

475 (PS 3)

CELLULOSE FIBERS SHOW PROMISE IN REDUCING SUNBURN INJURY OF 'PAULARED' APPLES.

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A set of 3 experiments was conducted to determine if cellulose fibers (CF) could reduce the incidence of sunburn injury in 'Paulared' apples. Sunburn injury was artificially increased in these experiments by fruit manipulation and removal of shading vegetative growth to expose apples to at least 4 hours of direct sunlight. The 4 treatments applied included an unsprayed control, a commercial binding agent (CBA), a 1% corn starch (CS) colloidal suspension, and a 3% CF suspension that contains CBA and CS. No differences between treatments were found in the first experiment. The CF suspension concentration was increased to 9% for the second experiment. This resulted in uneven CF distribution on the fruit surface and no significant differences between treatments. The third experiment was designed to more precisely determine sunburn symptom expression by delineating the manipulated fruit surface area directly exposed to sunlight prior to treatment. The resulting percent of area that showed a white (bleached) sunburn symptom was significantly less for the apple fruit treated with CF than CBA alone.

476 (PS 3)

DORMANT PRUNING INFLUENCE ON PEACH PISTIL HARDINESS
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Ethephon (100 mg·liter⁻¹) was applied to mature peach trees (*Prunus persica* (L.) Batsch. cv Redhaven) on 13 Oct. 1989. Ethephon-treated and non-treated trees were pruned on 12 Dec. 1989, or left not pruned. Flower bud hardiness was assessed via exotherm analysis from Dec. through Mar. on buds taken directly from the orchard and on buds deacclimated / reaclimated under controlled conditions. Buds from ethephon-treated trees were consistently harder than buds from non-treated trees. After a warm spell in Jan., buds from pruned trees not previously treated with ethephon were less hardy than those from non-pruned trees. Hardiness of buds from ethephon-treated trees after the warm spell was not affected by pruning. All buds rehardened with the return of low temperatures. Under controlled conditions, buds from pruned trees were less hardy than those from non-pruned trees. Pruning resulted in a rapid loss of hardiness at warm temperatures (21C). If trees had been treated with ethephon the previous fall, significant rehardening of dehardened buds from pruned trees occurred at 5 or -1C. Buds from pruned, non-treated trees did not rearden.

477 (PS 3)

EVALUATION OF LOW-INPUT PECAN ORCHARD FLOOR MANAGEMENT SYSTEMS

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Legume ground covers in pecan orchards can reduce nitrogen inputs and increase beneficial insects. Preliminary data indicate that certain legumes can supply over 100 kg·ha⁻¹ N. Additionally, certain legumes have high aphid populations which attract beneficial insects. When aphid populations on the legumes crash, beneficial insects seek alternative food sources in the pecan trees, thus reducing the necessity for pesticide applications. Preliminary studies suggest that a mixture of 'Dixie' crimson clover and hairy vetch produces high populations of beneficial insects and over 100 kg·ha⁻¹ N. Treatments were established at four pecan orchard sites in Oklahoma, each with 5 ha of a crimson clover/vetch mixture and 5 ha of native grass sod. Additions of 0-200 kg·ha⁻¹ N were added to the sod plots but no supplemental N was added to the legume plots. Nitrogen and biomass production by the legumes, and leaf N concentration of pecans were determined. In addition, both aphid and beneficial insect populations were monitored in the legume and grass treatments, and in the pecan trees. Results will be discussed in the presentation.

478 (PS 3)

COMPARISONS OF PLANT DENSITIES AND TRAINING SYSTEMS OF PEACH TREES

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'Redhaven' peach tree plantings were established in 1985 to compare tree densities (299 trees/ha to 1794 trees/ha) and training systems (Open Vase, Central Leader, Y-shaped, Palmette Trellis, Tatura Trellis, and MIA Trellis). Tree trunk growth (diameter) was significantly less as the population of trees increased. Trunks of trees trained to the

Open Vase were larger than Central Leader or Y-shaped trees. In 1988, yields per ha increased as tree density increased. Trees trained to the Tatura Trellis (897 trees/ha) had the highest yields (27.7 t/ha). Trees trained to the Central Leader and planted at 1794, 897, and 598 trees/ha had next highest yields of 24.5, 21.4, and 24.3 t/ha, respectively. By the 6th year, yield differences were not generally related to tree density. The top yielding systems were Open Vase (598 trees/ha) and Tatura Trellis (897 trees/ha) with yields of 32.1 and 29.0 t/ha, respectively. Trees trained to Open Vase had higher yield efficiencies (kg/cm² limb CSA) in 1991 than trees in other systems-spacings and had yields of 23.6, 27.4, and 32.1 t/ha for plant densities of 299, 448 and 598 trees/ha, respectively.

479 (PS 3)

EFFECTS OF APPLE TREE DENSITY AND ROOTSTOCK ON YIELD AND FRUIT CHARACTERISTICS OVER 13 YEARS

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A three density-three rootstock test was conducted on three spur-type apple cultivars grown in sandy loam soil. Trees of the three cultivars: 'Redspuree' (RS), 'Goldspuree' (GS), and 'Spuree Rome' (SR) were trained to a central leader system in a 100% grass cover. All cultivars produced best in the high density planting (1344 trees/ha). Most consistently and significantly affected were the SR. The least productive density, the low trees density, had 336 trees per ha. while the medium density had 672 trees/ha. Density had a more significant effect on SR culls and a slightly more significant effect on SR fruit soluble solids than it did on these variables of the other cultivars. Density had little effect on fruit firmness of all cultivars. Of these rootstocks: m7a, m26, and mml06, the mml06 rootstock usually produced the greatest yields, especially in the RS and SR cultivars. Results for the GS were more variable than they were for RS and SR with its production on the m7a rootstock occasionally exceeding that of the mml06 rootstock. The m26 rootstock produced the lowest yields. Rootstock had no significant effect on fruit firmness of all cultivars.

480 (PS 3)

CONTAINER CULTURE OF HIGH-CHILLING PEAR AT TAIWAN'S LOWLAND

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High-chilling pear cv. Shinseiki (*Pyrus serotina* Rehd.) were used to evaluate the cultivation potentiality at warm area via the decrement of supraoptimum temperature damage and the escape from dormancy. Several experimental results were obtained as follows: the media prepared by combination of peat and bark compost (1:1 in volume) inside nonwoven bag was lower in temperature than other media; both of the temperature of leaf surface and media decreased more than 2°C at noon by 25% shading favoring the CO₂ exchange in the daytime; the foliage application of Aminofol increased leaf thickness and chlorophyll content; and BA or PP-333 treatment enhanced lateral buds development during the supraoptimum temperature period of summer, etc. An integrated management based on these results helped the 1-year old container-grown Shinseiki pear trees over-summer. The experimental trees were then forced to budbreak and flower by application of cyanamide in October. Eventually, the fruits were harvested in March. These results suggested that the production of high-chilling pears in warm area was technically feasible.

481 (PS 3)

SHORT-LIFE AND NON-SHORT-LIFE SOIL RATIO AND ROOT TYPE AFFECT PEACH TREE SURVIVAL IN FIELD MICROPLOT

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A planting of 90 Redhaven peach (*Prunus persica* (L.) Batsch) trees either budded to Lovell and Nemaguard rootstocks or on their own roots, was established in spring 1984 using in-ground 55-gallon microplots. Planting soils (top soil, not B and C layers) prepared in five ratios by mixing soils from peach tree short life (PTSL) and non-PTSL (NPSL) sites (100% PTSL, 75% PTSL + 25% NPSL, 50% of each, 25% PTSL + 75% NPSL, and 100% NPSL) as main plots, were replicated 3 times. Two trees per rootstock were randomized within main plots. The planting was maintained using conventional cultural practices. Observations for tree survival were recorded in December each year. During this investigation, both soil mix and root types significantly affected tree survival, which was consistently the highest in 100% NPSL and the lowest in 100% PTSL soil. Effects of other soil combinations were intermediate; however, greater tree mortality was associated with increased ratio of PTSL soil. Trees on Lovell roots invariably survived the best followed by those on Nemaguard roots and the lowest when on their own roots. As early as in fourth leaf, >55% of the own-rooted trees died compared to <10% on either rootstock.

HERITANCE OF COLD TOLERANCE IN CULTIVATED SPECIES OF
OPUNTIA

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Freezing temperatures limit areas in which prickly pears (*Opuntia* species) can be cultivated for their fruits and nopals. Inheritance of cold tolerance was investigated in three cultivated species of *Opuntia*. Parental, F₁, backcross and F₂ populations from crosses between *O. ficus-indica* (accession #1271), *O. lindheimeri* (accession #1348) and *O. robusta* (accession #1241) were used. Plants were evaluated for cold tolerance by the conductivity method after 3 hrs in a growth chamber at temperatures ranging from 0° to -15°C and acclimation at 10°/5°C (day/night) for 14 days. Means of each genetic population were calculated and broad and narrow sense heritability estimates were determined. The heritability estimates were generally low with evidence of small additive effects and large environmental effects.

220

PILOT PROJECT TO CRYOPRESERVE DORMANT APPLE (*Malus* sp.) BUDS. Philip L. Forsline¹*, Cecil Stushnoff², Leigh E. Towill³, John Waddell³, and Warren F. Lamboy¹. ¹USDA-ARS-NAA, Cornell Univ., Geneva, NY 14456, ²Dept. of Horticulture, Colorado State Univ., Fort Collins, CO 80523, and ³USDA-ARS-NSSL, Fort Collins, CO 80523.

Dormant buds of 64 apple accessions from the National Germplasm Repository (NGR), Geneva, NY were cryopreserved at the National Seed Storage Laboratory (NSSL), Fort Collins, Co. Initial tests after 1 mon, 1, 2, and 3 years of LN₂ storage showed no decline in viability. Storage of 16 cultivars (1988/89 and 1989/90 dormant seasons) with a broad range of cold-hardiness characteristics has shown approx 45% viability by patch budding. Storage from dormant seasons of 1990/91 and 1991/92 included 48 cultivars selected for excellent cold-hardiness characteristics. With approx 85% initial viability of these cultivars, a more sensitive statistical analysis can be performed over years. Overall viability over storage duration and sampling years showed 32 had more than 80%, 55 had more than 50% and only 4 had less than 30%.

221

USE OF MINOLTA SPAD 502 CHLOROPHYLL METER FOR SELECTION AND EVALUATION OF SWEET CORN

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Sweet corn genotypes were selected, recombined in a half-sib fashion, and evaluated for yield performance at the NYSCALS Experiment Station at Freeville, NY. The objectives of this study were to identify selection criteria associated with N efficiency. Selection and evaluation parameters included chlorophyll readings with the Minolta SPAD 502 chlorophyll meter. The Minolta chlorophyll meter is a rapid, non-destructive method of determining leaf chlorophyll status, and may be an effective tool for evaluating plant N status and thus yield. It is of interest to evaluate plants early in a breeding program for yield potential. Chlorophyll readings were measured at the fifth-leaf stage and at maturity. In 1991, chlorophyll readings were significantly correlated to N concentration (%) and total N content (gm) of the fifth-leaf. Chlorophyll readings measured at the fifth-leaf stage and tasseling were correlated to primary ear fresh and husked weight in 1992. Based on these results, chlorophyll readings were an effective assessment of N status and ear yield.

Hort Science

115 ORAL SESSION 26 (Abstr. 222-229)
Cross-commodity: Weed Control and Pest Management

222

THE USE OF PLANT GROWTH REGULATORS TO CONTROL EASTERN BLACK NIGHTSHADE (*SOLANUM PTYCANTHUM*) BERRIES. John B. Masiunas* and Michael P. Crotser, Department of Horticulture, University of Illinois, Urbana, IL 61801.

Eastern black nightshade berries interfere with harvest, stain fruit, and are an undesirable contaminant in processing vegetables. The problem may be reduced if flowering, berry production, and maturity could be regulated. Greenhouse experiments evaluated the effect of commercially available plant growth regulators on eastern black nightshade growth and reproduction. Nightshade were seeded in 10 cm plastic pots and allowed to grow until the reproductive stage. Chlormequat-chloride, ethephon, gibberellic acid, dikegulac sodium, and paclobutazol were applied at standard rates in 90 L ha⁻¹ of spray solution using a moving nozzle spray chamber. Nightshade growth, flowering, and berry production were evaluated 3 wk after treatment. Gibberellic acid and ethephon caused leaf chlorosis. Ethephon increased the percentage of ripe berries and decreased the number of flowers per plant.

223

EFFECT OF CULTIVAR AND INSECTICIDE SPRAYS ON TARNISHED PLANT BUG INJURY TO STRAWBERRIES

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Six strawberry (*Fragaria x ananassa* Duch.) cultivars known to vary in susceptibility to tarnished plant bug (*Lygus lineolaris* P. de B.) injury (apical seediness) were grown under three insecticide regimes including no spray, one spray and three sprays, to determine if differences in susceptibility could be used to modify chemical controls for this insect. The most susceptible cultivars harbored more tarnished plant bug nymphs than the least susceptible cultivars. Differences in injury among cultivars was greatest when no insecticide was applied. 'Honeyoye' and 'Sparkle' had the least amount of apical seediness, followed by 'Redchief', 'Guardian' and 'Kent'. 'Mic Mac' consistently had the highest level of injury. When insecticide sprays were reduced, apical seediness did not significantly increase for cultivars exhibiting low susceptibility.

224

EVALUATION OF LOW-INPUT PECAN ORCHARD FLOOR MANAGEMENT SYSTEMS

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Legume ground covers were evaluated in pecan orchards to reduce nitrogen inputs and increase beneficial insects. Treatments were established at two sites in Oklahoma, each with 5 ha of a 'Dixie' crimson clover/hairy vetch mixture and 5 ha of grass sod. Nitrogen was applied at 0-200 kg ha⁻¹ to the sod plots, but legume plots were not fertilized. Aphids and selected arthropods were monitored on ground covers and in the pecan canopies. Data indicated that a mixture of crimson clover/hairy vetch supplied up to 186 kg ha⁻¹ N to the trees. Beneficial arthropods monitored were Coccinellidae, Chrysopidae, *Nabid*, *Syrphid*, and spiders. Lady beetles, primarily *Hippodamia* and *Coleomegilla*, were the most important aphid predator in the spring, and green lacewing was the most important fall predator. There were fewer aphids infesting pecans using a crimson clover/hairy vetch ground cover than a grass sod.

50WP or Pennant 7.8E was sprayed on the fertilizer (coated). Ronstar 2G-blended fertilizer and Ronstar 50WP-coated fertilizer provided weed control at the 4, 8, and 16 lb ai/A rates similar to broadcast (2G) or sprayed (50WP) herbicide applied at the label rate (4 lb ai/A). Ronstar provided better prostrate spurge weed control than Pennant. Formulation had no effect on weed control when comparing blended or coated fertilizer. Herbicide-blended and coated fertilizers provided effective prostrate spurge control in containers.

GERANIUM PRODUCTION AS INFLUENCED BY THREE METHODS OF IRRIGATION USING A CONTROLLED RELEASE FERTILIZER

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Seed geraniums (*Pelargonium x hortorum* Bailey 'Scarlet Elite') were grown in 10-cm pots in a 1 pine bark : 3 peat moss : 1 perlite medium from 18 March until 5 May 1993. Plants received Osmocote 14N-6.1P-12.5K and either conventional overhead (CO), drip (DI), or subirrigation (SI). Subirrigation produced greater shoot and root dry weights than CO or DI. Plants grown using DI produced fewer branches than plants grown using CO or SI. Plants receiving SI reached anthesis before plants receiving CO or DI. Method of irrigation had no influence on total root, soil, or leachate N, but SI did increase total shoot N.

STYRENE-LINED AND COPPER-COATED POTS AFFECT MAPLE GROWTH

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Red maple cultivars 'October Glory' and 'Northwood' were grown in 7 gallon containers to determine the influence of styrene lining and copper coating of containers on container medium temperature and growth of red maple cultivars. Copper coating effectively reduced circling of roots at the container wall-medium interface. Root control with copper was less effective on 'October Glory' (a more vigorous cultivar) than on 'Northwood'. Height, caliper, and root dry weight also were less for 'Northwood'. In the absence of copper, surface-root coverage was greater in foam-lined containers than in containers without foam where temperatures averaged 10°C higher.

VEGETATIVE GROWTH AND NITROGEN FIXATION OF PIGEONPEA AND COWPEA AT THREE TEMPERATURES

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Low temperatures adversely affect legume-*Rhizobium* symbiosis in the temperate regions. Plant growth and N-fixation of two pigeonpea and two cowpea genotypes were examined at three temperature regimes (20/10 C, 30/20 C and 38/25 C day/night). Sterilized seeds were inoculated with broth culture containing approximately 1×10^8 cells ml⁻¹ of *Bradyrhizobium* USDA 3278, 3458 and 3472. Nitrogen fixation by pigeonpea was inhibited at 20/10 C. Cowpea IT82E-16 inoculated with USDA 3458 at 20/10 C produced the greatest amount of nodules. Inoculation had no effect on Nitrogenase activity in pigeonpea. Pinkeye Purple Hull inoculated with USDA 3472 at 20/10 C had the highest Nitrogenase activity. These results indicate a high degree of variability among genotypes and *Bradyrhizobium* in their response to temperature.

INHIBITION OF TAP ROOT ELONGATION IN CONTAINERS BY SIX DIFFERENT MATERIALS COATED WITH SPIN OUT™

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Tap roots of two coarse rooted species, *Nyssa sylvatica* and *Quercus acutissima*, were subjected to six treatment materials which were cut to fit or placed on the bottom of a 7.6 l container. Each treatment material (paint only, Styrofoam plug tray, 3M floor buffer mat, peat fiber sheet, stone and weed barrier fabric) was either painted with Spin Out™ of impregnated with Spin Out™ WP. Treatments that allowed the tap root to penetrate the material, i.e. weed barrier fabric, stone and 3M floor buffing mat, were more effective in controlling tap root elongation. The weed barrier fabric significantly reduced tap root length of *Quercus acutissima* and *Nyssa sylvatica* by 80% and 67% respectively compared to controls and by 65% and 53% respectively compared to the paint only treatment. In some cases the 3M and stone treatments were more effective than the weed barrier fabric but were impractical because of weight or expense.

COMPARISON OF THE PHYSICAL AND CHEMICAL PROPERTIES BETWEEN CONTAINER-GROWN WOODY ORNAMENTALS.

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Kenaf (*Hibiscus cannabinus*) is an alternative fiber crop being grown in Mississippi that may be used as a tree-less fiber substitute for making paper. A by-product in this process is the pithy light-weight fiber core. The objective of this study was to examine the chemical and physical properties of kenaf fiber core as a medium component in growing woody ornamentals and compare to pine bark. Comparisons of media in which *Ilex crenata* 'Cherokee' and *Rhododendron eirocarpum* 'Wakabuisi' were grown were made. The physical and chemical properties including bulk density, total pore space, water retention, pH and soluble salt concentrations were determined. Aged kenaf had lower pH values than fresh and both aged and fresh kenaf had higher pH values than pine bark. The total pore space of kenaf was lower than the pore space of pine bark. At the termination of the study, the kenaf media had considerable shrinkage, which was considered unsuitable for a long-term crop.

STRATEGIES FOR REDUCING PESTICIDE AND FERTILIZER INPUTS IN PECAN ORCHARDS

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Annual legume ground covers were evaluated in pecan (*Carya illinoensis*) orchards to supply nitrogen and increase beneficial arthropods. Treatments were established at two sites, each with 5 ha of a 'Dixie' crimson clover (*Trifolium incarnatum*)/hairy vetch (*Vicia villosa*) mixture and 5 ha of grass sod. Data indicated that the legume mixture supplied over 100 kg ha⁻¹ N to the pecan trees. Beneficial arthropods were greater in orchards with legume ground covers than in orchards with a grass ground cover. Lady beetles and green lacewings were the most important spring predators, and green lacewings were the most important fall predator. The species distribution on the ground covers differed from that in the canopy. *Coleomegilla maculata lengi*, *Hippodamia convergens* and *Coccinella septempunctata* were the most abundant lady beetle species in the legume ground covers, and *Olla v-nigrum*, *Cycloneda munda*, and *Hippodamia convergens* were the most abundant species in the pecan canopies. Beneficial arthropods appeared to suppress injurious pecan aphids.