

crosses yield sufficient seed for use in the inheritance studies. Fifty to one hundred progeny were used from each cross. Segregation of the traits of interest were observed in the F<sub>1</sub> populations. Inheritance measures were based on the segregation pattern of the F<sub>1</sub> progeny.

Heritabilities for traits varied widely. Genetic models based on segregation ratios will be presented for each trait. The mode of inheritance and heritabilities revealed from this study will be useful to plant breeders in developing efficient cultivar improvement strategies.

692 (PS 5)

#### CHARACTERIZATION OF GENES FROM MORNING GLORY (*IPOMOEA [PHARBITIS] NIL*) WITH HOMOLOGY TO A MAIZE PROTEIN KINASE

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Signal transduction plays a crucial role in an organism's response to its environment. Developmental processes like flowering in photoperiodically sensitive plants must employ some form of signal communication to effect this response. Protein kinases occupy an intermediate position in signal transduction pathways between signal perception and the final metabolic effect produced. Their importance is underscored by the fact that genes encoding protein kinases have been highly conserved during evolution. Over 30 independent clones were obtained by screening a genomic bank from morning glory DNA with a probe derived from a gene encoding a maize protein kinase. Selected clones were digested with *SacI* and the resulting DNA fragments transferred to filters for hybridization with the maize probe. The results indicate that these genes represent a small family comprised of approximately 5 members based on the hybridization conditions employed for their isolation.

693 (PS 5)

#### KARYOTYPIC ANALYSES IN *ALSTROEMERIA PELEGRINA* L.

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Karyotypic analyses on two color forms of *Alstroemeria pelegrina* (white and pink) and their intraspecific hybrid *A. pelegrina* (white) x *A. pelegrina* (pink) showed that all genotypes have 2n=16 chromosomes. They also have the same basic karyotypic formula of three metacentric (r=1.0-1.7), one subcentric (r=1.7-3.0), and four telocentric (r>7.0) chromosomes. All of the three karyotypes are highly asymmetric, with a chromosome ratio of the largest:smallest being greater than 3. Satellites were observed on four pairs of chromosomes in *A. pelegrina* (white), but were not clearly identified in the studied plants of *A. pelegrina* (pink) and the hybrid. Meiotic studies of the hybrid indicated that the chromosome pairing was normal. Pollen viability of the hybrid was 97%; this is higher than both parents, *A. pelegrina* (white) and *A. pelegrina* (pink), which had a viability of 58% and 95%, respectively. The role and function of the satellites need further investigation.

694 (PS 5)

#### IRON AVAILABILITY IN LEAFY GREENS

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An experiment to determine iron availability in six different leafy greens was conducted. The experiment determined both total iron within the specific greens as well as the digestible iron available from the total iron. Data were compared, and percent iron available was determined.

695 (PS 5)

#### INFLUENCE OF COMPUTER-CONTROLLED ENVIRONMENTAL MANAGEMENT ON OHIO GREENHOUSE PRODUCTION

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In July 1992 a mail survey was conducted of Ohio greenhouse growers who were using computers to assist them in the management of their greenhouses. The respondents represented 122.5 acres of Ohio's total 530 acres of green-

house production. Computers had been operational in these greenhouses from 4 to 78 months. Functions delegated to computer control were: temperature, humidity, CO<sub>2</sub>, DIF, fertilizer, irrigation, shade cloth, and light control. Sixty five percent of the respondents experienced a reduction in labor expenses; 92% expressed satisfaction with their computer system's ability to adapt to a variety of situations; and 100% believed the computer system gave them better control over the greenhouse environment. Additionally, 84% expressed concern about the reduction in registered pesticides for ornamentals. Since installing a computer system, 45% of the respondents experienced a reduction in pesticide usage. As evidenced by the survey results, approximately one quarter of the greenhouse production area in Ohio is being successfully controlled by computers.

696 (PS 5)

#### PUSSY WILLOW BRANCHES - A NEW CROP FOR SUSTAINABLE AGRICULTURE

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Field experiments were conducted to investigate the potential of using pussy willow (*Salix discolor*) as part of filter strip plantings to control soil erosion and chemical runoff from agronomic crops into nearby waterways. Of special interest was the possibility of obtaining economic return from the filter strip planting in the off-season for agronomic farmers.

Pussy willow cuttings were planted six feet apart in three rows between agronomic cropland and a waterway with ten feet between the rows in spring 1990. Branches were first harvested in February 1992 and again in February 1993. Harvest techniques included removal of all branches at 10 inches or 24 inches above ground level.

The 1992 harvest yielded 72 salable branches per plant which were graded into four sizes. The total weight and number of branches decreased with increasing row distance from the cropland. The 1993 harvest yielded larger, more uniform branches. Comparisons of yields from multiple year harvesting techniques will be presented and economic possibilities discussed.

697 (PS 5)

#### MICRONUTRIENT TOXICITY SYMPTOMS IN BUFFALOGRASS

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The effect of increasing micronutrient levels on buffalograss (*Buchloe dactyloides*) was investigated. Seedling plants established in peat-lite mix in 10-cm pots were irrigated with solutions containing 0.5, 1, 2, 4, 6, 8, or 12 mM of boron (B), chloride (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), or zinc (Zn). The control solution contained (in  $\mu$ M): 20 B, 0.5 Cu, 40 Fe, 10 Mn, 0.5 Mo and 4 Zn. A standard macronutrient concentration was used for all treatment solutions. Boron and Mo induced visual toxicity symptoms more readily than other micronutrients. Boron toxicity was characterized by chlorosis often accompanied by bleached leaf tips, while Mo toxicity resulted in leaf necrosis. The lowest levels that induced foliar toxicity symptoms were: 0.5 mM B, 2 mM Cu, 4 mM Fe, 6 mM Mn, 1 mM Mo, and 4 mM Zn. Chloride did not induce foliar abnormalities in the concentration range tested. Biomass yield was reduced when the nutrient solution contained 2 mM B, 8 mM Cu, 2 mM Mo, or 12 mM Zn. Elevated levels of Cl, Fe and Mn did not alter dry matter yield. Tissue concentrations of micronutrients were also determined.

698 (PS 5)

#### DOES SIZE OF HARDWOOD CUTTING AND NUMBER OF BUDS AFFECT ROOTING SUCCESS OF *ACTINIDIA ARGUTA*?

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This work was conducted to determine if characteristics of the hardwood cutting (such as size of the cutting and the number of buds) could be correlated to rooting and subsequent development. Dormant wood of 13 cultivars of *Actinidia arguta* were cut into lengths which varied from 3.5-18 cm containing from 1-9 buds. After being treated with 0.3% indolebutyric acid, cuttings were then stuck into Oasis Rootcubes and placed under intermittent mist. Cultivars of *Actinidia arguta* included 74-46, 74-55, 124-40, 125-40, 127-40, 119-40-B, "Meader Male", "Meader Female #1", "Geneva #1", "Ananasnaja", "Michigan State", *arguta cordifolia* 1563-51 and a New Zealand *cordifolia* selection. There was a significant effect of cultivar on number of roots, root grade, length of roots, and callus. All rooting parameters were highly correlated with length of the cutting and number of buds in active growth. Caliper was negatively correlated with only root grade.



699 (PS 5)

VAM INOCULATION OF SUDEX USING PRAIRIE REMNANT SOIL  
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Soil samples collected from four remnant prairie plant communities in Indiana were used as inoculum for pot cultures of Sudan grass seedlings (*Sorghum sudanense*). The growth of seedlings was correlated with the quality of the prairie remnant; the less degraded sites provided inoculum which resulted in the most vigorous plant growth in culture. Sudan grass root segments were harvested and prepared for assay of vesicular-arbuscular mycorrhizae. VAM was shown to be present in inoculated samples. Results indicate that soil collected from undisturbed prairie remnants may provide a better source of VAM inoculum for larger scale production of plants which associate with VA mycorrhizae.

700 (PS 6)

WINTER ANNUAL LEGUMES AND GRASSES AS MULCHES FOR SUSTAINABLE AGRICULTURAL PRODUCTION OF FRESH-MARKET TOMATOES

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Hairy vetch, crimson clover, and rye, separately or in combination, were grown in the fall as cover crops and mowed in the spring to form an organic mulch in a no-tillage sustainable agricultural system for production of fresh-market tomatoes (*Lycopersicon esculentum* Mill, cv 'Sunny'). Fruiting earliness, yield, and size were compared between the organic mulch treatments and those under bare soil, paper and black polyethylene mulches. Fruiting was about 9-10 days earlier under black polyethylene mulch than all other treatments. Total marketable yields (t·ha<sup>-1</sup>) under the mulch treatments were: hairy vetch, 85; hairy vetch plus rye, 69; crimson clover, 66; black polyethylene, 44; bare soil, 36; and Horto paper, 30. Average fruit size was significantly larger in all organic mulch treatments than in bare soil, Horto paper, and black polyethylene mulches. Early growth of tomato plants was highest with plastic but subsequent growth was highest with hairy vetch. Superior vigor with hairy vetch was probably the result of higher nitrogen concentration of vetch residue relative to the other cover crops.

701 (PS 6)

POTENTIAL OF NO-TILL TOMATO PRODUCTION IN TENNESSEE  
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No-till (NT) culture has worked well with many agronomic crops; however, NT culture has been less successful with vegetable crops. 'Mountain Pride' tomatoes were grown under (NT) and conventional-till (CT) culture at the Plateau Experiment Station. During the first two years of the study, both NT and CT plots were tilled in the fall and sowed in a winter wheat cover crop. In the third year of the study, a continuous NT culture was maintained. Tomato yields were identical from the two tillage practices in the first year. In the second year, yields were significantly higher from NT tomatoes than CT tomatoes. The trend reversed in the third year with CT producing significantly more yield than NT culture. In addition, NT tomato plants were stunted and roots were observed to grow laterally near the soil surface. Production of NT tomatoes following a winter wheat cover crop appears feasible; however, continuous NT was not promising.

702 (PS 6)

EFFECT OF PLANTING DATE AND CULTIVAR ON PROCESSING SWEET CORN PRODUCTION IN TENNESSEE  
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Six processing type sweet corn cultivars were evaluated for productivity and production problems at eight planting dates at the Plateau Experiment Station at Crossville, TN. Plant size and yields declined rapidly after the fourth planting date. During this period soil moisture was adequate and temperatures were relatively cool, therefore, plant growth responses may have been attributed to day length or light interception. Insect populations and insect damage increased as the harvest season progressed. 'Reveille' had poor ear fill throughout the season, while percentage ear fill of all of the other cultivars, with the exception of 'More', decreased rapidly after the fourth planting date. 'More' plants were the most vigorous throughout the trial. 'More' was one of the most productive cultivars throughout the season and especially at the later planting dates.

703 (PS 6)

TILLAGE, COVER AND ALLELOPATHIC EFFECTS ON BROCCOLI.  
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'Packman' hybrid broccoli was grown under three tillage systems at three locations in 1989 and 1990 to study the feasibility of no-till production. Tillage systems consisted of 1) conventional tillage with no winter cover, 2) conventional tillage with wheat winter cover, and 3) no-till transplanted directly into paraquat killed wheat cover. Locations were at Knoxville, Greeneville and Crossville, TN. Yield, value and marketability of broccoli was significantly reduced in no-till vs conventional tillages. The possibility that small grain cover crops have a deleterious effect on broccoli growth was then investigated. Broccoli was grown in greenhouse pots with solutions of ferulic, syringic, p-coumaric, p-hydroxybenzoic and vanillic acids at 1, 10, 100 and 1000 µM concentrations and compared to controls which received only water. Shoot dry weight and plant height were both reduced with increasing acid concentrations. Soil samples were taken from field plots in 1990 and analyzed for levels of these acids using HPLC. Soils with higher levels of mulch had higher levels of ferulic and p-coumaric acid, but similar levels of the other acids. Allelopathic effects of the cover crop is a potential cause of reduced broccoli yields under no-till conditions.

704 (PS 6)

EFFECTS OF PHOTOPERIODS ON GREENHOUSE TOMATO AND PEPPER PRODUCTION

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Most works on artificial lighting of winter greenhouse vegetable crops studied the effects of photosynthetic photon flux but rarely photoperiod. Over the last three years, we conducted experiments to find out the best photoperiods for production of greenhouse tomato and pepper. We found that extending photoperiod up to 20 hrs increased productivity of pepper plants while continuous light (24 hrs) decreased yields. For tomato plants, productivity reached a maximum under a 14-hr photoperiod while longer photoperiods (16 to 24 hrs) did not increase yields. For both pepper and tomato plants, optimal growth (shoot fresh and dry weights) was obtained under the same photoperiods that gave the best productivities. We also observed leaf chloroses on tomato plants after 6 weeks under photoperiods of 20 and 24 hrs and leaf deformations (wrinkles) on pepper plants exposed to continuous lighting. We also observed that plants under continuous light grew better and flowered earlier during the first 5 to 7 weeks of treatments. So, tomato and pepper plants can use advantageously continuous supplemental lighting for a short period of time but are negatively affected on a long term basis. Future works should look at varying photoperiods to optimize yields.



705 (PS 6)

## EFFECTS OF ORGANIC AND CONVENTIONAL PRODUCTION SYSTEMS ON YIELD AND ACTIVE INGREDIENT CONCENTRATION OF MEDICINAL PLANTS.

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The major objective of medicinal plant production is to optimize dry matter yield as well as active ingredient concentration. This research examined the influence of three organic production systems and one conventional production system on dry matter yield and active ingredient concentration. Plants of thyme, horehound and camomile (*Thymus vulgaris* L., *Marrubium vulgare* L., *Matricaria recutita* [L.] Rauschter, respectively) were sown in greenhouse and then transplanted to the field. Preliminary results showed that dry matter yield was higher with the conventional production system for all species and active ingredient concentration was higher in the organic systems for thyme and horehound. Higher active ingredient concentration in these two species was obtained in the organic-biodynamic system. For camomile, highest active ingredient concentration was found with the conventional production system. These results indicate that both dry matter yield and active ingredient concentration are affected differently by organic and conventional production systems.

706 (PS 6)

## THE INTERACTIVE EFFECTS OF SHIITAKE MUSHROOM STRAINS AND WOOD SPECIES ON THE YIELD OF SHIITAKE MUSHROOMS

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Shiitake mushrooms are grown on hardwood logs or bagged synthetic hardwood media. Domestic production of shiitake mushrooms was 3.9 million pounds in 1990-91 with a value of \$16.3 million. Production of shiitake is expanding throughout the U.S., but shiitake mushroom strains are so environmentally sensitive, and wood species so diverse that evaluations of shiitake strains and wood species must be conducted on a regional basis to provide reliable results for producers. The objectives of this project were to determine the best wood species, the most productive shiitake strain and the species/strain interaction for the southern region. At the end of 30 months, there were very significant ( $P < 0.01$ ) differences among strains and wood species and a significant ( $P < 0.05$ ) interaction. Five wood species--sassafras, white oak, red oak, sycamore, and cherry--were each inoculated with 8 shiitake spawn strains--WR46, V3, WW44, West Wind, Twice Flowering, WW70, CW25, and WR85. Logs were soaked as needed and mushrooms were harvested at marketable sizes. The shiitake strains WR46, WW44, and WW70 produced the highest yields over all wood species and red oak and white oak were the most productive tree species over all shiitake strains. The optimal shiitake strain x wood species combinations were WW44 and WR46 on red oak and WW70 on white oak.

707 (PS 6)

## CAULIFLOWER YIELD AND TIPBURN INCIDENCE: EFFECT OF A HYGROSCOPIC SOIL AMENDMENT AND IRRIGATION IN SANDY SOILS

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 Cauliflower grown in hot and dry summer conditions is susceptible to a Ca and water-related physiological disorder known as tipburn. The objective of this research was to investigate the effect of several cultural practices influencing plant water relations on cauliflower yield, stomatal conductance and tipburn occurrence. 'Snow Crown' seed was sown in field seedbeds on 21 Apr 1992 and seedlings transplanted to the production field on 10 June 1992. The experimental design was a split-plot with 4 replications. Main factor treatments were: a hygroscopic polymer, AquaMend, applied at 33.6 kg/ha in bands and rototilled before transplanting, night misting of plants beginning at head formation, and night covering of plants with a plastic tent, and a non-treated control. Plants in sub-plots were irrigated to field capacity when soil matric potential (SMP) reached a minima of -20, -50, or -80 kPa. Occurrence and severity of tipburn was rated as well as stomatal conductance. Marketable yields without wrapper leaves were measured on 2 harvest dates. Neither tipburn nor stomatal conductance were significantly effected by treatment although stomatal conductance showed a tendency to increase with decreasing SMP values. Decreasing SMP also significantly increased yields, which is consistent with the simultaneous increase in stomatal conductance, and probably associated with the excessive rainfall and frequent flooding in 1992. The use of AquaMend significantly increased yield and head weight as SMP decrease. Among the cultural practices, AquaMend produced the greatest and tents the lowest yields. The use of AquaMend shows potential for increasing yields and decreasing irrigation requirements in cauliflower production in sandy soils.

709 (PS 6)

## THREE-YEAR EFFECT OF INITIAL SOIL ORGANIC MATTER AMENDMENT ON VEGETABLE CROP PRODUCTIVITY

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 We evaluated the effects of soil organic matter amendments on crop growth and yield over a three-year period. In Spring, 1990, we added 3.8 cm of spent mushroom compost and 1.3 cm of well-rotted horse manure to the top 0.2 m of selected plots in a 0.4 ha field. Other plots received recommended amounts of synthetic NPK. Total yield and yield of No. 1 grade tomatoes were 25% and 67% greater, respectively, in the amended plots than in the conventional plots the first year. In 1991, we no-till planted three varieties of sweet corn into this field. The conventional plots received either 75% or 100% of recommended N. Previously amended plots received no further N. Sweet corn production was 46-200% greater in amended plots, depending on variety. In 1992 following moldboard plowing, we planted snap beans followed by broccoli or cabbage. Conventional plots received the recommended amount of N (in 100% N plots from 1991) or no N (in 75% N plots from 1991) while plots amended in 1990 received no further N. Yields of snap beans were comparable in all three treatments. Broccoli heads had greater diameters in plots that had been amended. Cabbage from the amended plots were more mature based on growth stage. The beneficial effect of this initial amendment has continued for three growing seasons. This observation suggests that while the initial cost of organic soil amendments may be higher than synthetic fertilizer for the first year, comparable or greater yields may be expected allowing this approach to be cost-effective over a three-year period.

710 (PS 6)

## NITROGEN EFFECTS ON PAPRIKA PEPPER FOR MECHANICAL HARVEST

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Nitrogen rates were evaluated on paprika (*Capsicum annuum* L.) grown at uniform populations over three years. The objective was to evaluate the influence of N rate on plant lodging and fruit yield and quality in production for mechanical harvest. Three rates of N were evaluated; 45, 90, and 135 kg ha<sup>-1</sup>. Yield of marketable red and non-red pods increased with the higher rates of N. Plants were taller and stem weight was greater with the higher rates of N. Plant lodging was not significantly influenced by N rate. Plant uprooting force was greater as the N rates increased. Red color was lower with the higher N rates. Percent of the total fruit yield that was red did not differ due to N rate. The disadvantage to higher N rates, in addition to cost, was less red color in the marketable fruits. The higher rates of N would allow more successful mechanical harvesting of paprika due to improved plant anchorage.

711 (PS 6)

## EFFECT OF NITROGEN FERTILIZATION ON GROWTH AND YIELD OF AMARANTH

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This study was conducted to establish the optimum level of N fertilization for the production of vegetable amaranth, *Amaranthus tricolor*, in middle Georgia. The soil fertilization treatments consisted of 0, 45, 90 and 135 kg N ha<sup>-1</sup>, applied in two equal doses, first at 18 days after planting and again when plants were 5 weeks old. Accession RRC 241 was planted on 19 June in randomized complete block design with four replications. The crop was harvested 48 days after planting and data on leaf number, leaf fresh weight, stem fresh weight, and green yield were collected. Green yield for treatments 0, 45, 90 and 135 kg N ha<sup>-1</sup> were 5.3, 10.7, 13.2 and 13.5 Mg ha<sup>-1</sup>, respectively. Regression of N fertilization on all vegetative components were significant. A linear response was seen for stem fresh weight, a quadratic response for green yield and cubic responses for leaf number and leaf fresh weight. The R<sup>2</sup> values for leaf number, leaf fresh weight, stem fresh weight, and green yield were 0.61, 0.63, 0.29 and 0.85, respectively. The results indicate that 90 kg N ha<sup>-1</sup> of fertilization should provide optimal vegetative growth in amaranth.



712 (PS 6)

## BITTER GOURD: A POTENTIAL CROP FOR SMALL FARMS

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A preliminary study on bitter gourd, *Momordica charantia* L., an exotic crop grown extensively in China and India for consumption and medicinal purposes was conducted during summer 1992. The objective of the investigation was to determine the potential of bitter gourd as an alternate crop for small farm production. On May 21, seeds were planted on hills 3 m apart. A 1.65 m high chicken-wire trellis was erected for trailing the crop. Observations on disease and insect incidence, flowering date, fruiting pattern and yield were recorded. The crop was disease free, but was infested with whitefly and stinkbug. Flowering started about 60 days after planting. The first harvest was made on August 10 and then continued three times a week for eight weeks. The fruit yield peaked during the sixth week of harvest. Average fruit length and diameter were 20 and 6 cm, respectively. Per plant average fruit number and fresh fruit weight were 87 and 12.9 kg, respectively. The preliminary results indicate that bitter gourd has a potential as an alternate crop for small farm vegetable production.

713 (PS 6)

## DETERMINATION OF OPTIMAL SPAN FOR PLANTING AMARANTH IN MIDDLE GEORGIA

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Amaranth, *Amaranthus* spp., is a promising summer leafy vegetable for the Southern United States. Planting of greens is usually spread over a period of time to enable growers to supply the market on a continuous basis. This study was carried out to establish the time span for planting amaranth in Middle Georgia. *A. tricolor*, genotype "RRC 241" was planted in a randomized complete block experiment on six planting dates one month apart between 14 April and 14 September. Data on plant height, photosynthetic rate and green fresh weight were collected 40 days after planting. June, July and August plantings had similar plant height, which was significantly greater than other planting dates. The plants from June seeding had the highest photosynthetic rate of  $25.2 \mu\text{mol m}^{-2} \text{s}^{-1}$ . Green yields from April, May, June, July, August and September plantings were 0, 0.1, 9.1, 7.4, 5.7 and 2.5 Mg ha<sup>-1</sup>, respectively. It was inferred that June and July were the best months for planting amaranth in Middle Georgia.

714 (PS 6)

## RESPONSES OF MULCHED TOMATOES TO UNDER-BED TRENCHING AND PROCESSED MUNICIPAL WASTE APPLIED TO CALCAREOUS SOILS

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Trenches 0, 25 and 50 cm deep (d) and 15, 30 and 45 cm wide (w) were dug, refilled, and bedded-over in 1985. Tomatoes were planted in 1985, '86 and '88. Daorganite processed sludge was initially applied broadcast; in 50 cm deep x 45 cm wide trenches; and in 45 cm wide strips on beds, and rototilled 10 cm deep at rates of 0, 6.7, 13.4, and 26.8 t/ha. Three subsequent annual applications were strip rototilled at 0.5x the above rates to determine effects of initial and residual rates on tomato yields. In 1989, 0 and 9 t/ha of Daorganite or Bedminster Bioconversions compost were applied in trenches 0, 12.5, 25 or 50 cm deep and 45 cm wide; and 0, 6.7, or 13.4 t/ha of each were strip rototilled. Inorganic fert. was applied at approx. 0.5x recommended rate. Yields of large and marketable fruit increased with increasing depth and width of trenches. Tomatoes responded best to 6.7 and 13.4 t/ha annual sludge applications, and to rototilled strips or trench placements of sludge. Yields of large and marketable fruit increased with increasing depth of trenches. Yields were higher with 9 t/ha sludge in trenches plus 6.7 or 13.4 t/ha sludge strip rototilled, and with 13.4 t/ha of either sludge or compost strip rototilled in the bed.

715 (PS 6)

## NITROGEN AND POTASSIUM FERTILITY OF JALAPENO PEPPER DURING PLANT DEVELOPMENT AFFECTS PLANT GROWTH AND FRUIT YIELD AND PUNGENCY

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Nitrogen (N) and potassium (K) nutrition of Jalapeno peppers was determined on plants grown in sand culture. Varying rates of N (1 to 30 mM) and K (1 to 12 mM) in Hoagland's solution were evaluated to determine optimum nutrient concentration for plant growth and fruit production. Application of nutrient treatments were initiated at transplanting and flowering. A quadratic response to N rate was determined for biomass and fruit production per plant, regardless of when the N treatments were initiated. Plants that had N treatments initiated at transplanting were smaller and had less fruit. Optimum N rate for fruit yield was 15 mM. A linear response to K rate was determined for biomass, fruit number, and fruit weight per plant when nutrient treatments began at transplanting. A quadratic response to K rate was determined when K treatments began at flowering. Pepper plants that had K rates initiated at transplanting were smaller and had less fruit. The optimum K rates for fruit yield was 3 to 12 mM. Pungency of fruit was only affected by N rate treatments initiated at transplanting. 1 mM N reduced capsaicin levels in fruit as compared to other rates. Jalapeno peppers grown in sand culture required 15 mM N and at least 3 mM K for optimum fruit production.

716 (PS 6)

## INFLUENCE OF WINTER COVER CROPS AND NITROGEN FERTILIZER ON TOMATO AND BEAN PRODUCTION AND SOIL NITRATE DISTRIBUTION

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Winter cover crops (wheat and crimson clover) in combination with three levels of nitrogen fertilizer (0, 6, 120 kg/ha) were evaluated as to their influence on bean and tomato production (fruit yield, disease and insect on fruit, and nutrient content of fruit and plants). The influence of cover crop and fertilizer on nitrogen distribution in the soil profile was determined for each treatment. A split plot design was used with the cover crop as the main treatment and nitrogen rate as the split treatment. Soil cores were taken in the spring before planting and at the termination of harvest each year. Results indicate that cover crop had an effect on non-marketable bean fruit, but did not affect marketable fruit harvested for both bean and tomato. Cracked and insect damaged tomato fruit was greatest in fallow and wheat treatment, and culls of bean fruit was greatest in the clover treatment. Cover crop treatment had no effect on overall tomato and bean plant nutrient content. Wheat and clover cover crop treatment reduced the amount of nitrate leaching in the soil profile as compared to the fallow. These results suggest that wheat and clover can be used effectively as cover crops to reduce nitrate leaching without affecting bean and tomato fruit yield.

717 (PS 6)

## Mechanical height control for tomato plug transplants: effects on yield

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Mechanical conditioning is an effective method for limiting excessive stem elongation in tightly grown plants. It is particularly effective in tomatoes. Any treatment that reduces growth of transplants has the potential to also reduce subsequent growth, and thereby reduce yield. Giving plants 0, 10, 20 or 40 strokes daily showed a maximal height reduction with 20 strokes, but further reduction in leaf area with 40 strokes. The potential reduction in growth rate was about 25%. Harsher treatment to provide greater growth control appears unproductive. For studying the effects of stroking on yield, 288-size transplants were grown as they would in commercial production, and 3 flats of each transplanted in grower-cooperators' fields in 1991 and 1992. There was no significant yield reduction in either year. In 1991, the stroked plants had more severe blossom end rot than the controls, resulting in about 1 kg/m more culls. The weather in each year caused low yields and high sample variation. When the plants experience less stress during the growing season, the transplant treatments would be expected to have a larger effect.

	Control	Stroked	
1991	10.7 ± 1.3 <sup>1</sup>	9.4 ± 1.6	NS
1992	4.3 ± 0.6	4.2 ± 0.4	NS

<sup>1</sup>Yield (kg/m) ± s.d.



718 (PS 6)

# EVALUATION OF HARVEST SCENARIOS FOR COWPEA (*Vigna unguiculata* L. Walp), A CANDIDATE SPECIES FOR CONTROLLED ECOLOGICAL LIFE-SUPPORT SYSTEMS

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Physiological characteristics of cowpea suggest it as a candidate species for CELSS. Improving productivity will be essential for CELSS. The leaves of cowpea provide an added source of edible biomass and may extend harvest index (HI=edible/total biomass). A greenhouse study evaluated the interaction of photoperiod and cultivar with 3 harvest scenarios: 1) seed only, 2) seed and leaves (mixed), and 3) leaves only. Overall, seed only HI was 25% less than leaf-only HI. For IT84S-2246, a short-day cultivar for flowering, both mixed and seed only HI dropped 20% as photoperiod increased from 8 to 24 hours. While edible yield rate remained constant, shoot dry weight increased as photoperiod increased for both harvest scenarios, thus decreasing HI. For the same reason, the leaf-only HI of S-2246 increased as photoperiod increased. For IT82D-889, a day-neutral cultivar for flowering, HI remained constant regardless of photoperiod. Leaf-only HI was 65%, whereas seed and mixed HIs were 40 and 45% respectively. For all harvest scenarios, D-889 produced 25 grams less edible biomass per plant than that of S-2246. Due to the interaction of harvest scenario and cultivar, cultivar selection must be based on yield performance in each type of harvest scenario. Further investigations will answer the extent of sacrificing seed yield for leaf harvest. NASA Grant NAGW-2329.

719 (PS 6)

# BRUSHING TREATMENTS FOR HEIGHT CONTROL OF VEGETABLE AND ORNAMENTAL TRANSPLANTS

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Height control for vegetable transplants has become challenging with the loss of the industry standard growth regulator, daminozide (B-Nine). Although chemical growth regulators remain legal for use in nonedible crops, their margins of safety, costs and looming reregistration uncertainties, justify the investigation of nonchemical height control methods. Various cultivars of *Lycopersicon esculentum* and *Capsicum annuum*, were subjected to daily brushing treatments for at least four weeks. Various ornamental cultivars, which currently can be kept chemically compact, were also subjected to the same treatments. The experimental apparatus height and weight differences among test plants and the method's economic feasibility on a commercial basis will be discussed.

720 (PS 6)

# TILLAGE, COVER, AND ALLELOPATHIC EFFECTS ON BROCCOLI.

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'Packman' hybrid broccoli was grown under three tillage systems at three locations in 1989 and 1990 to study the feasibility of no-till production. Tillage systems consisted of 1) conventional tillage with no winter cover, 2) conventional tillage with wheat winter cover, and 3) no-till transplanted directly into paraquat-killed wheat cover. Locations were at Knoxville, Greenville and Crossville, TN. Yield, value and marketability of broccoli were significantly reduced in no-till vs conventional tillage. The possibility that small grain cover crops have a deleterious effect on broccoli growth was then investigated. Broccoli was grown in greenhouse pots with solutions of ferulic, syringic, p-coumaric, p-hydroxybenzoic and vanillic acids at 1, 10, 100 and 1000  $\mu$ M concentrations and compared to controls which received only water. Shoot dry weight and plant height were both reduced with increasing acid concentrations. Soil samples were taken from field plots in 1990 and analyzed for levels of these acids using HPLC. Soils with higher levels of mulch had higher levels of ferulic and p-coumaric acid, but similar levels of the other acids. Allelopathic effects of the cover crop is a potential cause of reduced broccoli yields under no-till conditions.

721 (PS 6)

# EFFECT OF SHADING ON TOMATO

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High day and/or night temperatures interfere with fruit set of tomato (*Lycopersicon esculentum* Mill.). Shading may protect flowers and increase fruit set and yield. The cvs. 'Flash' and 'Sunny', which do

not set fruit under night temperatures above 21.1°C were planted in mid-May, mid-June, and mid-July in 1991 and 1992 into a Bernow fine-loamy, siliceous, thermic Glossic Paleudalf soil at Lane, Oklahoma. Sixty-percent shade cloth was attached to T-shaped supports over one-half of the plots three weeks after planting. High-low temperature thermometers were suspended on supports in beds with and without shade. Shading reduced high and low temperatures by 2.5 and 1°C below ambient. Earlier planting improved yield, but cultivar or shading did not. Shading increased plant dry weight in 1992. Dry weight was positively correlated ( $p=0.01$ ) with yield. Shading did not increase yield. Other levels of shading, removal of shade for a portion of the day, or erecting shading at transplanting may affect yield differently.

722 (PS 6)

# INFLUENCE OF NITROGEN AND PLANT SPACING ON SPORT PEPPERS

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Field studies were conducted in 1992 with 'Mississippi Sport' pepper. Plants were established by direct seeding at 8 cm or transplanting at 8, 15, 23 and 30 cm in-row plant spacing. All in-row plant spacings received one of five nitrogen applications (0, 55, 110, 165, 220 kg pe hectare). Plant parameters, fruit quality and yield were monitored. A modified commercial snap-bean harvester was evaluated for harvest. Closer plant spacings resulted in greater red and combined red and green grade yields. Nitrogen rate did not influence yield or stem diameter and height. The use of the modified mechanical snap-bean harvester appears to be a feasible technique to harvest sport pepper.

723 (PS 6)

# RYEGRASS AND CLOVER AS LIVING MULCHES FOR SWEET CORN ON SANDY SOIL

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Two living mulches were studied for their effect on weed control and nitrogen cycling in sweet corn grown on sandy soil under sprinkler irrigation. Plots with either annual ryegrass (*Lolium perenne*) or dwarf white clover (*Trifolium repens*) planted between sweet corn rows were compared to plots kept weed free by cultivation or herbicides. Each sweet corn plot (18.3m x 3.7m) was split into two subplots according to level of applied nitrogen. One subplot received 112 kg N/ha (100 #/A) and the other 224 kg N/ha (200 #/A). Nitrate and ammonium levels were measured in soil samples and nitrogen levels were measured in plant tissue samples. Measurements such as corn height were taken, as well as percent mulch cover, plant tissue fresh weight and dry weight, total corn yield and marketable yield, and weed counts. Applied nitrogen leached through the soil profile more rapidly than expected (within 2 weeks) and sweet corn growth and yield were poor in all the low level nitrogen plots. Even at the high nitrogen level, sweet corn yield was limited by mulch growth. The weed control benefits of this living mulch system could potentially be realized if mulch competition were limited, especially during early growth stages of the corn.

724 (PS 6)

# A SYSTEMS APPROACH TO PRODUCTION AND MARKETING FRESH-MARKET COLLARDS IN THE MIDSOUTH

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Results from research conducted in commercial fields, the ASU research farm, and commercial packing sheds were used to construct a production and marketing system for spring fresh market collards. The system was based on results from studies conducted in 1989 through 1993 which included date of planting trials, transplant population density studies, crop establishment comparisons, harvest method analyses, economic analyses of infrastructure requirements, quality comparisons with different post harvest handling methods, and buyer preference surveys. A system analysis was imposed to create a production/marketing program to provide 1000 boxes (9.1kg) of collards/wk for the Arkansas spring season, mid-April through June. Product would supply local markets and terminal markets in midwestern (Chicago and Detroit) and southwestern (Dallas and Houston) cities where Midsouth greens producers have comparative transportation advantage over other U.S. production regions. Results indicate that a



combination of direct seeding and transplanting for establishment and harvest using the cut harvest method (whole plant, single harvest) is optimal in early season with direct seeding with shucking (leaves stripped, multiple harvests) appropriate later. Harvest efficiency is higher and cost is lower with the cut harvest method, but shucked yields are higher and shucked product is preferred by buyers. Additional quality and economic analyses indicate that product should be hydrocooled and packed with crushed ice.

## 725 (PS 6)

**GROWING GLOBE ARTICHOKE AS AN ANNUAL IN VIRGINIA**  
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The globe artichoke (*Cynara scolymus* L.) is a herbaceous, perennial dicot grown for its immature flower bud. Globe artichokes are usually propagated vegetatively from root divisions or offshoots, because plants grown from seed lack uniformity. Furthermore, only a small percentage of plants grown from seed flower during the first season without vernalization. The globe artichoke is not winter hardy and cannot be grown in areas where temperatures are  $< -10^{\circ}\text{C}$  without protection. The cultivar Imperial Star was developed in California to produce uniform plants from seed and a high percentage of buds the first year. In this study, Imperial Star (IS) and Green Globe (GG) were evaluated for their ability to produce a crop during the first season from seed without vernalization in Virginia. Eight-week-old transplants were set in the field on 14 May 1991. The harvest period began on 12 August for both cultivars and ended on 28 September and 8 November for GG and IS, respectively. Eighty-one percent of the IS produced buds compared to 25% for GG. The average bud yield per plant was 12 for IS and 9 for GG. Ten and 9% of the buds were rated as off-type for IS and GG, respectively. The average bud weight was 77 and 80 grams for IS and GG, respectively. Only 54 and 49% of the IS and GG buds, respectively, exceeded the marketable weight of 75 grams. The percent marketable yield for IS was 46% and 42% for GG. The estimated marketable yield per hectare was 54,600 and 4,800 buds for IS and GG, respectively. Imperial Star is a significant improvement over GG plants grown from seed in short season areas.

## 726 (PS 7)

**SIMULATION OF HOURLY TEMPERATURES AND ESTIMATION OF CHILL UNITS.**

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A model [HeatSine-Exponential (HSE)] for the course of diurnal temperatures was validated with forty-three years of hourly temperatures from the Salt Lake City (Utah) airport. Daily parameters of the HSE model were determined by non-linear regression analysis. The HSE was compared to linear and other sine-exponential formulations. The HSE model had the highest average coefficient of determination ( $r^2 = 0.89$ ) and the lowest average root mean square error ( $0.92^{\circ}\text{C}$ ). All the models under study were tested for the estimation of chill units and compared against chill accumulations computed directly from hourly temperatures. The HSE and sine-exponential models were simplified through systematic variation of the model parameters. Deviations from the hourly temperature results were analyzed using relative error (RE). The average RE for the HSE model was 3.3% [standard deviation ( $s$ ) = 3.0]. The best linear method estimated chill units with an average RE of 6.1% ( $s = 4.3$ ).

## 727 (PS 7)

**MATHEMATICAL MODELLING OF TREE CROP ORCHARD DESIGN: INTERTREE SHADING DURING CRITICAL SEASONAL GROWTH AND DEVELOPMENTAL WINDOWS AND ITS IMPLICATIONS ON OPTIMAL SPACING**

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The authors have developed a computer model designed for shade-intolerant tree crops which describes the amount of intertree shading in an orchard. These data are used to formulate an optimal orchard design based on shading reduction in orchards for any tree crop during any developmental window at any global location.

Tree shape is modelled as an ellipsoid bisected about the semi-minor axis, with ellipsoid dimensions and eccentricity altered to reflect growth stages of the trees. Intertree shading is measured as the surface area of the projected shadow on the ellipsoid. Variables include crop, light extinction, ellipsoid dimensions, intertree spacing, orchard geometry, time and day of the year, and geographical coordinates. Simulations compared the sunlight-related attributes of a variety of orchard geometries for different growth phases of the trees during different parts of the year for several global locations. Results indicate extensive variability of intertree shading to be a function of latitude, regardless of other variables.

## 728 (PS 7)

**ROOT RESTRICTION AND PHOTOSYNTHETIC RESPONSE IN A PEACH ROOTSTOCK**

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Experiments on root restriction effect were carried out on micropropagated peach rootstock (GF677) plants grown in pots with different volume (1350 and 270 ml).

Root restriction reduced plant growth expressed as shoot length, FW and DW accumulation and leaf area. Application of a triazole (BAS 111, GA biosynthesis inhibitor) or TIBA (inhibitor of auxin polar transport) also reduced plant growth as compared to root restriction.

Pn measured on expanded leaves developed during the time-course experiment showed to be affected by root restriction. In fact the assimilation rate exhibited by plants grown in 270 ml volume pots remained at lower level at least at the lower light intensities. TIBA treatment dramatically reduced the assimilation rate at all the light intensities tested, while BAS111 did not induced evident differences as compared to the control plants. The stomata density per leaf doubled in the plants grown in 1350 ml pots as compared to that of plants in the 270 ml pots.

## 729 (PS 7)

**MORPHOLOGICAL EFFECTS OF VARIABLE LEVELS OF ROOT RESTRICTION ON 'LORING' AND 'REDHAVEN' PEACHES IN DIFFERENT ENVIRONMENTS**

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A greenhouse and parallel field study were established to evaluate different levels of root restriction and their influence on shoot development. One year old 'Loring' and 'Redhaven' peach (*Prunus persica* L. Batsch) were grown for 7 months in containers with volumes ranging from 1.93 to 19.2 L using a mixture of kitty litter, sand (1:1v). Plants were irrigated daily and fertilized weekly. Plants grown in small containers (highly restricted 1.93-3.85 liters) exhibited less leaf expansion and caliper development. Number of primary shoots, total combined length of secondary shoots, and total length of all shoots were reduced. Shoot/root ratio was not altered by the container volumes suggesting a coordination of root and shoot growth modulated by the container volume. The same trends were observed in both field and greenhouse. Root fresh weight was reduced by the highly restricted versus the less restricted treatment (15.4-19.25L) the same extent irrespective of cultivar and location with values ranging from 33.1-38.6%.

## 730 (PS 7)

**TOLERANCE OF PEACH ROOTSTOCKS TO IRON CHLOROSIS**

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Bailey, Lovell and Halford peach rootstocks were evaluated to determine their tolerance to iron chlorosis. Two year old trees budded with Redhaven scions were used. Experiments were carried out in a greenhouse with trees grown in nutrient solutions and soil. Soil was obtained from an orchard with a history of severe iron chlorosis problems. Nutrient solutions were treated with bicarbonate, and pH was maintained at approximately 8.3 to induce iron chlorosis symptoms. Mean chlorophyll content of leaves from Redhaven on Halford was  $42 \text{ mg/m}^2$  which was significantly higher than Redhaven on Bailey ( $30.3 \text{ mg/m}^2$ ) and Redhaven on Lovell ( $28.4 \text{ mg/m}^2$ ). Photosynthetic rates of leaves from Redhaven on Halford were significantly higher ( $16.6 \text{ } \mu\text{m}^2/\text{sec}$ ) than those on Bailey ( $7.3 \text{ } \mu\text{m}^2/\text{sec}$ ) and on Lovell ( $2.1 \text{ } \mu\text{m}^2/\text{sec}$ ). Shoot growth was measured weekly. Redhaven shoots on Halford had significantly more shoot growth (80 cm) from the beginning of the experiments than on Bailey (23 cm) and on Lovell (19 cm). Results from these experiments show that Halford rootstock with a Redhaven scion is more tolerant to iron chlorosis than Bailey and Lovell rootstocks with Redhaven scions.

## 731 (PS 7)

**YIELD COMPONENTS IN SPUR VS. NON-SPUR STRAINS OF 'DELICIOUS' APPLE ON TWO ROOTSTOCKS**

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Yield components of spur and non-spur strains of 'Delicious' apple on 2 rootstocks were compared over 4 years (5th through 8th leaf). Yield per unit trunk cross-sectional area was higher in spurs than in non-spurs with but few exceptions. Differences in fruit set, rather than in flower density or fruit size, were largely responsible for this difference in yield. Yields were higher on EMLA 7 than EMLA 111 rootstock, partially because of earlier bearing. When cropload was factored out, fruit size was slightly greater on EMLA 7 than on EMLA 111.



EFFECT OF LIGHT ON ENDOGENOUS IAA AND IBA CONCENTRATIONS DURING THE INDUCTIVE PHASE OF ROOTING IN *MALUS PUMILA* M.9 JORK

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Shoots of M.9 Jork, grown in vitro, were treated with IBA and then incubated in the dark or light for 5 days to determine the effect of light on endogenous IAA and IBA concentrations during root initiation. Incubation in the dark resulted in significantly greater percentages of rooting and more roots per plant than when the shoots were placed in the light during the inductive period. Uptake of IBA continued throughout the 5 days with both IAA and IBA concentrations in the basal portion of the stems increasing during this period. The increase of both free and total IBA was significantly greater than that of IAA. Relatively little IBA was converted to IAA. An increase of peroxidase activity was noted in the dark, resulting in less free IAA being present in the dark than in the light. Considering the greater amount of IBA relative to that of IAA, however, we concluded that IBA itself, and not its conversion to IAA, is the active agent during root initiation.

## 733 (PS 7)

## TEMPERATURE OPTIMUMS FOR ANTHOCYANIN SYNTHESIS IN 'BRAEBURN', 'DELICIOUS', 'FUJI', AND 'GALA' APPLE TISSUE

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Color in apple skin is a composite of varying concentrations of chlorophyll, carotenoids, and anthocyanins/flavonols. Anthocyanin biosynthesis is influenced by a number of factors including rootstock, nitrogen status, wounding, certain plant growth regulators, light, and temperature. This study investigated changes in the optimum temperature for anthocyanin accumulation of 'Braeburn', 'Delicious', 'Fuji', and 'Gala' apple tissue disks. Prelimacteric (core ethylene < 1.0  $\mu\text{l-liter}^{-1}$ ) apples with little color development were harvested in September, 1992 and immediately brought to the laboratory. Six 15mm disks about 3mm thick were removed from the shaded side of each fruit and transferred to moistened filter paper on temperature-controlled blocks preset at temperatures ranging from 15C to 40C at intervals of 5C and covered with plastic ( $\text{CO}_2$  permeable) film. The disks were illuminated for up to 48 hours with a high pressure sodium lamp at a distance of about 1m. Following the illumination period individual peel disks were extracted with acidic methanol for anthocyanins. The temperature optimum for maximum anthocyanin biosynthesis for each cultivar will be reported.

## 734 (PS 7)

## FRUIT GROWTH RESPONSES IN 'HEDELINGEN' SWEET CHERRY WITH FIVE ROOTSTOCK CULTIVARS, BLOSSOM THINNING, AND IRRIGATION

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Small fruit size reduces fresh-market value and potential net income in sweet cherry. Several new rootstock cultivars for sweet cherry induce greater precocity, heavier blossom density, and a range of dwarfing but also may reduce fruit size. A field study was undertaken with sixth leaf 'Hedelfingen' scions grown on *Prunus avium* L. 'Mazzard' seedling rootstock or on one of 4 new rootstock cultivars: 'Damil', 'Gi 148/1', 'Gi 172/9', and 'Gi 196/4'. Factorial treatments included (+/-) trickle irrigation when soil tensiometer readings reached 20 k Pa and (+/-) hand thinning to single fruits/cluster at 7 days after full bloom. High natural precipitation reduced irrigation effect but fruit size was increased significantly by thinning. Yield differences were also seen between rootstock cultivars.

## 735 (PS 7)

## COMPARATIVE GROWTH AND PHYSIOLOGY OF RED-VERSUS GREEN-FRUITED STRAINS OF SELECTED EUROPEAN PEAR CULTIVARS

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Several growth and gas exchange parameters were measured on potted, 1-year-old greenhouse grown trees of the green-fruited cultivars, 'Bartlett', 'd'Anjou' and 'Clappe's Favorite' and their red-fruited sports, 'Red Bartlett', 'Red d'Anjou' and 'Kalle'. Trees were on seedling 'Bartlett' rootstock. In addition to growth and gas exchange, total chlorophyll and soluble protein content and RubisCo activity were

assayed. Green-fruited cultivars required less leaf area to support a unit of biomass than did red-fruited cultivars. 'Clappe's Favorite' had higher maximum  $\text{CO}_2$  uptake than 'Kalle', although there were no  $\text{CO}_2$  uptake differences between green- and red-fruited 'Bartlett' and 'd'Anjou'. Dark respiration was less negative in 'Bartlett' than 'Red Bartlett' and lower in 'd'Anjou' than 'Red d'Anjou'. There were no differences in quantum requirements for photosynthesis between green- and red-fruited cultivars. These observations may elucidate reasons for inferior growth in red-fruited sports compared to their parents.

## 736 (PS 7)

## CHANGES IN OIL CONTENT, FATTY ACID, AND VITAMIN E COMPOSITION IN DEVELOPING HAZELNUT KERNELS.

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Kernel oil content increased while moisture content decreased during development. Oil concentration of varieties was between 59.6% and 67%, at harvest and the major lipid class was triglycerides. Oleic acid increased from 10% to become the most abundant fatty acid at harvest (74%). Linoleic increased from about 4% to around 30% early in the season but then decreased although it finally represented a high proportion of total fatty acids (19-22%). Total vitamin E increased as oil content increased.  $\alpha$ -tocopherol was the major form of vitamin E and its concentration increased to around 400  $\mu\text{g/g}$  oil throughout the season and was almost 90% of total vitamin E.  $\beta$ -tocopherol was only a minor constituent and decreased from the beginning to around 10-20  $\mu\text{g/gm}$  of oil at the end.  $\gamma$ -tocopherol increased during the first stage of growth and then decreased during the second and third stages.

## 737 (PS 7)

## POLLINATION OF ANJOU PEAR

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A two-year study was conducted on 12 possible varieties as pollen sources for Anjou pear. Bloom dates of the varieties were compared with bloom date of Anjou. Viability of pollen was determined including germination and tube growth. The Anjou trees were hand-pollinated using the various sources of pollen, then later we determined fruit set. The fruit was harvested and size of fruit, number of seeds, firmness, soluble solids, titratable acidity and physiological disorders were determined. Bloom dates corresponding most closely to Anjou were Bartlett, *Pyrus calleryana* and the Asian pear Nijisecki. Pollen from El Dorado, OHxF 33 and OHxF69 had the highest percent germination and the best pollen tube growth. Bartlett, *Pyrus calleryana*, Nijisecki, OHxF333 and OHxF69 showed the highest percent fruit set. The largest fruit was from flowers pollinated with Nijisecki, Dawn, Bosc and self-pollinated. Fruit with highest numbers of seeds was fruit with pollen from Nijisecki, Usseriense, Dawn, Comice and Bosc. There was no difference in firmness, soluble solids or titratable acidity, and there was no physiological disorders. The study indicated Bartlett pear is the best all-round pollinizer for Anjou pear.

## 738 (PS 7)

EFFECT OF TRELLIS TYPES ON YIELD AND QUALITY OF PASSION FRUIT, *A. S. Bhagsari\**, Agricultural Research Station, Fort Valley State College, Fort Valley, GA 31030-3298, and *O. S. Otim*, Makerere University, Kampala, Uganda, East Africa.

Field experiments were conducted at the Makerere University Agricultural Research Institute, Kabanyolo, Uganda from September 1990 to March 1992, using two local purple types of passion fruit (*Passiflora edulis* Sim) and Kawanda Hybrid. There were 18 experimental rows, each 72.0 m long with 4.5 m spacing between the rows. Each row had 12 pits 6 m apart with two plants per pit. Three types of trellises [control-bar (CB), T-bar (TB), and double T-bar (DTB)], each extending the entire row length, were installed on wooden poles using No. 10 wire. Fruit number and yield were significantly higher for Kawanda Hybrid than the local purple types. The fruit yield for Kawanda Hybrid ranged from 16.84 MT/ha (CB) to 22.05 MT/ha (TB). Kawanda Hybrid fruit yield for TB and DTB was about 30.0% higher than that of CB. The mean fresh fruit weight was about 40.0 g for the purple types and 63.3 g for Kawanda Hybrid. The mean pH of fruit juice was 2.7 for Kawanda Hybrid and 3.1 for the local purple types. Mean total soluble solids in juice were 15.9%.