including parents with known moderate levels of weevil resistance was evaluated for resistance in a field experiment with few naturally occurring weevils. Weevils were collected from several Mississippi locations and introduced at different times. Male and one female were released at the crown of each plant 73 days after transplanting. Seventeen parents and their progenies plus 6 additional clones from each were released in 5 plants plus replicated 8 times. Genetic variability for resistance to weevil injury was observed. Mean percentage injured roots ranged from 25 to 85 and there were differences in resistance to injury among genotypes. Additive genetic

VARIANCE was moderate as increased resistance levels should result from selection and intermating for high resistance.

INDUCED RESISTANCE RESPONSE OF SWEETPOTATO TO FUSARIA ROT ROOTS BY HY-PHORNE


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USDAARS Appalachian Fruit Research Station, Kearneysville, WV, "Aro, Volcani Center P.O. Box 6, Bet Dagan, Israel, 52500

Jewl sweetpotato storage roots previously treated with ultraviolet (UV-C) light and then stored for 30 days before artificial inoculation with Fusarium solani showed increased resistance to Fusarium root rot; as indicated by reduced lesion size, the root rot colonization and lesion tissue. There was a horiztonal relationship between the incidence of Fusarium root rot and UV-C doses. The optimum dose of UV which reduced Fusarium root rot was 3.3 x 10^4 ergs/cm².

Exposure of sweetpotato to UV-C promotes phenylalanine ammonia-lyase (PAL) production with the maximum PAL activity occurring at 3.3 x 10^4 ergs/cm². Crude extracts from UV-C treated sweetpotatoes reduced germination, germ tube elongation and growth of F. solani when compared to untreated extracts.

MAYOR (PASSIFLORA INCANATA L.) AND PASSION FRUIT (PASSIFLORA EDULIS) COMPARED

Harvey E. Arbo, Frank B. Hatta and James O. Giner, Jr., Department of Horticultuce, P. O. Drawer T, Mississippi State University, Mississippi State, MS 39762

Fruit growth and composition of commercial passion fruit types and maypop were compared. Fruit growth (diameter) of purple passion fruit (Passiflora edulis Sims.) and maypop (P. incarnata L.) showed a sigmoidal growth curve. Passion fruit were larger than both greenhouse-grown and wild maypop fruit. Wild maypop produced larger fruit compared to greenhouse-grown maypop. Yellow passion fruit had the lowest percentage pulp and the highest soluble solids. Greenhouse-grown maypop had the lowest soluble solids. Purple and yellow passion fruit had higher juice than maypop. Wild maypop fruit had the highest sucrose and purple passion fruit had the lowest. Yellow and purple passion fruit juice had higher sucrose and glucose than did maypop juice.

COWPEA VIRUSES, INDIGENOUS AND EXOTIC, AND UNIQUE MECHANISMS BY WHICH THEY ARE TRANSMITTED AND INDIRECTLY INTRODUCED

Richard Hamilton, USDA ARS, Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331

Vectors with specific vector-virus relationships (e.g., aphid, turtle, thrips) commonly cause short-range dissemination of cowpea viruses. However, viruses that are seed-borne in cowpea can be disseminated around the world in a vector chip through the increased world emphasis on germplasm collection and exchange, for development of improved crop cultivars, increases the risk of dissemination seed-borne viruses in germplasm. Seed-borne cowpea viruses that are not reported in the U.S.A., but are not to occur in Vigna unguiculata from world centers of cowpea origin include COWPEA APHIDI-RODENT MOSAIC, COWPEA MILL MOTTLE, COWPEA MOSAIC, and COWPEA MOTTLE VIRUSES. All of these viruses were detected in ELISA serology in V. unguiculata seedlots processed as potential germplasm introductions. In collaboration with the government of Denmark, germplasm-borne viruses, once introduced into breeding programs, may be transmitted directly into progeny and spread with genes selected from the germplasm source. Such viruses also may be spread by insect vectors to other breeding lines, and could cause disease outbreaks to nearby commercial cowpea crops.

VIRUSES SEED-BORNE IN COWPEA: SIGNIFICANCE FOR COWPEA BREEDING PROGRAMS AND PRODUCTS

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By ELISA serology, we have detected and characterized the following seed-borne viruses in Vigna unguiculata seedlots, processed cooperatively with the Government of Denmark as potential germplasm introductions: BLACKBEYE COWPEA MOSAIC, COWPEA APHIDI-RODENT MOSAIC, COWPEA MILL MOTTLE, COWPEA MOSAIC, COWPEA MOTTLE, COWPEA MOSAIC, COWPEA MOTTLE, CUCUMBER MOSAIC, CUCUMBER MOSAIC and SOUTHERN BEAN MOSAIC VIRUSES. Twenty-three of 155 seedlots

from IU old-world countries were found to contain one or more of these viruses. TOBACCO RINGSPOT and URD BEAN LEAF CRINKLE VIRUSES are known to be seed-borne in cowpea, but were not included in assays. At least six other cowpea-virus vectors, as yet inadequately characterized, are also reportedly seed-borne in cowpeas in India and countries of west Africa. We are currently characterizing viruses in Vigna and interactions and selected germplasm accessions, with emphasis on seed-borne potyviruses. Comparisons among BICMV and CMV isolates, for which ccmus sources of genetic resistance have been identified, revealed a wide range of isolate pathogenicity for both viruses.

RELATIONSHIP BETWEEN SWEETPOTATO FIBROUS ROOT GROWTH AND NUTRIENT UPTAKE IN FRITTED CLAY MEDIA.
E. G. Rhoden* and P. J. Ndolo, G. W. Carver Agricultural Exp. Station, Tuskegee University, Tuskegee, AL 36088

A greenhouse study was conducted to investigate the ability of sweetpotato (Ipomoea batatas), cv. 'Centennial', 'Rojo Blanco', 'Georgia Jet' and 'IT-02-155', fibrous roots to accumulate N, P, K, Ca and Mg. Sweetpotato plants were grown in a fritted clay medium and harvested 42 and 82 days after planting. Fibrous roots comprised 22 to 20.1% and 3.9 to 11.1% of the plant dry weight at 42 and 82 days after planting, respectively. There was no difference in average root length/cm depth of soil among the four sweetpotato cultivars at day 42. While there was no difference in average root length among 'Centennial', 'Rojo Blanco' and 'IT-02-155', these cultivars were significantly different from 'Georgia Jet' at day 82. For the four cultivars, there were no significant differences in N, P, K, Mg and Ca uptake at day 42, but each cultivar absorbed significantly more of each nutrient 87 days after planting. 'Georgia Jet' absorbed significantly more of the nutrients measured than the other cultivars, resulting in the highest dry matter yield. The data show that the efficient uptake and utilization of nutrients by sweetpotato are related to the amount of fibrous roots present.

EFFECT OF FOUR ROW COVER SYSTEMS ON PRODUCTION OF SOLANUM TUBEROSUM IN SOUTHEAST MISSOURI
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'Norchip' and 'Atlantic' potatoes grown at Rindgett and Drielst, Missouri on 2 sandy, well drained entisols were evaluated for growth in four row covers. The row covers were spunbonded polyester, inosar slitted, clear, clitted polyethylene and VisPore. Row covers increased the mean afternoon soil temperature from 62° to 108°. The mean plant heights were significantly different among treatments for the cultivar 'Norchip' but were not different for 'Atlantic'. Data for average and total plant weights were significantly different between the bare soil control and all row covers. The grade of marketable weights and numbers in Kg and nos/ha of 'Norchip' and 'Atlantic' potatoes had a significant contrast at the 0.01 level of probability with cultivars.

EFFECTS OF SURFACE MOISTURE AND COLONIZATION BY INA BACTERIA ON FROST DAMAGE TO TOMATO SEEDLINGS
Glenn Down and Jeffrey Anderson*, Department of Horticulture and Landscape Architecture, Oklahoma State University, Stillwater, OK 74078

Norchip and Atlantic potatoes are susceptible to frost damage during the early spring and prior to flowering. Although surface moisture increases foliage temperatures during the day, it decreases diurnal temperature fluctuations at night. The surface temperatures of leaves with and without a daily application of water were 2.5°C and 3.5°C, respectively. The higher temperature difference for the wet leaves is due to a combination of increased leaf area, lower water loss per unit area, and lower thermal capacity of the leaf. These results indicate that surface moisture increases frost damage to the foliage of these cultivars.

POSTERS

USE OF HPLC ANALYSIS TO MONITOR CHANGES IN SUGAR CONTENT OF STORED SWEETPOTATOES.
William M. Walter, Jr., U. S. Department of Agriculture, ARS, and Department of Food Science, North Carolina State University, Raleigh, NC 27695-7524

The sugar content of the sweetpotato cultivars 'Centennial', 'Crown', 'Georgia Ruby', and 'Sweet', was measured by high performance liquid chromatography (HPLC) and compared to the sugar content found by measuring the refractive index of cellular sap and converting the refractive index value to sugar concentration. The sugar content and refractive index values were measured for just-harvested, cured and stored roots. Changes in the sugar content as determined by HPLC were found to be linearly related to changes in sugar content measured by HPLC, indicating that this method can be used to monitor changes in postharvest sugar content.

CAROLINA CROWDER: A NEW, FEST AND DISEASE RESISTANT, ALL-PURPOSE SOUTHERNPEA
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The Agricultural Research Service of the United States Department of Agriculture announced the release of Carolina Crowder southernpea on 12 October 1990. The new cultivar is well adapted for cultivation throughout the southern U.S., where it can be expected to produce excellent yields of high quality, crowd-type peas. Carolina Crowder is resistant to the cowpea curculio, the major insect pest of the southernpea to southeastern production areas, and is insensitive to cowpea mosaic virus, an important virus pathogen of southernpea in the United States, and root-knot, a severe root disease (Meloidogyne incognita) of the root-knot nematode. Canned samples of fresh Carolina Crowder peas scored well in three years of quality evaluation tests. Pod color is a brilliant red at early green-shell maturity and the brilliant red colored with even, dark, colored pigment at optimum green-shell maturity. The attractive pod color should make Carolina Crowder an excellent candidate for fresh market use. Carolina Crowder plants have a greater tendency to produce a second crop than plants of most southernpea cultivars.

WATER PLANT THREPS: IDENTIFICATION OF RESISTANCE IN PEPPER
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A greenhouse study was conducted to confirm the availability of resistant line (L. L.) to western flower thrips (Frankliniella occidentalis Pergande). Host plant resistance ratings confirmed earlier observations that there is a considerable amount of variability within pepper germplasm for resistance to F. occidentalis. Plants of 'California Wonder', 'Keystone Resistant Giant', 'Mississippi Nematohart', 'Sweet Banana', and '.Tojo Wonder L.' were resistant to the insect and exhibited only mild injury. Plants of 'Bohemian Chili', 'Carolina Cayenne', and 'Santana' however, exhibited the symptoms of severe thrips injury, i.e., poorly developed, distorted and distorted leaves, greatly shortened internodes, and severe chlorosis. The resistance in pepper to F. occidentalis appears to be due to tolerance mechanisms, not nonpreference or antibiosis mechanisms. The levels of resistance identified in this study are sufficient to justify the initiation of breeding efforts to transfer F. occidentalis resistance into susceptible pepper cultivars.

PLANTING DATE EFFECT ON PIGEONPEA DEVELOPMENT IN MID-MISSOURI
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Determinates, photosynthesis-resistant genotypes of pigeonpea, (Cajanus cajan) have the potential for production in the short growing season of the temperature region. A field study was conducted to determine the effect of three planting dates on the growth and

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development of this crop in Missouri. Seeds of four genotypes, ICPL 87 Isolation (85K), ICPL 85010, ICPL 85024 and ICPL 8304 were planted at three planting dates in 1999, May 1, May 15 and May 31. Genotypes on the earliest planting date were low but increased in the later planted ones. The earlier the planting date the longer was the time to flowering, but the earlier was pod maturity. The earliest planted group flowered within 78-110 days after planting. The genotypes in this group produced the highest fresh pod weights of 33% and 55% of the last two planting dates. The latest planting date produced the lowest yield. The number of seeds per pod and weight of 100 seeds had ranges of 5.1-5.9 cm, 3-4 seeds and 17-23 g, respectively and were unaffected by planting dates.

INFLUENCE OF SEAWEED BASED POLIAR ESTER FEED STERILIZER ON YIELD OF TOMATOES AND CHICORY

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Seaweed extract has been reported to have various beneficial effects on many crops. A study was conducted in 1989 and 1990 to evaluate the effects of Response 9-9-7, a seaweed extract fortified with NPR, on yield of staked tomatoes and cucumbers. Plants were sprayed to the runoff weekly, biweekly, every 3 weeks and every 4 weeks with 1:500, 1:250, 1:150 and 1:125 v/v Response/water respectively. Yield data indicated that spraying tomatoes sprayed with Response 9-9-7 at all rates yielded the highest yield which was sprayed with plain water. However, the only significant difference was obtained when tomatoes were sprayed with 1:150 Response/water in 1989 and 500 in 1990. Response/water at 1:500 rate significantly increased the quantity and marketable yield of cucumber in both years. Response 9-9-7 had no effect on yield of tomatoes grown in the summer under heat stress.

THE EFFECT OF ULTRAVIOLET LIGHT ON CONTROLLING POSTHARVEST ROTTS ON FRUITS

U. S. Stevens* and L. L. Wollard. Department of Agriculture, University of Western Louisiana, Lafayette, LA 70504

Herbertia laeue is a rare native Iris species of South Louisiana and is difficult to propagate. Seed and bulbs were evaluated as potential explants for micropropagating Herbertia laeue. Green dry seeds of Herbertia were sterilized at 2°C for 0, 3, 6 and 9 weeks on MS media containing 0.0, 0.6, 4.9 and 9.8 mg BAP and 0.0, 0.6, 5.4 and 10.7 mg NAA. Seeds cultured on 4.9 mg BAP plus 5.4 NAA, and 9.8 mg BAP plus 10.7 mg NAA produced healthy shoots with no roots. Cultures with no hormones produced shoots with roots. Germination appears to be a matter of time and not the effect of chilling, age of seed, nor hormones. Bulbs were scaled to 5 and 10 cm and placed on the above media with no chilling. Bulbs scaled to 10 cm resulted in a high rate of contamination. Scaling to a 5 cm explant produced fewer contaminated cultures. Decontaminated bulbs produced healthy shoots across all treatments.

CONTROL STIMULATION OF PHYTOCHROME ACTIVITY AND BIOLOGICAL PEST CONTROL FOR ENHANCED PLANT GROWTH IN A CONTROLLED ENVIRONMENT

Dennis L. Wollard and Jacqueline Carlisi-Dunlop*, Department of Agriculture, University of Western Louisiana, Lafayette, LA 70504

The objectives of the greenhouse tomato industry are to optimize production while simultaneously abating the use of pesticides. A variety of mulch colors were evaluated to enhance production: black, white, yellow, red and no mulch. Black mulch yielded an average of 104.2 kg of marketable 25 kg/m2 of marketable 25 kg/m2 of marketable per plant. Yellow, red and white produced slightly less and the no mulch resulted in the least yield. Two greenhouses were used to evaluate two pest management programs. House One was established as the biological control where whitethrip parasites - Encarsia formosa, aphid predators - Chrysopa carnea, thrips predators - Amblyseius McKenziei and worm parasites - Trichogramma pretiosum were released at regular intervals within the greenhouse. House Two was established as the traditional control where pesticides such as Thiodan 500 WP, Malathion 37% EC and DVPN were utilized to control insect pests. There was a comparable economic return for both pest management programs where each yielded 23 kg for every $1.00 invested.

YIELD RESPONSES AND NUTRIENT UPTAKE OF TRIPLOID WATERMELON AS AFFECTED BY FERTILIZERS, SOURCE, MULCH, AND ROW COVER

D. R. Eshar* F. J. Dasing, and M. L. Baker, Texas Agricultural Experiment Station, Overton, TX 75684

Response of triploid watermelon [Citrullus lanatus (Thunb.) cv. Tirum] to fertilizer source (FS), polloid tear (PL) vs. commercial fertilizer (CF), black plastic mulch (BPM), and spoutbundled floating row cover (SFC) was evaluated in 1999 on an East Texas Fuyu-Darco sandy loam soil. Plant growth and percent sonice sonice were measured by FS. Vine fresh weight, number and total melon weight per plant, average melon weight, and percent soluble solids were increased 27%, 29%, 45%, 24%, and 17%, respectively, by BPM compared to no mulch treatment. BPM + SFC treatment decreased vine fresh weight but increased total melon number which in turn increased plot weight. PL increased plant P, K, and Mg 16%, 12%, and 24%, respectively, when compared to CF. Plant Ca and Mg were increased 16%, 22%, and 15% by the use of BPM. A reduction in plant N was found when SFC was used alone and with treatments lacking BPM or BPM + SFC. Mean soil temperature was increased on the average 2°C at 10 cm depth by BPM when compared to all other treatments. Mean 24 hr air temperature 2 cm above BP and bare ground under SFC was increased 3°C above ambient.

THE EFFECT OF ULTRAVIOLET LIGHT ON CONTROLLING POSTHARVEST ROTTS ON FRUITS

U. S. Stevens* and L. L. Wollard. Department of Agriculture, University of Western Louisiana, Lafayette, LA 70504

Low doses of ultraviolet light (254nm UV-C) irradiation reduced postharvest rots of pome, stone and citrus fruits. Brown rot (Monilinia fructicola) of 'Elberta' and 'Loring' peaches was significantly reduced by UV-C. Alternaria rot (Alternaria spp.) and bitter rot (Coccidiophora musaeodidae) of the principal storage rots of 'Golden Delicious' apples showed significant reduction following UV-C treatment. Further application of (o-cinnamoliphenol) in a commercially available green mold (Penicillium digitatum) of 'Dancy' Tangerines and 'Marsh Seedless' grapefruits, stem end rot (Alternaria citri), as well as sour rot (Geotrichum candidum) of 'Dancy' tangerines after irradiation.

CITRUS: SURVIVAL AT -11.1°C TEMPERATURE DURING THE 1989 FREEZE

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During the 1989 freeze, a scaffold branch irrigation freeze protection system was in operation on five-year old 'Washington' navel and 'Owari' satsuma trees and several younger trees of various navel orange varieties, a cold tolerant satsuma selection and other navel orange trees. Temperature dropped to a low of -11.1°C, with 20 consecutive hours of -6.7°C or below and 80 consecutive hours of -6°C or lower. Post freeze evaluations and ratings show that an average tree survival rate of 94.6% was obtained. An average of 84.6% survival of scaffold branches and an average of 11% canopy survival was also achieved through the use of scaffold branch irrigation for freeze protection. Trunk injury ratings averaged 8.8 (scale 0-10); 0 = dead, 10 = no injury and shoot regrowth after pruning was good averaging 6.8. 0 = no shoot regrowth; 10 = excellent shoot regrowth. The average percentage of the regrowth was slightly above 80% of the original tree volume prior to the freeze. Nonprotected trees sustained 100% kill and necessitated removal and reestablishment.

EVALUATION OF SELECTED FRUIT QUALITY ATTRIBUTES FOR SEVEN STRAWBERRY CULTIVARS

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Fresh strawberries are highly perishable commodities, and berry quality at harvest defines their potential shelf life. We are conducting harvest quality evaluations for seven commercially available cultivars. Seven different fruit quality attributes were assessed during the early, middle and late phases of the picking season: marketable berry yield, berry weight, berry firmness, berry color ("A" value), percent soluble solids, titratable acidity (percent cotic acid), and the ratio between soluble solids and titratable acidity. Marketable
berrry yield, berry weight and berry tinnness varied substantially between cultivars. A few differences were observed between cultivars for berry color. Berry flavor, as evidenced by the ratio between soluble solids and acidity, was also apparently different between cultivars with three of the seven cultivars consistently exhibiting higher ratios. The relationship of each measured parameter to quality will be discussed.

PERFORMANCE OF 'REDGLOBE' PEACH ON FIVE ROOTSTOCKS
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Trunk diameter, yield, root sprout production, and tree mortality of 'Redglobe' peach were evaluated over a 14 year period on 5 rootstocks: 'Lovell', 'Halford', 'Nemaguard', 'Bailey', and 'Siberian C'. Trunk diameter in year 14 was not different for trees on 'Lovell' and 'Halford', with diameters of 23.7 and 23.5 cm respectively, as compared to 93 and 45 kg on 'Halford'. These were not significantly different from each other. Both 'Lovell' and 'Halford' produced 1.8 root sprouts per tree on less both years. Trunk diameter on 'Nemaguard', 'Bailey', and 'Siberian C' was different from 'Lovell' and 'Halford'. Yields on 'Nemaguard', 'Bailey', and 'Siberian C' were 92, 98, and 41 kg respective- ly, in year 12, with trees on 'Siberian C' being different from the other 4 rootstocks. Yields in year 14 were 60 kg on 'Nemaguard', 55 kg on 'Bailey', and 28 kg on 'Siberian C'. Root sprouts on 'Nemaguard' were 1.6 and 6.7 in years 8 and 14 while 'Bailey' averaged 1.7 and 7.7. Root sprouts on 'Siberian C' were low in year 8, but increased in year 14 to 15.1 per tree. Tree mortality on 'Siberian C' was 44% by year 14.

PREPLANT SOIL PREPARATION METHODS INFLUENCE PRODUCTIVITY OF 'HARVESTER' PEACH TREES
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Influence on productivity of 'Harvester' peach trees to three methods of preplant soil preparation were studied for five years. The three methods were as follows: 1) a backhoe was used to prepare the soil; 2) a tamper was used; and 3) a combination preparation. Trunk yield data were taken after the first three growing seasons. There were no significant treatment differences for yield at the .05 level of probability. Trends shown an increase in yield using the turn plow and the backhoe method showed better early tree growth, but by the fifth year, there were no apparent differences.

WATER QUALITY AFFECTS CALCIUM AND MAGNESIUM REQUIREMENTS FOR AZALEA GROWING MEDIUM
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Calcium and magnesium medium requirements were investigated for the production of container-grown 'Fornosa' azalea irrigated with filtered and unfiltered deep well water. Four inch 'Fornosa' azalea plants were placed into 3.8 liter containers filled with amended 1:1(v:v) pine bark and peat growing medium. Calcium and magnesium treatments were supplied by either dolomitic lime or gypsum + epsom salt at three rates. Plants irrigated with good quality water produced excellent quality plants regardless of Ca/Mg treatment. Plants irrigated with poor quality water produced significantly better quality plants than did medium with dolomitic lime during 157 days of deep well irrigation. Medium with Na level was significantly higher in the control treatment than in the filtered well water treatment. Growth effects of calcium and magnesium treatments were dependent upon water quality and time length of treatment.

A GENETIC STUDY OF RIND COLOR PATTERNS IN WATERMELON
Charles E. Johnson and Blair Buckley, Calhoun Research Station, Louisiana Agricultural Experiment Station, LSU Agricultural Center, Calhoun, LA 71225

Inheritance of dark green stripe and light green rind color in watermelon was investigated. Controlled crosses were made between watermelon cultivars: 'Louisiana Sweet'-light green rind with dark green stripe; 'Calhoun Sweet'-dark green rind without stripes; and 'Charleston Gray' and 'Calhoun Gray' both having light green rind without stripes. Plants of parental F1 hybrid, F2 and BC lines were classified as having rind color and presence or absence of stripes. All F1 progeny produced only striped fruit. Chi square analysis of F2 and BC generations corresponded to 3:1 and 1:1 ratios respectively, for striped: non-striped rind color and presence of stripes controlled by one dominant gene. The cross 'Louisiana Sweet' x 'Calhoun Sweet' (light green x dark green rind color), resulted in F1 and F2 progeny having only dark green rind fruit, indicating obvious dominance for dark green rind color. Segregation in BC populations indicated a single dominant gene for dark green rind color; however, lack of segregation in the F2 suggests additional factors may be involved.

INCREASING SEED GERMINATION PERCENTAGE OF CRATEAGUS OPACA (MAYHAW) BY FERMENTATION
Marvin L. Baker, Texas Agricultural Experiment Service, Texas A&M University System, Overton, TX 75684

Fermentation and other seed pregervatizations treatments of Mayhaw (Crataegus opaca) Hook. and Arn.-Series Aestivalis) (Vines; Philp. 1985) were evaluated as potential requirements to increase germination percentages. Low seed germinability and erratic seedling emergence are major problems in Crateagus breeding. Freshly harvested fermented open-pollinated seed from 5 different Mayhaw selections averaged 93.4% at 8 days fermentation and 92.9% at 4 days fermentation. Frozen stored from these selections and later fermented 12 days showed the following higher percentages of germination: frozen storage for 10 days - 97.4% (+4 days fermentation); frozen storage for 20 days - 83.6% (+4 days; frozen storage for 30 days - 74.4% (+4; frozen storage for 40 days - 72.6% (+4; frozen storage for 60 days - 70.2% (+4 and frozen storage for 90 days - 60.8% (+8. Positive responses to short fermentation durations (+8 days) were observed, but longer fermentation durations were deleterious. Embryo dormancy requiring acid treatment for stratification and problems with germination including substances were minimized by fermenting fresh ripe fruit containing large embryos. The fruits and seed were not allowed to dry and they were either prepared immediately or frozen for later use.

CULTURAL METHODS AFFECTING YIELD OF ENDRIFF BRY DREAMS
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The effects of planting date and plant density on total and marketable yield were examined for the edible dry beans 'Aurora' and 'Fleetwood', erect type of genotype cultivars, over three years. For 'Fleetwood' alone, fertilizer levels and application of a spray-on soil polymer mulching material were examined for effects on yield. The mulching material was degraded by rain prior to canopy closure but patches were present at harvest. Using continuous recording thermometers, temperatures over two week periods following sowing of 'Fleetwood', from 23 cm below the surface of mulch and bare soil were converted to soil degree days (SDD). 'Fleetwood' generally had higher yields than 'Aurora'. Earlier planting improved yields. In one of the three years increasing plant density increased yields. Increased fertilization did not affect yield. Application of mulch did not affect yield. However, spray-on-mulch did increase SGD after the earliest planting date. Cultivation systems for existing production, or potential production areas, must be developed for the conditions of each location.

INFLUENCE OF NITROGEN APPLICATION TIME AND PHOSPHORUS RATE ON PECAN
Michael W. Smith, Department of Horticulture and Landscape Architecture, Oklahoma State University, Stillwater, OK 74078

Thirty-five-year-old 'Hayes' and 'Patrick' trees (22 trees/ha) were fertilized with 112 kg N/ha (NH4NO3) either the second week of March or the first week of Oct each year. Phosphorus was applied (broadcast) during March 1986 and again during May 1989 at 0 or 244 kg P2O5. Treatments were arranged in a split-split plot design with four single-tree replications. Leaf N concentration and the number of shoots/1-year-old shoot were not affected by N application time, and the effect on shoot length was inconsistent. Total yield and annual yield three of five years were greater from 'Hayes' than 'Patrick' when N was applied during October rather than March. Yield of 'Patrick' was unaffected by time of N application. Phosphorus application increased soil P up to 20 cm deep, and leaf P concentration increased the following three of five years in 'Hayes' and two of five years in 'Patrick'. Shoot growth, number of new shoots, nut size, kernel percentage, and yield were not significantly affected by P application.

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Effectiveness of Different Zn Fertilizers and Two Methods of Application in the Control of 'Little-Leaf' in Peach Trees in South Texas

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Fall soil treatments of ZnEDTA and ZnSO₄ at three increasing rates (52.6, 64.4, and 128.6 g Zn/acre) were tested to correct Zn deficiency in three year old 'Earligrande' peach trees. All Zn carriers increased the Zn leaf content. 'Peach trees treated with ZnEDTA had the highest Zn content, close to the medium and high rates of soil applied ZnEDTA or ZnSO₄, respectively, in appearance, chlorophyll content and foliar Zn content. Three applications of Zn at 0.35 g of Zn/each (743 mg/378 gal H₂O) gave excellent tree response and was cost effective.

A Study of Drought Tolerance in Sweetpotatoes

Lavette H. Newell* and James O. Garnett, Jr., Department of Horticulture, Mississippi State University, Mississippi State, MS 39762.

In two experiments, 15 sweetpotato genotypes were evaluated for drought tolerance using the detached-leaf water loss method. Dry weight loss was also determined. Differences in the rate of leaf water loss over a 48 hour period were found. 'Vardaman' had the greatest amount of dry weight loss and the least amount of water loss. No relationship between dry weight loss and water loss was found.

When measuring chlorophyll fluorescence using two sweetpotato genotypes, 'Vardaman' had a higher rate of photosynthetic transport activity.

In Vitro Blackspot Disease Resistance of Roses


The objective of this study was to determine if blackspot (Diplodia roseae, Wolf) resistance and susceptibility is expressed in callus derived from known resistant and susceptible genotypes of roses. Established callus lines of blackspot susceptible hybrid tea roses 'Fascial' and 'Tropicana' and blackspot resistant species roses Rose roxburghii and R. bettigeri were inoculated directly with a blackspot conidia suspension. Uninoculated callus served as controls. Cultures were incubated at 25°C for 28 days in the dark. The evaluation of the resistance and susceptibility was determined by the percent change in fresh weight. Resistance was indicated that for all genotypes tested, inoculation resulted in a decline in tissue appearance and rate of weight decrease. These results indicated that in vitro resistance to blackspot differs from the resistance found in whole plants.

The Effect of Copper Sulfate Filters on Growth of Tomato and Pepper Transplants

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Tomato and pepper transplants were grown in an environment with a high or low far-red light ratio, to determine if this was an effective method for controlling plant height. This light environment was provided by placing plants under copper sulfate filters, which absorb most of the light in the far-red region of the spectrum. Copper sulfate solution was 4%, 3%. Transplants grown under the filters were approximately 40% shorter than control plants, had less dry weight and leaf area, and increased leaf chlorophyll. Leaf number data was less clearly affected. Differences were not observed among the three different CuSO₄ concentrations. Similar results were observed for peppers. Field trials on tomatoes indicated that total yield, earliness of fruiting, and fruit quality were not affected by growing transplants under the CuSO₄ filters.

The Effects of Diurnal Light on Photosynthesis and Growth of Greenhouse Grown Apple

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Greenhouse grown 'Lawsaprome' MM.111 trained to single shoots were given the following shade (33%) treatments: 1) sun-all-day (control), 2) shade in the morning (am-shade), 3) shade in the afternoon (pm-shade) and 4) shade-all-day. All shade treatments increased shoot length and decreased dry weight/leaf area (DW/LA). Shade-all-day increased leaf number, LA/leaf and leaf area. DW partitioning was lower in shaded leaves than in unshaded leaves and was 10% greater than control and to roots was 34% less than control. Ps of am-shade did not increase in the afternoon when PFD was maximal. Saturated net photosynthesis (Pn) was 72% of control in am-shade, 84% of control in pm-shade and 62% in shade-all-day. Shade reduced Pn by 40% of control.

Compensatory Growth and Physiological Responses to Defoliation of Apple Trees

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Defoliation by hand was simulated with potted tree model systems and field-grown trees. 'Redchief'/M.7 apple trees were grown in 10 pots as a single shoot. Forty-five days after 25%, 50%, or 75% removal of apical or basal leaf number, new leaf dry weight (produced after treatment) was 23%, 53%, and 45% higher, respectively, and apically treated trees, and 7%, 61%, and 64% higher for basally treated trees, than control trees. Root dry weight was reduced by as much as 59% (apical 75% removed). Photosynthesis following 75% leaf removal was inhibited 1 day after treatment, but increased above the control within 3 days. However, by 35 days after treatment photosynthesis had declined to 25% of control. Leaf removal (50%) June 15 (1990) of 4-year old 'Early Grannys'/M.9 increased net photosynthesis by 40% within 8 days of treatment. Trunk cross-sectional area increase of June and twice-June (15 and July 30) defoliated trees was 35% of control trees. Leaf nitrogen content (% dry wt.) in September was 1.75 for twice-defoliated trees compared to 1.28 for control trees.

J.B. Edmond Undergraduate

Fruiting Characteristics of Hot Peppers

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Hot pepper (Capsicum annum) is gaining popularity as a food. One way this has been assessed is to determine the fruiting characteristics of two hot pepper cultivars; 'Scotch Bonnet' and 'Brown Lue'. After evaluating 100 fruits of each cultivar, it was found that 'Scotch Bonnet' fruits had 34% more seeds and 93% more mass than 'Brown Lue'. Although 'Brown Lue' had longer fruits (5.89 vs. 3.33 cm) than 'Scotch Bonnet', this difference was not significant. In addition, 'Scotch bonnet' had greater fruit circumference and circumference to length ratio than 'Brown Lue'. When fruits were compared for fresh and dried weights, there was no significant difference. However, 'Brown Lue' had a significantly higher percent dry matter. Based on dry matter, if fruits were to be produced for crushed peppers, it might be more advantageous to use 'Brown Lue'.

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KUDZU IN THE SOUTH: AN OLD ALTERNATIVE CROP
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Kudzu (Pueraria lobata) has become a pervasive weed in
the southeast US. It has been receiving much attention
recently and a study was initiated to evaluate the plant as an
alternative food and feed source. Kudzu vines were sectioned
into 0-25, 25-50, 50-75 and 75-100 cm and analysed for acid
detergent fiber (ADF), neutral detergent fiber (NDF), ash and
crude protein content. Leaf ash content of kudzu increased
while stem ash content decreased as the vine was sampled from
the growing tip. Stem NDF increased from 44.4% at the 0-25 cm
section to 57.5% at the 75-100 cm section of the vine, while
leaf NDF declined from 52.23 to 39.01% for the same sections.
The trend was reversed for ADF in the kudzu leaf and stem.
Crude protein content of kudzu ranged from 10.45% at the 0-25
cm section for leaves to 7.42% for stem sections at 75-100 cm.
The high crude protein content of kudzu as well as its abun-
dance in the Southeast makes it a good feed source and a
potential food source. However, further studies are needed
to determine the vitamin content and digestion coefficient to
ascertain its suitability as a food and feed source.

EVALUATION OF THE NITROGEN FIXING CAPABILITIES OF
PHASEOLUS VULGARIS LINES, DEVELOPED FOR THE CARIBBEAN
BASIN
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Chemically fixed nitrogen is a costly import for Caribbean Basin
Countries. Increased cost of fertilizer only serves to reduce crop yields in
these areas. This greenhouse research was undertaken to evaluate the
N, fixing capabilities and yield potential of several Phaseolus vulgaris lines
developed for use in Caribbean Basin countries. Ten common bean lines
from breeding programs at the Universities of Puerto Rico and Wisconsin
and two efficient Rhizobium phaseoli strains were used for the study.
Plants treated with Rhizobium UMR 1899 and UMR 1652 had significantly
higher stem and leaf dry weight than the control plants. Bean lines WBR
22-34, WBR 22-50, WBR 22-66, PR9056-988 and the cultivar Coxtono
showed increased dry matter accumulation over that of the control plants.
Plants treated with the Rhizobium strain UMR 1899 had the highest stem
and leaf dry matter accumulation. Modulation was significantly higher
when plants were treated with UMR 1632. The lines WBR 22-34 and PR
9056-988 produced more nodules than the other lines used. Pod yield as
measured by number of immature pods was highest for PR 9056-988
when inoculated with Rhizobium UMR 1899.