

2003 Florida State Horticulture Society

June 8-10

Sheraton World Resort, Orlando

Annual Meeting

Abstracts

Citrus Section

Ed Stover, Presiding

*Indicates student paper competition

Monday June 9

Morning Session

- * **Distribution of Flavonoid Glycosides, Polyphenolics and Antioxidant Potentials in Different Tissues of *Citrus X paradisi*, *Citrus pumello* and *Citrus sinensis*.** Ufuk Koca, Bala Rathinasabapathi and Gloria A. Moore, Horticultural Sciences Dept., UF, Gainesville

Flavonoid glycosides in Citrus fruits are known for their antioxidant qualities. Despite the availability of data on flavonoid glycoside levels in Citrus fruits and juices, little is known on how various flavonoid glycosides are distributed in Citrus plants and how that distribution relates to the tissue's antioxidant potential. The objective of the current study is therefore to test the correlation between the levels and nature of flavonoid glycosides in a tissue and its antioxidant potential in three Citrus species. Fruit peel, juice vesicles, juice vesicles' membrane, flavedo, albedo, young leaves and mature leaves of grapefruit, orange and pumello tissues were quantitatively extracted using a solvent mixture. The extracts were evaluated for their levels of flavonoid glycosides and total phenolics. Antioxidant potential, as measured by a ferric reducing (FRAP) assay, was correlated to the levels of flavonoid glycosides and total phenolics. The significance of species-specific and tissue-specific differences in their antioxidant potentials is discussed.

- * **Valuing Catastrophic Losses for Annual and Perennial Agricultural Crops.** Damian C. Adams, Richard L. Kilmer, Charles B. Moss, and Andrew Schmitz, Food and Resource Economics Dept., UF, Gainesville.

Courts are often required to estimate changes in welfare to agricultural operations from catastrophic events. For example, courts must assign damages in lawsuits, such as with pesticide drift cases, or determine "just compensation" when the government takes private land for public use, as with the removal of dairy farms from environmentally sensitive land or destruction of canker-contaminated citrus trees. In economics, the traditional method of estimating changes in welfare is the computation of lost consumer and producer surplus, but courts rarely use this method. Instead, they turn to substitute valuation methods that may not fully capture welfare change, such as changes in land value, replacement value, and total revenue. This study examines various measures for valuing the back-to-back catastrophic freezes that occurred in the Florida citrus industry in the 1980s. We first use the traditional method to determine the welfare change due to a freeze (1) for a citrus grove that loses one crop and is able to return to full production the next year, (2) for a citrus grove that loses all of its trees and is abandoned and the land is left idle, and (3) for a citrus grove that loses all of its trees and the trees are replanted. These measures are then compared to substitute valuation measures that have been used by courts to determine welfare changes.

History of Bedding Citrus Groves in the Indian River District to Improve Drainage. Paul J. Driscoll, Grove Manager, Ft. Pierce.

The economic success of a citrus grove in the Indian River District depends on its drainage characteristics. The history of various bed designs used to improve drainage along with their advantages and disadvantages is discussed. The development of the equipment used to construct beds is outlined.

Irrigation of Young Flatwoods Citrus Trees. Brian J. Boman, Indian River Research and Education Center, UF, Ft. Pierce.

An irrigation study was conducted on young 'Valencia' orange trees planted in January 1999 at the Indian River REC in Ft. Pierce. Trees were irrigated with microsprinklers with top hats to direct the water into a 1.0 m diameter area around the tree. Plots consisted of 8 trees, with irrigation treatments during rain-free periods scheduled 3 times per day (D3), once per day (D1), every 3 days (3D), or whenever tensiometer readings at a depth of 15 cm exceeded 15 kPa (T15). One year after planting, the trees on the T15 treatment had similar height and canopy development as the other treatments, but about 20% less trunk cross-sectional area. Two years after planting, the T15 treatment trees had about 90% of the height and canopy width of the other treatments and about 20% less trunk cross-sectional area. At 3 years after planting, trees on the D1 irrigation program had 10-17% more trunk cross-sectional area, and about 10% more height than the other treatments. At 4 years after planting, the D1 treatment was superior in all respects to the other treatments. In March 2003, the D1 treatment trees had about 20% more trunk cross-sectional area, 5-8% more canopy width, and 7-10% more height than other treatments.

Survey and Control of Brazil Pusley (*Richardia brasiliensis*) in Florida Citrus. R. S. Chandran, West Virginia U., Morgantown, West Virginia, and M. Singh, Citrus Research and Education Center, UF, Lake Alfred.

Surveys for Brazil pusley (*Richardia brasiliensis*) and Florida pusley (*Richardia scabra*) in leading citrus producing counties of Florida indicated the presence of only Brazil pusley, where Florida pusley was considered to predominate. Field and greenhouse studies were conducted to evaluate 2,4-D and glyphosate, applied separately, or as a tank mixture, or as a commercial prepackage mixture for Brazil pusley control. In separate field studies, tank mixing 2,4-D and glyphosate at 1.2 and 0.68 kg ae/ha provided 95% and 94% control at 5 weeks after treatment (WAT), compared to 85% and 53% control when glyphosate was applied alone at 0.68 kg/ha. The prepackage mixture containing the same concentrations of 2,4-D and glyphosate provided 92% and 79% control of Brazil pusley, in the two field studies, respectively. In greenhouse studies, Brazil pusley control with 2,4-D + glyphosate tank mixed at 1.2 and 0.68 kg ha⁻¹ was 91% and control with the prepackage mixture was 44%. Viability and regrowth of Brazil pusley rootstocks were not affected by the different herbicide treatments.

The Costs Associated with Florida Citrus Groves Exposed to Citrus Canker. T. H. Spreen, M. L. Zansler, Food and Resource Economics Dept., UF, Gainesville, and R.P. Muraro, Citrus Research and Education Center, UF, Lake Alfred.

The transmission of citrus canker (*Xanthomonas campestris* pv. *citri*) from private residences to the commercial groves of southwest Florida in the mid-1990s led to an intense citrus canker regulatory program of eradication. Citrus canker is a bacterial disease causing lesions on the leaves and fruit of all varieties of citrus trees. The ill-favored appearance of citrus canker on fresh citrus varieties adversely affects their marketability. In addition, the vitality of the tree is weakened causing yield reduction by as much as 15 percent in some varieties. The citrus canker eradication program in Florida stipulates that any tree determined to be infected with the disease, as well as all trees within a 1900-foot radius, be removed. The economic costs to citrus growers in Florida associated citrus canker discovery is estimated in two scenarios: production costs associated with the eradication of citrus groves due to a canker find and production costs associated with living with citrus canker. A hypothetical canker-free grove is modeled for comparison.

Canopy Hedging, Topping, and Skirting Effects on Yield and Fruit Quality of ‘Valencia’ Oranges.

J. D. Whitney, T. A. Wheaton, W. S. Castle, and D. P. H. Tucker, Citrus Research and Education Center, UF, Lake Alfred.

A 5-year hedging, topping, and skirting experiment was conducted in 9-yr-old ‘Rohde Red Valencia’ orange on Carrizo citrange rootstock. Spring hedging resulted in higher juice brix than did fall hedging, but there were no consistent differences in yield. Compared to flat topping at 15 ft, flat topping at 12 ft reduced juice brix and lb solids/box, but yield was not consistently reduced. Angle topping resulted in consistently higher yield than did flat topping. Compared to no skirting, skirting at 20 and 36 inches high had no consistent effects on yield and fruit quality.

Factors Reducing Fresh Grapefruit Packouts in Florida: Can Packouts be Improved?

Mark A. Ritenour and Ed Stover, Indian River Research and Education Center, UF, Ft. Pierce.

The greatest financial returns for grapefruit are often achieved by selling fruit for the fresh market. While Florida growing conditions yield fruit of exceptional internal quality, they also favor the development of cosmetic defects that can render the fruit marketable only for juice. Such defects include under/over-sized fruit, windscar (and other mechanical peel injuries), poor colored fruit, misshapen fruit, fungal blemishes (e.g., melanose), arthropod damage (e.g., rust mite), sunburn, and freezing injury. A few of these defects are always major elimination factors, but the incidence and relative importance varies from year to year. Data shows that average grapefruit packouts (especially for red grapefruit) have declined over the past decade, suggesting that market demands and / or cultural practices may have shifted. This analysis is intended to explore factors contributing to this decline in packouts, in an effort to identify opportunities for better returns. Aspects considered will include: 1) the possibility that lower input grove care, associated with poor returns, may be involved in the lower packouts; 2) influence of sales to more demanding markets (e.g., Japan); 3) effects of declining tree health; 4) and a shift to more sales of late-season fruit. Discussion will be encouraged during the presentation to aid in our understanding of the complex interactions that result in low packouts.

Monday Afternoon Session 1:30-3:00

Pre-Emergence Herbicide Azafenidin for Weed Management in Citrus Groves. S. D. Sharma, CCS Haryana Agriculture University, Regional Research Station, Karnal, Haryana, India, and M. Singh, Citrus Research and Education Center, UF, Lake Alfred.

The effects of different rates of the herbicide Azafenidin alone and in tank mix with other pre-emergence herbicides were examined on some important weed species. Azafenidin alone had immediate damaging effects on emerging seedlings of test weeds, which became bleached and died 1 week after treatment (WAT) even at the lowest rate (0.28 kg a.i. ha⁻¹). No significant difference in the control of test weeds was obtained with tank mix applications of Azafenidin with Bromacil or Diuron, or with Azafenidin alone. One week after treatment, 23% control was obtained in morning glory, milkweed vine, and hairy beggarticks, 26% to 73% control in Brazil pusley, and 100% control in redroot pigweed when Norflurazon, Bromacil, Diuron, or Simazine herbicides were applied alone. Two weeks after treatment all test herbicides, including Azafenidin at the lowest rate of 0.28 kg a.i. ha⁻¹ achieved 100% control of the test weed species. Symptoms of phytotoxicity of Azafenidin were obvious on the upper leaves of citrus rootstock seedlings. The order of symptoms severity was Volkamer > Carrizo = Swingle and injury increased with the rate of Azafenidin. Carrizo seedling height was significantly reduced at higher rates (1.68 and 2.2 kg a.i. ha⁻¹) of Azafenidin 4 WAT. Upper leaves of Volkamer were bleached by 2.2 kg a.i. ha⁻¹. Beyond four weeks, all three rootstocks resumed normal growth in all Azafenidin treatments. Therefore, Azafenidin could be used as an effective and potential broad-spectrum herbicide in citrus groves at very low rates.

Biological Control of the Citrus Leafminer with *Ageniaspis citricola* in Louisiana. Seth J. Johnson, Donald C. Henne, Dept. of Entomology, LSU AgCenter, Baton Rouge, Louisiana, and Wayne J. Bourgeois, Citrus Research Station, LSU AgCenter, Port Sulphur, Louisiana.

The citrus leafminer, *Phyllocnistis citrella* Stainton was first discovered in Louisiana in May 1994. A classical biological control program was initiated against the citrus leafminer in Louisiana during January 1995. The parasitic wasp, *Ageniaspis citricola* Logviniskaya was obtained from the University of Florida and was reared at the Citrus Research Station in Plaquemines Parish. This parasitoid was released there and at three other locations in the parish during June and July 1995. Average percent parasitism by *A. citricola* at survey sites peaked at 37, 37 and 56% in 1995, 1996 and 1997, respectively. *Ageniaspis citricola* appeared to have established but disappeared in 2000, apparently due to the severe drought of 1999 and 2000. Widespread leafminer damage occurred in 2001, and most of the mid- and late-summer flush was damaged with multiple mines in untreated orchards. Several hundred *A. citricola* pupae were collected in Gainesville, FL on July 8-9, 2002. A total of 130 *A. citricola* adult wasps were released at the Citrus Research Station on infested 'Satsuma' trees from July 12-15. A survey conducted from June 27 – September 18 revealed high numbers of citrus leafminer that peaked at an average of 3/leaf. The first *A. citricola* was recovered on Aug. 8. Mean parasitism peaked at 51% on September 18. If *A. citricola* is successfully reestablished the citrus leafminer density should be much lower in the future.

Unusual Infestation of California Red Scale (Homoptera: Diaspididae) in Southern Florida: Apparent Interactions with Pesticides and Weather

Philip A. Stansly, Southwest Florida Research and Education Center, UF, Immokalee.

California red scale (CRS), *Aonidiella aurantii* (Maskell) was virtually unknown in Florida citrus until an unprecedented, though short-lived outbreak occurred in 1998. This was a so-called “El Niño year characterized by an unusually wet winter followed by a very dry summer. The predominant variety affected was the tangor ‘Murcott’, most of which had been sprayed with a newly registered acaricide, pyridaben (Nexter® 75WP). Replicated experiments were conducted in a commercial ‘Murcott’ grove to evaluate the effects of pyridaben under different application regimes (1999) and companion pesticides (2000). Moderate populations of CRS were observed in 1999 that temporarily increased in response to pyridaben compared to the grower standard where abamectin (AgriMek® 0.15 EC) was used. An accompanying decrease in parasitism of CRS was also observed. Nonetheless, pack-out was normal, and no differences in scale incidence among treatments were observed the following spring. Populations of CRS were lower in 2000 with many fewer complaints from growers. A trial comparing pyridaben to another standard acaricide, diflubenzuron (MicroMite®) did not result in differences in CLM populations, although parasitism of CLM was again somewhat reduced on trees treated with pyridaben. The atypical Mediterranean-like weather pattern in 1998 may have provided favorable conditions for CRS that were further enhanced by pyridaben applications, possibly through secondary effects on parasitoids. CRS populations subsequently became less responsive to pyridaben following establishment of normal weather patterns.

Sprayer Air Energy Demand for Satisfactory Spray Coverage. M. Salyani, Citrus Research and Education Center, UF, Lake Alfred.

Sprayer fan energy demand increases by the cubic factor of air volume or fan speed; therefore, higher air capacities dramatically increase the needed horsepower for spray application. This requires higher capital investment for larger sprayers/tractors and higher operating costs due to increased fuel consumption. The experiments involved a standard PTO-powered sprayer with four fan sizes and an engine-driven tower sprayer at two fan speeds. The sprayers were operated at ground speeds of 0-4 mph for air velocity measurements (outside and inside tree canopy) and volume rates of 26-384 gpa for spray deposition assessments. Mean and maximum air velocities decreased as sprayer ground speed increased. The effect of ground speed was more pronounced at inner and higher canopy locations. Mean deposition of the standard sprayer was affected by the air volume but not with spray volume. The interaction between air volume and spray volume was significant. The opposite result was observed with the tower sprayer. These results suggest that high air volume rates may not give significant increase in spray deposition or canopy penetration. This was the case with both sprayers at comparable volume rates. It appeared that the air and spray penetration largely depend on the tree canopy structure and prevailing wind direction. If the goal is to spray medium size trees, sprayers with small air capacities should be sufficient. However, for large and densely foliated trees, higher air volume and energy may be justifiable.

Trunk Shaker and Abscission Chemical Effects on Yields, Fruit Removal, and Growth of Orange Trees. J. D. Whitney, Citrus Research and Education Center, UF, Lake Alfred.

In a 5-year study, available abscission chemicals were applied to ‘Hamlin’, ‘Pineapple’, and ‘Valencia’ orange trees, which were harvested with commercially available trunk shakers. In the first 2 years, abscission chemicals prosulfuron and metsulfuron-methyl were applied and loosened mature fruit, but were phytotoxic to the trees and young ‘Valencia’ fruit. Abscission chemical CMN-P was applied the last 3 years and it provided better mature fruit loosening without being phytotoxic to the trees, young ‘Valencia’ fruit, or reducing yields. Trunk circumference growth was not affected by shaker and/or abscission chemicals. CMN-P increased total fruit removal of the trunk shaker an average of 9%. Trunk shakers did not significantly reduce total yields compared to conventional manual harvesting methods.

Tree Skirting Effects on Yield and Quality of ‘Valencia’ Oranges. J. D. Whitney, T. A. Wheaton, W. S. Castle, and D.P.H. Tucker, Citrus Research and Education Center, UF, Lake Alfred.

A five-year experiment was conducted on 10-foot-tall ‘Valencia’ trees on Swingle rootstock to determine the effects of skirting (lower limb removal) at 20 and 36 inches above ground level on yields and fruit quality. Average yields were not significantly affected by skirting at 20 and 36 inches. Fruit from the bottom of the unskirted trees showed significantly increased rind blemishes, were generally smaller in size, but had juice qualities at least equivalent to other fruit on the tree.

Monday Afternoon Session 3:30-5:15

Pest Status of Leaf-Footed Bugs on Citrus in Louisiana. Seth J. Johnson, Donald C. Henne, Dept. of Entomology, LSU AgCenter, Baton Rouge, Louisiana, and Wayne J. Bourgeois, Citrus Research Station, LSU AgCenter, Port Sulphur, Louisiana.

Leaf-footed bugs are generally considered minor pests of citrus in the United States. However, since 1998 leaf-footed bugs have been a serious pest of Satsuma oranges in Louisiana. Leaf-footed bugs typically began feeding on ‘Satsuma’ in mid-August and continued feeding through harvest. Four species of leaf-footed bugs were collected on citrus with *Leptoglossus phyllopus* (L) and *L. zonatus* (Dallas) being the two dominant species. The collection of *L. zonatus* at the Citrus Research Station at Port Sulphur in November 1997 was a new State record. During the drought years of 1999 and 2000 *L. phyllopus* was more abundant than *L. zonatus* on ‘Satsuma’. In 2001 and 2002 summer rainfall was characterized as normal to above normal, and late summer hosts of *L. phyllopus*, such as puncture vine, were plentiful. In 2001 and 2002 low numbers of *L. phyllopus* attacked ‘Satsuma’ but *L. zonatus* was still abundant. Leaf-footed bugs caused concealed damage to ‘Satsuma’ through the transmission of the yeast, *Nematospora coryli* Peglion. Symptoms of the disease included a staining, collapsing and drying out of the juice sacs inside the rind. The stain was brown to reddish brown in the portion of the juice sacs inoculated. Frequently, the disease resulted in desiccation and a dry rot of one to several wedges, rendering the fruit unfit for consumption. External symptoms of feeding punctures and disease were visible on the rind as the fruit ripened in the form of small 5-10 mm “green islands” as the rest of the rind color turned orange.

Spatial Soil-Tree-*Diaprepes* Variability in Biological Zones at the Field Scale. Hong Li, Jim Syvertsen, Arnold Schumann, Clay McCoy and Robin Stuart, Citrus Research and Education Center, UF, Lake Alfred.

A study of soil-tree-*Diaprepes* root weevil (DRW) relations was conducted in a citrus grove in Osceola County in Florida in 2002. The objectives were to assess spatial variability of soil, tree (Swingle citrumelo rootstock) and DRW, to delineate DRW biological zones, and to determine soil-tree-DRW relationships using principal component analysis (PCA). Soil electrical conductivity (EC) was measured using electromagnetic induction EM38, and *Diaprepes* adult population (using Tedder's traps), soil pH, organic matter content, P, K, Ca, Mg, B, Zn, Fe, Cu, and other properties were measured in a 35 x 25 m grid across the grove. Boundary analysis showed that *Diaprepes* had a log-normal distribution pattern as related to soil EC. Three biological zones of *Diaprepes* were delineated based on the spatial patterns of soil EC, and correlations between soil EC and *Diaprepes* were significant within zones. *Diaprepes* frequency was high in low Mg and Ca concentration areas shown by their negative correlation coefficients. *Diaprepes* semivariogram tended to increase with distance then stabilize within 200 m. Soil Mg had a low and similar semivariogram within a range of 100 m. The PCA quantified that first, second and third principal components (PC1, PC2 and PC3) together accounted for 80.4% of the total variance in the data that explain spatial soil-tree-*Diaprepes* variability. The results showed that soil-tree-*Diaprepes* correlations can be better described using biological zoning. *Diaprepes* populations correlated closely with soil Mg and Ca concentrations, indicating that soil liming practices may affect *Diaprepes* frequency and distribution.

Listening to the Larvae: Acoustic Detection of *D. abbreviatus*. R. W. Mankin, Center for Medical, Agricultural, and Veterinary Entomology, USDA-ARS, Gainesville, and S. L. Lapointe, U. S. Horticultural Research Laboratory, USDA-ARS, Ft. Pierce.

The *Diaprepes* root weevil is an important pest of citrus trees in Florida and the Caribbean. The larvae feed underground on the root systems, reducing productivity or even killing the trees, either by direct damage or by facilitating invasion by *Phytophthora* spp. and other root pathogens. Field surveys of larvae are difficult to perform and typically involve labor-intensive, destructive excavation of root systems. A search for new, nondestructive tools to detect *D. abbreviatus* larvae led to development of a portable instrument that uses a soil probe with an accelerometer to detect subterranean sounds. An experienced listener or a trained signal analysis program can usually distinguish *Diaprepes* and other insect sounds from background noise. The system has been tested in lightly and heavily infested citrus groves in Florida and Puerto Rico. It works best with actively moving and feeding 5th- and higher instars, which can be detected over distances of 10-20 cm, depending on background noise and the soil conditions. It does not work well at soil temperatures below ~10 Celsius or in periods of high wind because the signal to noise ratio decreases below acceptable levels under such conditions. The initially developed instrument was expensive and was not satisfactorily robust for harsh field environments, but a more portable, field-worthy instrument has been developed that shows considerable promise as a practical tool for researchers and grove managers. Currently, the instrument is being evaluated for its capability to assess the efficacy of different *Diaprepes* control treatments.

Young Tree Performance in a Grapefruit Rootstock Trial with *Diaprepes* Weevil and *Phytophthora* Diseases in Flatwoods Soil. K. D. Bowman, U. S. Horticultural Research Laboratory, USDA-ARS, Ft. Pierce, J. H. Graham, Citrus Research and Education Center, UF, Lake Alfred, and R. C. Adair, Jr., Kerr Center For Sustainable Agriculture, Vero Beach.

Florida citrus groves are severely damaged by infestation from *Diaprepes* root weevil (*Diaprepes abbreviatus*). In some areas with heavy flatwoods soils, a complex of *Phytophthora nicotianae* and *P. palmivora* diseases with *Diaprepes* weevil (PDX) has been observed to be especially devastating. Swingle citrumelo and many other trifoliolate hybrids are more severely affected by PDX than rootstocks such as Cleopatra. No rootstocks currently available combine sufficient tolerance to PDX with other needed characteristics. A field trial of new rootstocks budded with 'Flame' grapefruit was planted at a site affected by PDX in Vero Beach in 2000. The trial contained advanced selections from the USDA rootstock breeding program, as well as Swingle and Cleopatra. Soil in the test area is primarily Winder and the area is heavily infested by *Diaprepes* weevil. Trees in the trial were inoculated at the time of planting with diseased roots from nearby trees declining from PDX. Initial growth of some trees was strong, while others were severely stunted. After 18 months, grapefruit trees on Cleopatra and three of the hybrids were significantly larger than trees on Swingle. After 24 months, comparison of soil cores showed a strong correlation between the amount of *Phytophthora* on the roots and tree size. After 36 months, trees on Cleopatra, US-802, US-942, and US-897 were growing strongly, while trees on Swingle and some other rootstocks were small and weak. There are apparent large differences between the tested rootstocks in their ability to tolerate these PDX conditions.

Gene Expression of *Poncirus trifoliata* to Low Temperature Using Differential Display. C. Zhang, P. Lang, F. Dane, R. C. Ebel, W. A. Dozier, Dept. of Horticulture, Auburn University, Auburn, Alabama, N. K. Singh and B. Locy, Dept. of Biological Sciences, Auburn University, Auburn, Alabama.

Low temperature is a major environmental stress affecting Citrus productivity. *Poncirus trifoliata* is one of the most commonly used rootstock for *Citrus* in part because as a deciduous species capable of surviving to -30°C , it promotes greater cold tolerance in the scion. Differential display was used to detect changes in gene expression for *P. trifoliata* under low acclimation temperatures. Close to 250 cold responsive cDNA fragments have been cloned and sequenced. About 30 exhibited homology to known genes and were confirmed to be differentially expressed in cold acclimated versus nonacclimated *P. trifoliata* using relative RT-PCR.

Interaction Between Flooding and *Diaprepes* Root Weevil Feeding on Two Citrus Rootstocks. Hong Li, Jim Syvertsen, Clay McCoy and Arnold Schumann, Citrus Research and Education Center, UF, Lake Alfred.

Interaction of flooding stress and *Diaprepes* root weevil (DRW) feeding injury of citrus was evaluated in the greenhouse at CREC during Oct.-Dec. 2002. The effects of flooding duration and DRW larva feeding were assessed on leaf water stress, shoot growth, and root damage of seedlings of two different rootstocks (Swingle citrumelo and Smooth Flat Seville, SFS). The treatments consisted of flooding duration of 0, 10, 20 or 30 days, and presence or absence of *Diaprepes* larva feeding for 42 days after flooding. There were 8 replicate plants in each

rootstock x flooding x DRW category, and treatments were arranged in a completely randomized experimental design. After the flooding period, seedlings were drained for a week then 5 larvae per seedling were introduced into root zones. We determined leaf stomatal conductance (gs), soil oxidation-reduction potential (ORP), shoot growth, larva survival (LS), and root rating based on larva feeding damage and root density. The results showed that rootstock, flooding, and DRW feeding significantly affected gs, ORP and shoot growth ($p < 0.001$). Shoot length increased faster for Swingle than SFS under flooding condition. Flooding decreased growth more than larva feeding pressure in SFS but not in Swingle. Flood damaged seedlings displayed greater water stress, even without larva feeding. LS was significantly greater in trees which had been flooded and larva feeding created significantly more damage in flooded roots ($P < 0.001$), with less damage in trees flooded for 10 days compared to those flooded for 30 days. These data suggest that improved drainage may be an important component of *Diaprepes* management

Response of ‘Hamlin’ Orange to Fertilizer Source, Rate and Irrigated Area. A. Schumann, Citrus Research and Education Center, UF, Lake Alfred, A. Fares, University of Hawaii, Manoa, Hawaii, A.K. Alva, USDA-ARS, Vegetable and Forage Crops Research Unit, Prosser, Washington, and S. Paramasivam, Savannah State University, Savannah, Georgia.

Fertilizer and water use efficiencies are important management criteria in Florida citrus production. Increasing costs of energy, fertilizer and water will reduce the profitability of citrus production if yields are not maximized at optimal rates. Improved water and fertilizer use efficiencies can also minimize the impact of nitrate leaching to groundwater. Two ‘Hamlin’ experiments 1) comparing dry granular, fertigation, and controlled release fertilization at four rates, and 2) comparing three microsprinkler wetting diameters and two fertilizer rates were assessed in years 7-8. Yield and leaf nitrogen concentrations showed a strong quadratic response, suggesting an optimum fertilization rate beyond which low fertilizer efficiencies and profitability exist. Increasing microsprinkler wetting diameters increased yields without additional water or fertilizer consumption. Reasons for these responses and economic analyses of the treatments are presented.

Tuesday Morning Session 10:00-12:00

Ecolabeling for Florida Citrus. J. J. Ferguson, Horticultural Sciences Dept., UF, Gainesville.

Like other food labels that inform consumers about product ingredients and nutrition, ecolabels additionally provide information about production practices and related environmental and social issues. “Certified Organic”, the most widely known USDA ecolabel, with defined soil and crop management programs, has generated a broad emphasis on sustainable food production systems, healthful food, environmental and social justice issues, often described as the “Greening of the Food Market”. A wide range of ecolabels, both in the US and twenty five other countries, has emerged, along with a Global Ecolabeling Network, promoting products based upon environmental impact assessments and often addressing issues dealt with only anecdotally in organic certification. Although multi-faceted ecolabeling programs may confuse consumers, efforts are underway to coordinate certification and marketing strategies. Florida citrus growers already committed to IPM and related sustainable practices but who may not seek organic certification, may qualify for established ecolabels programs, several of

which are already active in Florida. Certification standards generally focus on avoiding the use of transgenic, genetically modified crops and livestock and require common best management practices including reduced pesticide use, equipment calibration, soil and water conservation, conserving and recycling nutrients, fair working conditions, and wildlife habitat conservation. Ecolabels therefore offer the broad potential for translating environmental concerns into another market advantage for an already internationally recognized Florida citrus crop.

The Measurement of the Food Consumption of an Individual Caribbean Fruit Fly. H. N. Nigg, R. A. Schumann, E. J. Etxeberria, Citrus Research and Education Center, UF, Lake Alfred, S. E. Simpson, Florida Dept. of Agriculture, Div. of Plant Industry, Winter Haven, S. Fraser and E. D. Burns, Florida Dept. of Agriculture, Div. of Plant Industry, Gainesville.

Current worldwide methods for fruit fly management include bait-pesticide combinations. These combinations are not necessarily tested for attractiveness and consumption for any particular fruit fly and, consequently, tend to be generic. On the other hand, kairomones tend to be organism specific. Kairomones are defined as attractants, arrestants, excitants (elicit biting, piercing, oviposition) and phagostimulants. Kairomones hold the promise of fly specific baits, lower pesticide use, fruit fly management in the urban setting and environmentally acceptable technologies. Examples of kairomones used for *Anastrepha suspensa* (Loew), Caribbean fruit fly will be detailed. Our current kairomone research with Caribbean fruit fly indicates that the fly exhibits preferences for specific sugars. Critical to this research is an accurate and dependable technique for measurement of the consumption of an individual fly. The data for this component for development of kairomone-based baits will be presented.

Development of “Tetrazyg” Rootstocks Tolerant of the *Diaprepes* / *Phytophthora* Complex under Greenhouse Conditions. J.W. Grosser, J.H. Graham, C.W. McCoy, A. Hoyte, H.M. Rubio, and J.L. Chandler, Citrus Research and Education Center, UF, Lake Alfred.

Diaprepes root weevil has become an increasingly important pest affecting Florida citrus production. No citrus rootstock germplasm appears to be resistant to weevil larvae feeding. Mechanical wounds on tap and scaffold roots caused by weevil feeding create opportunities for invading fungi, especially ubiquitous *Phytophthora spp.* Our strategy for dealing with this problem is to develop complex rootstock hybrids that have the capacity to tolerate mechanical damage caused by weevil feeding and then quickly recover through vigorous root growth in challenging soils inoculated with both *Phytophthora nicotianae* and *P. palmivora*. Crosses were made of superior allotetraploid somatic hybrid rootstocks and resulting seed were planted in a high pH calcareous ‘Winder’ soil inoculated with both *Phytophthora spp.* in greenhouse flats. Vigorous healthy “tetrazyg” seedlings were selected and propagated by grafting to vigorous rootstocks and subsequently rooted cuttings. New mandarin + pummelo somatic hybrids were also included in the assays. Replicated *Diaprepes* force-feeding assays were conducted in conetainers®, and hybrids selected for reduced mechanical damage were replanted in the ‘Winder’/*Phytophthora* mix to assess recovery potential. Several hybrids showed excellent capacity for complete recovery in this greenhouse test and are now being propagated for more extensive field evaluation. Citrus rootstock breeding and selection at the tetraploid level maximizes genetic diversity and selection efficiency, and shows great promise for generating new rootstocks that can tolerate the *Diaprepes/Phytophthora* complex.

Comparison of ‘Rohde Red’ and Standard ‘Valencia’ Juice Color and Maturity. Robert E. Rouse, Southwest Florida Research and Education Center, UF, Immokalee, and Renee M. Goodrich, Citrus Research and Education Center, UF, Lake Alfred.

The 'Rohde Red Valencia' cultivar appeared as a limb sport in a Highlands county grove in 1955. Fruit is typical to many old-line 'Valencia' oranges in size and production, but develops a deeper juice color. Color scores have ranged from 39 to above 40. 'Rohde Valencia' has shown some tendency to be unstable and previous reports have shown clone FL 472-11-43 to be superior to other 'Rohde' clones, and is the only selection available from the Florida citrus budwood program. Fruit quality measurements from fruit in the Budwood Foundation Block in Immokalee show color development in 'Rohde' begins to exceed standard 'Valencia' about January and continues to enhance through maturity. 'Rohde' has lower acid, lower Brix, higher ratio, and higher color than standard 'Valencia'.

Effects of Nine Rootstocks on Yield and Fruit Quality of ‘Parent Washington Navel’ Trees. Ali Al-Jaleel, Najran Hort. Development Research Center, Najran, Saudi Arabia, and Mongi Zekri, Hendry County Extension, UF, LaBelle.

Over seven years, the horticultural adaptability and performance of ‘Parent Washington Navel’ orange trees were evaluated on nine commercial rootstocks in the Najran area of Saudi Arabia. Fruit yield, fruit size, individual fruit weight, peel thickness, percent juice, soluble solids and acid were measured. Trees on Volkamer lemon (VL), *Citrus macrophylla* (CM), rough lemon (RL) were the most productive and trees while Cleopatra Mandarin (Cleo) and Swingle citrumelo (SC) were the least productive. Trees on Sour orange (SO), Amblycarpa (Amb), Carrizo citrange (CC) and *Citrus Taiwanica* (CT) were intermediate in fruit production. The greatest fruit individual weight and largest fruit were found on trees budded on RL and VL, while the lowest fruit weight and smallest fruit were found on trees budded on Cleo and SO. Peel thickness was the highest in fruit collected from trees on RL and SC and the lowest in fruit collected from those on Cleo and SO. Trees on Cleo and CM had the highest juice content and those on RL had the lowest juice content. Fruit from trees on CC and SO accumulated the highest soluble solids and fruit from trees on CM and CT accumulated the lowest soluble solids, while fruit from trees on VL and SC had the highest acid content and fruit from trees on Cleo and RL had the lowest acid content. Overall, trees on vigorous rootstocks (VL, CM, RL) performed better and were more productive than trees on other rootstocks. Trees on SC and Cleo performed the poorest.

Evaluation of Year to Year Yield Variability of Orange Trees in Florida. L.G. Albrigo, J.I. Valiente, CREC, UF, Lake Alfred, B. Albritton and J. Albritton, Albritton Companies Inc., Wachula.

Thirty years of yields for ‘Valencia’ and ‘Hamlin’ oranges in Florida were evaluated against alternate bearing, freezes, winter cool temperature accumulation, bloom and postbloom temperatures to determine what factors were related to yield fluctuations. Yield data was converted to yield per mature tree equivalents using Florida Agricultural Statistics Service tree census data. This corrected for changes in number of trees by age over time. Alternate bearing cycles were more clearly shown after converting yields to a mature tree equivalent basis. Freezes of category 2 or less (4 hours below 24°C or less) did not affect yields. The following

years of bloom resulted in unusually large swings in yields that were not associated with significant freezes: 66-67 versus 67-68, 78-79 versus 78-80, 86-87 versus 87-88, 97-98 versus 98-99 and 01-02 versus 02-03. For several of the swings, accumulated winter temperatures were related to changes in yields, presumably because of differential effects on flowering intensity.

Fruit Quality Sampling of 'Valencia' Orange Trees. F. S. Davies and G. R. Zalman, Horticultural Science Dept., UF, Gainesville.

Sized fruit samples are often used to estimate juice content, soluble solids content (SSC), acid and ratio of SSC: acid. Typically fruit samples are taken around the tree at a 3-6 foot height. We compared fruit quality of a 20 fruit sized sample of 'Valencia' oranges on various rootstocks with whole tree harvests at 7 locations in Florida. Ten trees were sampled and harvested at each location. Juice content samples averaged 6.9% lower than the whole tree measurements and SSC and acid means were 4.7 and 7.2 % lower, respectively. SSC content and actual whole tree values were poorly correlated, probably because SSC is generally much higher in the top vs. the lower portions of the canopy and SSC is quite variable within the tree. Sample and whole tree juice content levels were moderately correlated and acid content sample levels were highly correlated with whole tree measurements. There is lower within tree variation for these quality factors than for SSC.

Late-Summer Topping Increases Fruit Size in Indian River 'Murcott'. Ed Stover and Scott Ciliento, Indian River Research and Education Center, UF, Fort Pierce.

Fruit size is a significant factor in the value of most citrus varieties grown for sale as fresh fruit. Production of fruit too small to market is most common in heavily overcropped trees, a condition most frequently observed in 'Murcott' and other tangerine-types. In most fruit species, substantial improvements in fruit size are largely restricted to cropload reduction relatively early in fruit development. Topping of 'Murcott' in July or August was established as a means of reducing tree collapse due to stress of heavily overcropped trees in the 1970s. In 2001, we were approached to conduct a trial on the fruit size effects of topping 'Murcott' in early August. Frankly, we expected to see little benefit, but established a randomized complete block augmented factorial trial in which topping 20" from a 15' tree and application of 25 lbs of KNO₃ were compared to nontreated controls. All fruit were harvested and sized from each of the treatment trees. KNO₃ treatments did not significantly affect any parameter measured. Topping decreased fruit per tree by 15% but increased mean fruit weight by 13%, resulting in no significant reduction in total yield. Cartons of fruit in the 80-120 count sizes were increased from 0.83 to 1.56 carton / tree but cartons of all marketable sizes were not significantly increased.

Garden & Landscape Section

Anita Neal, Presiding

*** Indicates Student Paper Competition**

Monday Afternoon 1:00-3:00

An Historical Perspective of the Environmental Horticulture Industry in Manatee County and it's Impact on Statewide Development

F. M. Melton, Manatee County Extension Service, UF, W. E. Waters, Professor Emeritus, IFAS, UF

Several nursery owners in Manatee County were pioneers in the nursery industry in Florida. Pliny Reasoner began the nursery industry in Florida in 1881, and became known throughout the world for the exotic plants they had collected. Other pioneers grew interior plants, cut flowers, native plants, sod, and turf grass plugs. The landscape contracting and maintenance business grew fast in the 1950's and 1960's as population growth occurred. The University of Florida Research and Extension Service have grown to serve the industry from the 1950's to present. Today the landscape industry income exceeds the wholesale nursery income in Manatee County and statewide. Trends of industry being dominated by large chain stores are likely to continue.

Demonstration Gardens of the Different Geographical Areas of Manatee County

J. V. Morse, Manatee County Extension Service, UF

Manatee County's geography extends from the west coastal islands to approximately forty miles inland. The soil differences include coastal islands, flatwoods, sandy ridges, flood plains, swamps and marshes. Soil pH changes dramatically from the high pH of the coastal islands to the very low pH of the flatwoods, flood plains, swamps and marshes. Also, the islands tend to stay warmer with the temperature getting progressively colder further as you head inland. A total of six demonstration gardens were planted with different themes. Three of the gardens were planted to represent the three major geographical areas of Manatee County (beach, central, eastern). Plants were chosen for each garden according to soil pH, drought or wet tolerance, salt-tolerance, and heat or cold-tolerance needed for each specific geographical area. There is signage for each area describing its specific plant requirements and all plants are labeled with common and Latin names. Plant labels also indicate whether the plant is native or exotic. These gardens have become a great teaching as well as learning tool for the general public. They are able to see the plants, how they grow and in which areas of the county specific plants should be planted.

Effect of Fertilizer Source on Nitrate Leaching and Turfgrass Quality

S.K.Saha*, L.E. Trenholm, Department of Environmental Horticulture, UF, Gainesville,
J. B. Unruh, Department of Environmental Horticulture, UF, Milton.

Due to increasing concern over potential pollution of Florida's water resources from fertilization of home lawns, state wide research is being conducted to verify different aspects of turfgrass Best Management Practices. The objectives of this study are to evaluate differences in plant visual quality and growth responses and fertilizer leaching between turfgrass and landscape plants in response to different fertilizer formulations.

The experiment is being performed in a climate controlled green house at the G.C.Horn Turfgrass Field Laboratory at the University of Florida in Gainesville. 'Floritam' St. Augustinegrass (*Stenotaphrum secundatum* [Walt.] Kuntze.) is being compared to a mix of common Florida ornamentals including Canna (*Canna generalis*), Nandina (*Nandina domestica*), Ligustrum (*Ligustrum japonicum*) and Allamanda (*Allamanda spp*). All plants are growing in 80 gallon plastic pots in an Arredondo fine sand. There are three fertilizer treatments (16-4-8 quick-release, 15-0-15 quick-release, 8-4-12 slow-release) are applied at 4.9 g Nitrogen m⁻² every other month. Water is applied to meet the evapotranspiration and turfgrass tubs are mowed weekly. Experimental design is a randomized complete block design with four replications. Leachate is collected at three intervals following fertilizer application and analyzed for nitrate nitrogen and phosphate content. Visual quality ratings, time domain reflectometry (TDR) data are being collected weekly and multi-spectral reflectance (MSR) readings are taken every other week. Preliminary data indicate that turf is more responsive to fertilizer treatment than ornamentals. Best turfgrass responses are found with the quick release treatments during the first two weeks after fertilizer application.

Evaluating Methods of Predicting Irrigation Needs of Warm-Season Turfgrasses

J.H. Lee*, and L.E. Trenholm, Environmental Horticulture, UF.

Water is one of the greatest limiting factors influencing turfgrass growth. Due to increased pressure to preserve water resources, there is interest in development of sensor-based technologies to indicate turfgrass irrigation requirements. This study is designed to determine what technologies might reliably and accurately predict irrigation scheduling needs of warm-season turfgrass. 'Floritam' St. Augustinegrass and 'SeaIsle 1' seashore paspalum were established in 19" tubs in the Envirotron Turfgrass Research facility in Gainesville in the spring of 2002. Each grass was subjected to repeated dry-down cycles where irrigation was withheld. Data was collected on: a) shoot quality, leaf rolling, leaf firing, turf color; b) spectral reflectance data within 450 to 930nm; c) soil moisture content; d) leaf relative water content (RWC); e) chlorophyll content index. These evaluations were used to determine if irrigation scheduling could be determined. Results of this study indicated that turf quality was highly correlated with visible range spectral reflectance ($P= 0.001$), reflectance indices ($P= 0.001$), and with soil moisture ($P= 0.001$) throughout the dry-down cycle. As turf quality declined below acceptable levels, these sensor-based technologies were able to predict the need for irrigation scheduling.

Experimental Establishment of Seashore Paspalum *Paspalum vaginatum* O. Swartz For

Potential Use by St. Lucie County Recreational Facilities

E. A. Skvarch, St. Lucie County Extension Service, UF

Two dominating influences will notably modify turfgrass management in the twenty-first century: water quality and water quantity/conservation. These will dictate to turfgrass supervisors new considerations for alternative water resources (recycled, grey, effluent, non-potable, wastewater brackish, and ocean water) to be used for irrigating turf sites including golf courses, and sports fields. Concerns for the environment coupled with governmental regulations will pressure turfgrass managers into adapting significant changes in turfgrass management techniques. These changes will include the consideration of multiple environmental stress tolerances, improved nutrient uptake, and multiple uses of irrigation. One turfgrass that may play a powerful role in turfgrass strategies will be Seashore Paspalum *Paspalum vaginatum* O. Swartz . This grass has the potential to incorporate multiple stress resistance, along with minimal pesticide use and efficient uptake of nutrients. Seashore Paspalum can also tolerate a wide range of recycled resources. In concerted effort representatives of the St. Lucie County Extension Service and The St. Lucie Parks and Recreation Services jointly attempted to established plots of Seashore Paspalum throughout varying county environments. Some plots displayed nominal to no growth when left on its own to establish, while a second displayed excellent growth habits when managed according to recognized cultural practices. In a third plot, a baseball infield was completely sodded and is currently being evaluated for establishment, nutrient uptake, pest and wear resistance.

Monday Afternoon 3:30-5:00

Grow It Locally, Buy It Locally, Eat It Locally – A Culinary Competition To Promote Local Produce

E. A. Skvarch, St. Lucie County Extension Service, UF, E. M. Lamb, Indian River Research and Education Center, UF

Both consumers and chefs are interested in purchasing locally grown vegetable crops for their freshness and high quality. Consumers purchase local produce because of freshness, taste and the support of local farmers (Food Processing Center, 2001). In the same survey consumers indicated that the factor most likely to increase purchases of local produce was increased availability in the area (63%). Within the five-county area around St. Lucie County, there are at least 25 local farmers with organic conventional, greenhouse or field production of vegetable crops. One of the most common requests received by Cooperative Extension personnel from these small farmers is assistance with direct marketing. At an initial meeting with the Treasure Coast Chefs' and local produce growers both entities unanimously agreed that they would like to open communication lines enhancing the flow of local produce from area fields to local kitchens. In order for this process to be successful both the chef's and the growers agreed that the local consumer must be brought into the equation. This was accomplished through a culinary competition mimicking the popular "Iron Chef" television show. The competition was held at a local Farmers Market, and spotlighted area chefs' cooking culinary delights prepared with locally grown produce. The anticipation of the event drew a large crowd of interested spectators.

As the hour competition unfolded explanations of the grow local, buy local philosophy was articulated to the crowd.

Growing and Marketing Spinach at Local Green Markets in Palm Beach County, Florida

K. D. Shuler, S. J. Nie, and P-A. N. Shuler, Stephen's Produce, Jupiter

Stephen's Produce began in 1995 as a 0.03 acre market garden to supply the Jupiter Farms Green Market with a Saturday supply of "garden fresh" produce. The garden was expanded each year. In 2002-2003, 0.25 acres were under cultivation and clientele were being served at two weekend green markets. "Melody" spinach has been included in the crop mix for five seasons. The sandy garden soil was amended with compost and horse manure/bedding and irrigated via drip tubing. Open beds on four foot centers were made each year and an insecticidal bait and fertilizer were applied preplant. For the 2002-2003 seasons, three main plantings were made at weekly intervals from 2 October to 16 October with the intention of cutting each bed every 21 days. Spinach was direct seeded two rows per bed and first harvest was made 22 November (51 days after seeding). Spinach was usually cut once a week (Thursday evening), washed, bagged, weighed, and stored in a refrigerator until Friday night when bags were moved into a Styrofoam cooler with ice for transport to the market. Spinach was sold in gallon size freezer bags containing 0.33 - 0.4 lb net/bag at \$2.00 - \$2.50 per bag (\$5.00 - 7.50/lb). From the initial three plantings plus a smaller fourth planting made on 2 December, an average of 29.8 lbs of spinach valued at \$172 were sold each week for 17 weeks (\$14.36 per linear ft of bed or \$156,380/acre or \$1,008/acre/day over the 155 day growing and harvesting season).

Growing and Marketing Swiss Chard at Local Green Markets in Palm Beach County, Florida

K. D. Shuler, S. J. Nie, and P-A. N. Shuler, Stephen's Produce, Jupiter

Stephen's Produce began in 1995 as a 0.03 acre market garden to supply the Jupiter Farms Green Market with a Saturday supply of "garden fresh" produce. The garden was expanded each year. In 2002-2003, 0.25 acres were under cultivation and clientele were being served at two weekend green markets. "Bright Lights" Swiss chard has been included in the crop mix for three seasons. The sandy garden soil was amended with compost and horse manure/bedding and irrigated via drip tubing. Open beds on four foot centers were made each year and an insecticidal bait and fertilizer were applied preplant. For the 2002-2003 seasons, an initial "starter" planting of chard was made 31 August followed by three main plantings made at weekly intervals from 2 October to 16 October with the intention of cutting each bed every 21 days. Chard was direct seeded two rows per bed and first harvest was made 18 October (48 days after seeding). Chard was usually cut once a week (Friday evening), bunched, spray washed, and stored overnight in a Styrofoam cooler with ice. Bunches of chard weighed from 1.15 to 1.5 lb and were sold at \$2.00 to \$3.00/bunch depending on size (\$1.75 - 2.00/lb). An average of 36 lbs of chard (27 bunches) valued at \$69 were sold each week for the 28 week market season (\$12.84 per linear ft of bed or \$139,827/acre or \$678/acre/day over the 206 day growing and harvesting season).

The Miami-Dade Adopt-A-Tree Program

A.G.B. Hunsberger, J.F. Garofalo, C.F. Balerdi, D.W. Pybas, Miami-Dade County Extension, UF

Miami-Dade County has an average tree canopy cover of only 10% with some areas having only 2% compared to the national average of 25-40%. To help overcome this problem, the county received a six million dollar FDACS grant to help replace lost tree canopy. "Adopt-A-Tree" events allow Miami-Dade County homeowners to select two trees of their choice. These events are held throughout the county, with areas with the poorest tree canopy given priority. The extension staff provided input on program development, horticultural advice, and conducted grades & standards workshops for nursery growers. As part of the "adoption" process, homeowners must attend an educational component before receiving trees. This includes a hands-on demonstration of correct planting procedures. Extension staff developed a variety of bilingual (English and Spanish) educational materials given to participants during the "adoption" process. During the first year (2001), over 7,000 people were taught and over 6,800 trees were distributed at seven "adoption" events. The number of trees to be distributed will eventually total 184,000.

Economic Considerations of Perennial Peanut as a Ground Cover in Urban Landscapes

F. Roka, R. Rouse, Southwest Florida Research and Education Center, UF, and E. Miavitz-Brown, Collier County Cooperative Extension Service, UF.

Perennial peanut has potential uses as a ground cover in home landscapes, road medians, driveways and parking lot islands, along berms, septic tank mounds, and canal banks. Peanut can also be used as a buffer to waterways prone to runoff high in N (Nitrogen) and P (Phosphorus) such as golf courses. Establishment costs of perennial peanut are expensive relative to the establishment costs of St. Augustine sod. Peanut sod is more than four-times as expensive as St. Augustine sod. Peanut ground cover, however, has significant cost advantages over St. Augustine with respect to annual maintenance. Peanut has been shown to be highly resistance to drought, nematodes, and plant pathogens that attack St. Augustine turf. In addition, it can be maintained with minimal fertilizer applications. This translates into water, energy, and input cost savings. Established stands of peanut also do not require mowing, further reducing annual maintenance expenses. Overall, annual maintenance costs for perennial peanut are estimated to be one-fifth the costs for St. Augustine turf. It is estimated that with these annual savings, the higher establishment of perennial peanut can be offset in less than four years.

Interpretative Educational Signs for Stormwater Ponds

P. Brown, V. Bryant, D. Armstrong, C. Claus, A. Wilson, J. Murphy, T. Murphy, L. Claudio, Pinellas County Extension, UF, Florida Botanical Gardens.

Through environmental horticulture and Florida Yards & Neighborhoods public outreach programs, including landscape site visits, it was concluded that the public has little knowledge of the function of stormwater ponds and the important role they play in mitigating polluted stormwater runoff. A need existed for a way to provide educational information to a large number of citizens. Interpretative educational signs were created and installed around two

stormwater ponds on the Pinellas County Extension/Florida Botanical Gardens campus to educate visitors and volunteers about the functions of a stormwater pond and its value to water quality and as a habitat for wildlife. These signs address where the water comes from, the structures found in a stormwater pond along with their function, how stormwater ponds help to mitigate the pollution that enters the pond, native plants suitable for landscaping ponds and the role they play, wildlife around the pond, and habitat creation along with a sign that addresses what each person can do to reduce or eliminate pollution in stormwater run-off from his or her individual landscape. Publications pertaining to stormwater ponds are available in a kiosk at one of the ponds. This project fills the role of providing education regarding the purpose and function of stormwater ponds to the thousands of visitors each year to the Pinellas County Extension Service and the Florida Botanical Gardens.

Tuesday Morning 10:00-11:45

Host Suitability of Caladium Varieties to the Root-knot Nematode *Meloidogyne incognita* R. McSorley, K.-H. Wang, and J. J. Frederick, Department of Entomology and Nematology, UF

Eight commercial varieties of caladium (*Caladium x hortulanum*) were evaluated for resistance to the root-knot nematode, *Meloidogyne incognita*, in tests conducted in greenhouse and growth room. Relative levels of resistance among varieties were evaluated in terms of nematodes present in soil and second-stage juveniles hatched from eggs extracted from roots at 4-5 months after nematode inoculation. Lowest numbers of nematodes were produced on 'White Christmas' and 'Pink Glow'. 'Crimson Wave', 'Fire Nymph', and 'Autumn Beauty' appeared to be the most susceptible varieties, usually supporting consistently high numbers of nematodes. Nematode numbers on 'Avalon Rose', 'Dawn', and 'Fire Chief' were generally intermediate, but often not different (at $P0.05$) from those present on the most susceptible varieties. Results demonstrate the existence of some levels of resistance against *M. incognita* in caladium germplasm.

New Insect Pests of South Florida

A.G.B. Hunsberger, Miami-Dade County Extension, UF

South Florida has several major ports of entry and one of the busiest airports in the country allowing for a great influx of International trade and tourism. Along with imported commodities and people, insects are frequent hitchhikers, with an average of one new insect species becoming established a month in south Florida. Many of these become either economic or esthetic pests. The most concerning of these new insects includes: the lobate lac scale (*Paratachardina lobata lobata*), pink hibiscus mealybug (*Maconellicoccus hirsutus*), Sri Lanka weevil (*Myllocerus undatus*), and tabebuia thrips (*Holopothrips near inquilinus*). All, except for the tabebuia thrips, have a wide host plant range, which includes many commonly grown ornamentals, and pose a significant threat to agricultural crops. In addition, little is known about their biology. Recent findings including possible biological control agents will be discussed.

Survival of the Cycad Aulacaspis Cycad Scale (*Aulacaspis yasumatsui*) in Northern Florida During Sub-freezing Weather

E.R. Duke, A.B. Lorenzo Florida A&M University, Tallahassee, and F.W. Howard, Fort Lauderdale Research and Education Center, UF

The cycad aulacaspis scale insect, *Aulacaspis yasumatsui*, was accidentally introduced into southern Florida in 1996. Since its initial discovery in the Miami area, it has been noted in numerous locations throughout the state. In addition, infested plants have been reported in Alabama, California, Georgia, Hawaii, Louisiana, South Carolina and Texas. The primary method of long-distance spread is presumed to be by the transport of infested plants. While the worst infestations tend to be in warmer climates (primarily USDA zones 9 and 10), the presence of the scale in areas where temperatures regularly fall below the freezing point would seem to indicate that the Cycad Aulacaspis Scale can survive in any area where a host plant may be found. In 2001, specimens of *Aulacaspis yasumatsui* were identified on *Cycas revoluta* plants growing in Leon County (USDA zone 8b). The infestations were purposely left uncontrolled in order to observe the effects of freezing temperatures on scale survival. In February 2002 and again in January 2003, nighttime temperatures in Leon County dropped below 20°F (-6.7°C) for a minimum of 4 hours. Live scale insects were found on leaf samples collected within 24 hours of each occurrence of freezing temperatures. The new flush of growth occurring on infested plants in the spring 2002 growing season was quickly covered with a white crust of primarily male insects, typical of Cycad Aulacaspis Scale infestations. This seemed to indicate that the insects were not significantly impacted by the sub-freezing temperatures experienced the preceding winter.

Assessing the Effects of Alternative Landscape Design and Management on Insect Diversity in Tallahassee-Leon County, Florida

A. B. Lorenzo, J. J. Muchovej, E. R. Duke, and M. Pescador, Ornamental Horticulture and Landscape Design and Management Program, Florida A&M University, Tallahassee, J. Legaspi and I. Baez, USDA/ARS Center for Biological Control, Florida A&M University, Tallahassee

In Florida, the average rate of urbanization statewide is about 25% per year over the past five years and it is likely to continue. An immediate effect of urbanization is on the magnitude and quality of vegetation and which in turn reduces biodiversity. The loss of vegetation particularly key host plants can certainly have an impact on beneficial insects and pests population. Similarly, in efforts to replant using non-native plants can certainly impact emergence of other insects and pests in the landscape. During the summer of 2002, this project was conducted in an attempt to determine if relationships exist between the number of beneficial insects and pests and abundance and diversity of the plant material found in urban residential landscapes. Using GIS technology, locations of residential homes in the Tallahassee-Leon County, Florida area who are either participants in the Florida Yards and Neighborhoods Program or members of the Capital City Garden Club were geocoded and mapped out. Each home site was visited and data on the following were collected: (1) size, (2) identity and number of plant species present, (3) composition, spatial and temporal arrangements, and (4) diversity index. Insect traps were installed in each participating home site, monitored and collected every week. An analysis of data collected from the sample residential landscapes revealed positive and negative relationships between the type, total number of plants, and number plant species at the site and the number of beneficial insects and pests in the landscape, respectively.

The White Malady Strikes! Management Approaches to Cycad Aulacaspis Scale and Pesticide Trial Updates

D. L. Caldwell, Collier County Extension, UF

This armored scale from Thailand invaded the Miami, Fl. area about 1994 and has spread throughout the state. It is especially destructive because it has multiple generations, feeds on foliage and underground tissues and under petiole bases and biocontrol agents are few. It is eliminating king and queen sagos from south Florida landscapes. Foliar applications were made October 1, 2002 to evaluate potential efficacy in managing this destructive pest. The softer pesticides, Organocide, and horticultural mineral oil and Safer Soap did not do well on this pest (21%, 47% and 5% mortality of the second instar nymphal stage respectively) at the recommended label rates. The best results, 85% mortality, were achieved with dimethoate (Cygon 2E). In another test, mortality of the adult stage with a dimethoate drench (2 oz/gal/plant) was 95%, whereas mortality on check plants averaged 16%. Other components (biological, plant selection, cultural practices) of an IPM approach will also be discussed.

Abstracts

Handling and Processing Section **Huating Dou, Presiding**

*** Indicates Student Competition Paper**

Monday June 9 **Morning Session**

Agro Processing Development (St. Kitts and Nevis)

Michael T. Talbot, Agricultural and Biological Engineering Department, Robert P. Bates, Food Sciences and Human Nutrition Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville

The authors assisted the Inter-American Institute for Cooperation on Agriculture (IICA) in determining and addressing the needs of the agro-industry in St Kitts/Nevis with primary attention to the existing and potential small processors. The aim being to add value to local food items and increase the safety, quality, production efficiency, and market appeal of existing and potential processed products. Local self-sufficiency is the initial goal, with inter-island export a distant and much more ambitious task. This presentation discusses the assessment and recommendations and addresses the potential for future assistance opportunities in the Caribbean region.

Stability and Change: A Look at Long-Distance Motor Carriage of Florida Produce and Ornamentals Over the Past Twenty Years

R. Beilock, Food and Resource Economics Department, UF, and J. Del Ciello, U.S. Department of Agriculture

Florida is almost entirely dependent upon trucking to deliver its produce and ornamentals to markets throughout North America, as well as for deliveries to out-of-state ports for exports. Over the past twenty years there have been several developments which have and continue to impact upon motor carriage. Among these are: deregulation, advances in communications technologies, general tightening of labor markets and aging of the workforce, speed limit changes, and rail mergers and advances in the ability of railroads to transport and monitor refrigerated shipments. To understand better how these have impacted on the segment of motor carriage this segment of the motor carrier industry, a 2001/2 survey of over 1,600 drivers of long-distance refrigerated trucks in Florida is analyzed and compared with similar surveys taken during the 1980s. The overall picture is one of stability, even in areas, such as driver supply, where there have been claims of radical changes. However, there are indications, such as changes in owner-operator leasing practices and increased concentration among ornamentals haulers, which suggest that significant transformations are occurring.

Assessing the Eating Quality of Muskmelon Types and Varieties Using Sensory Evaluation

Amy Simonne¹, Eric Simonne, Bob Hochmuth, Kimberly Kouri, Sandrine Cazaux, Suzanne Stapleton, David Studstill, Merry Taylor, and Wayne Davis. ¹Dept. of Family and Youth Sciences, Institute of Food and Agricultural Sciences, University of Florida, Gainesville

Because of a favorable marketing window, muskmelon may be a possible alternative crop for Florida. The objective of this study was to determine consumer preferences among six varieties of Eastern- (E), Western- (W) and Galia- (G)- type. Melons were grown during the spring of 2001 and 2002 at the North Florida Research and Education Center-Suwannee Valley, near Live Oak, Fla, on a Lakeland fine sand soil and following IFAS recommendations for cucurbit production. The taste tests were conducted in June following the guidelines and recommendations from the American Society of Testing Materials. Panelists were commercial vegetable growers, master gardeners, extension personnel, and field day participants. Panelists recorded their crunchiness, sweetness, flavor and overall preference score by making a mark on a 90-mm long, unstructured line with anchors. The industry standard 'Athena' was top rated in flavor and overall preference in 2001, but was only rank fourth overall. The overall top three rated varieties were 'Mission' (W), 'Odyssey' (E), and 'Inbar' (G). The eating quality of 'Passport' (G) was consistently below median values. The interaction between year and sensory attributes was significant, suggesting that conditions other than soil type and variety, and possibly including weather conditions also affected consumer preference. These panels preferred the sensory characteristics of the eastern-type and orange-fleshed varieties over those of the western-type and yellow-fleshed ones, respectively.

Sweetcorn Tolerance to Reduced O₂ With or Without Elevated CO₂ and Effects of Controlled Atmosphere Storage on Quality

Gamal S. Riad* and Jeffrey K. Brecht. Horticultural Sciences Department, University of Florida, Gainesville

Controlled atmosphere (CA) storage is a beneficial tool for extending the postharvest life of fresh fruits and vegetables, but specific tolerance levels to gas composition must be determined in order to apply this technique. Sweetcorn was stored for 14 days in air or 2% O₂ plus 0, 15, or 25% CO₂ at 5 °C to determine the best atmosphere composition for maintaining quality. Sweetcorn was more sensitive to reduced O₂ plus elevated CO₂ than to either alone. Storage in 2 % O₂ + 25% CO₂ significantly increased the respiration rate compared to air storage, indicating induction of fermentative metabolism, while there was no significant effect of in 2% O₂ + 0% CO₂ or in 2% O₂ + 15% CO₂ on respiration and storage in either 15 or 25% CO₂ in air (17.7 or 15.6% O₂, respectively) significantly reduced respiration. Treatments that reduced respiration maintained higher levels of sugars, which is the main quality parameter for sweetcorn. Elevated CO₂ also significantly reduced loss of greenness in the husks. CA had no effect on silk or kernel appearance. The impact of CA on dimethyl sulfide (DMS), the main characteristic aroma

component in sweetcorn, was also measured. CA with 2% O₂ + 15% CO₂ gave the best result in terms of quality maintenance for 14 days storage since it preserved the highest sugar level and reduced deterioration in sweetcorn visual quality. Sweetcorn tolerated 2% O₂ or 25% CO₂ alone for 2 weeks, but may be damaged by the two gas levels in combination.

Sensitivity of Beit Alpha Cucumbers (*Cucumis sativus*) to Low-temperature Storage

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Beit Alpha cucumbers were developed in Israel and, like European (Dutch-type) cucumbers, are grown in protected culture and are seedless. However, unlike European cucumbers they are significantly smaller, generally from 5 to 7 inches (125 to 175 mm) in length, and outstanding in flavor. This new crop presents exciting opportunities for Florida growers since it grows well at higher ambient temperatures. Under experimental conditions, Beit Alpha cucumbers produced earlier and more total marketable fruit than European cucumbers. Given that Beit Alpha cucumber is a relatively new crop in Florida, there exists the need for information concerning postharvest practices to maintain acceptable consumer quality and prolong storage life. Successful introduction and marketing of Beit Alpha cucumbers will be highly dependent upon adequate postharvest handling, which underscores the need for reliable data on cooling methods, packaging, optimal storage and transportation conditions. Unwaxed, Beit Alpha cucumbers ('Manar') were stored in rigid, polystyrene clamshell containers at 41, 46, 50 and 54°F (5.0, 7.5, 10.0 or 12.5°C) for 21 days. Since U.S. grade standards for Beit Alpha cucumbers do not currently exist, Canadian grade standards were used to assess maturity indices. Fruits stored at 5 and 7.5 °C developed chilling injury symptoms by 7 and 14 days, respectively. After 21 days in storage fruit at 7.5 and 10 °C showed yellowing and development of a few small, firm protuberances. Fruit stored at 12.5 °C did not develop any chilling injury but developed a high amount of protuberances which negatively affected appearance. Therefore, based on the information derived from this research, Beit Alpha cucumbers can safely be stored at 7.5 °C for 7 days and at 10 °C for up to 14 days without major deterioration in quality.

Effect of Pretreatment of Intact 'Kent' Mango with Ethanol Vapor, Heat or 1-Methylcyclopropene on Quality and Shelf Life of Fresh-cut Slices

Anne Plotto, Jinhe Bai, Elizabeth A. Baldwin, USDA/ARS, Citrus and Subtropical Products Lab., Winter Haven, FL, and Jeffrey K. Brecht, Horticultural Science Department, University of Florida, Gainesville

Treatments known to inhibit or delay ripening were applied to imported (ordered through local supermarket) 'Kent' mangoes. Mangoes that were fairly firm, well formed, and with some ground color development were treated with 1-methylcyclopropene (1-MCP) (25 ppm, 24 hours at 22 °C), ethanol (3.6 g / kg fruit, 24 hours at 23 °C), or heat (38 °C,

98% RH, 48 hours), and cut 24 hours (ethanol and 1-MCP) or immediately (heat) after treatment. 1-MCP and heat treatments decreased firmness, while ethanol treatment maintained firmness similar to control. The differences in firmness that were measured in whole fruit after treatment followed the same trend in fresh-cut pieces after storage at 7 °C. After 12 days of storage, cut pieces from ethanol-treated mangoes maintained the best visual quality. Fresh-cut pieces from heat-treated mangoes were darker (more orange) than all other treatments, and after 12 days, had become overripe. Heat treatment also resulted in the lowest firmness and titratable acidity. Ethanol treatment significantly decreased the total soluble solids content compared to all other treatments. Ethanol, acetaldehyde, and methanol were higher in the ethanol treatment by a factor of 10-12, 3-4, and 1.2-1.4, respectively. Ethanol treatment also resulted in higher α -pinene content, but there were no differences between treatments for other volatiles known to contribute to mango flavor. A taste panel could detect a significant off-flavor in pieces from ethanol treated mangoes after 8 days in storage. The differences in firmness between treatments measured with a texturometer were also perceived by a sensory panel.

Effect of 1-MCP pretreatment, CA storage and subsequent marketing temperature on volatile profile of 'Gala' apple

Jinhe Bai and Elizabeth A. Baldwin. USDA/ARS Citrus & Subtropical Products Lab., Winter Haven

'Gala' apples pretreated or non-treated with 1-methylcyclopropene (1-MCP, 0.625 $\mu\text{L L}^{-1}$) were stored under controlled atmosphere (CA, 2 kPa O_2 + 2 kPa CO_2) or regular air (RA) for 6 months at 1°C. Aroma compounds (measured by gas chromatograph and electronic nose) were analyzed every month after transferring to 20°C for one week to simulate marketing conditions. The effect of 1-MCP was stronger than CA after transfer of fruit to room temperature. For electronic nose data, canonical discriminant analysis separated the storage treatments (MCP + CA, MCP + RA, CA, RA), indicating that the aroma profile was different in apples from each treatment. This was confirmed by GC analysis. Fruit lost more esters compared to alcohols after transferring apples from 1°C to 20°C. 1-MCP + CA inhibition of volatile production was greater, and did not show any benefit for maintaining firmness and acidity (previous data), compared to 1-MCP + RA. Therefore, 1-MCP + RA was the best treatment for storing 'Gala' apples with minimal loss of volatiles, while maintaining firmness and acidity.

The Use of Ozone for Preserving Fruits During Storage

Morris S. Griffith. DECCO Cerexagri Inc., 7316 Commercial Circle, Fort Pierce.

Ozone gas (O_3) is one of the strongest oxidizing agents and sanitizers available that is approved for food contact applications. Ozone breaks down to oxygen and no toxic by-products have been reported. It can be effective in controlling microbes in water systems or storage atmospheres and can destroy (oxidize) ethylene in storage environments, thus protecting ethylene sensitive products. In clean water, concentrations as low as 0.5 to 2 ppm are effective against pathogens. Ozone should be introduced into clean water

because the half life of ozone is less than a minute in dirty water. In air, OSHA limits worker exposure to 0.3 ppm over a 15 minute period, and only 0.1 ppm over an 8 hour period. Recent trials have shown promise for the use of ozone in the storage of perishable products such as lemons, kiwis, strawberries, apples, cantaloupes, and peaches. In lemons, use of 0.1 ppm ozone in the atmosphere at night with 0.05 ppm during the day reduced microbial counts more than 10 fold. Kiwis stored under the same conditions resulted in 10 to 100 fold reduction in microbial counts. Cantaloupes flumed in water that contained 2 ppm ozone reduced microbial counts 10 to 100 fold. Potential applications for Florida produce will be discussed.

Monday Afternoon Session 1:30 – 3:00

Cooperative postharvest and processing citrus research

J. Ahrens, Florida Department of Citrus, Lake Alfred

Twentieth Century Developments in Handling Florida's Fresh Citrus Fruit- An Overview

David J. Hall, Agri-Chem Consulting, Clermont

During the twentieth century many developments in handling fresh citrus fruit were seen. Improvements in methods of cleaning, decay control, color enhancement, separation of freeze damaged fruit and waxing have been introduced. Most of these have resulted in improved appearance, and greater shelf life for Florida's fresh citrus fruit. An additional benefit of many of these improvements has been the reduction of dependence on hand labor in many operations.

Practical Challenges of Implementing Good Agricultural and Handling Practices in the Fresh Citrus Packing Industry

John M. Siddl, FMC Technologies, Inc., Lakeland

Fresh citrus packers are under increasing pressure to implement Good Agricultural and Handling Practices (GAHP) in order to address food safety concerns in their operations. At present, domestic GAHP compliance is being driven by produce buyers such as grocery store chains and wholesale distributors rather than regulatory agencies. Citrus packing operations face several challenges in implementing GAHP programs at their facilities. Issues of primary concern in these operations include changing employee culture, employee hygiene, effectively cleaning packing equipment, implementing a traceback program, and maintaining appropriate documentation. Produce buyers are contracting with independent auditing firms to monitor GAHP compliance in citrus packing operations. However, the specific requirements for GAHP compliance, the importance of each requirement with regard to food safety, and the system to rate or rank packing operations with regard to GAHP compliance are not consistent among these audit firms. A standard system for measuring GAHP compliance should be developed

jointly by packers, buyers, regulatory agencies, and audit firms to enable more consistent compliance and reporting of food safety issues within fresh produce packing operations.

Environmental and tree condition effects on sheeponing in grapefruit

J.P. Syvertsen¹, L. G. Albrigo¹, M.A. Ritenour², J.M. Dunlop¹, R.R. Pelosi² and M.S. Burton², UF, IFAS, ¹CREC, Lake Alfred, FL 33850 and ²IRREC, Ft. Pierce, FL 34945

Misshaped fruit, which are often predominantly sheeponed, can reduce the packout of grapefruit by more than 20 % in some years. The underlying causes of sheeponing are not understood. Since not all sheeponed fruit are elongated, the fruit height to width ratio was not a good quantitative measure of the shape of fruit that were visually rated as sheeponed. Although there were more fruit borne singly than in clusters, clustered fruit had a higher percentage of sheeponed fruit. Shape rating in July was maintained until Nov in the majority of fruit. Overall fruit shape changes from oblong towards round or flat as it develops so very few round or flat fruit in July become sheeponed by Nov. Elevating early season temperature in tree canopies by placing clear plastic tents over trees from before bloom until July, increased the percentage of sheeponed fruit (14 %) above that of the uncovered control trees (4 %). Ruby red grapefruit trees fertilized at 250 lbs N /Ac per year had more sheeponed fruit (14%) than trees that received 100 lbs N/Ac per year (3%). There were only small differences (There was no difference) in the percentage of sheeponed fruit in different grapefruit cultivars, rootstocks and canopy positions. If we can understand the mechanisms by which misshapen fruit occur, we may be able to minimize the problem or at least predict the onset of misshaped fruit as early as possible in a season.

Alternative Degreening of Early Season Citrus grown in Florida

Huating Dou, Shelley Jones, and Mark Ritenour¹. Florida Department of Citrus, 700 Experiment Station Road, Citrus Research and Education Center, Lake Alfred, FL 33850, and ¹Indian River Research and Education Center, Fort Pierce, FL 34945

Various trials involving degreening duration, degreening temperature, and storage humidity were designed to evaluate the different regimens on three major fruit types: tangerines, oranges and grapefruit. The trials with 'Fallglo' tangerines in storage showed that decay were significantly reduced by reducing commercial degreening temperatures from 85° to 75°F. Experiments showed that peel color was enhanced by increased humidity during storage. Degreening temperature was not a primary factor for hue angle development compared to degreening duration during this study. Degreening temperature studies showed that degreening at 65°F significantly reduced the incidence of decay in 'Fallglo' tangerines, but peel color development was slightly delayed and fruit were more susceptible to CI. In 'Marsh' grapefruit, the highest chilling injury incidence was found if fruit were degreened at 85°F. Cooler degreening reduced chilling injury and weight loss, but sometimes delayed yellow color development. 'Hamlin' oranges responded favorably to 75-85°F degreening for orange color development. Overall, for maintaining all postharvest quality parameters, tangerines and oranges responded best to

lower temperature degreening, while grapefruit quality was preserved using the typical commercial degreening regimen of 85°F for most parameters measured.

Monday Afternoon Session 3:30 – 5:00

Heat treatment for green mold control on Florida citrus

Jiuxu Zhang and Patricia Swingle. Florida Department of Citrus, 700 Experiment Station Road, Lake Alfred

Green mold caused by *Penicillium digitatum* is one of the most important postharvest diseases of Florida citrus. Curing with heat was investigated as a potential method for green mold control using ‘Valencia’ oranges. After fruit were inoculated with *P. digitatum* and incubated at either 95, 86 or 70 °F for 48 hrs, followed by storage at 70 °F for 2 weeks, the green mold incidence was 2.0, 34.4 and 76.1%, respectively. Using the same conditions, fruit were wounded but not inoculated, and green mold incidence of 0, 11.4 and 18.8%, respectively, was observed. Selecting 95 °F for further study, fruit were cured for either 1, 2, 3, or 4 days and then stored for 4 weeks at 70 °F. The incidence of green mold was reduced by 72.9, 97.3, 94.6 and 97.0%, respectively, compared to that of non-cured control fruit stored entirely at 70 °F. Fruit weight and taste were not significantly changed by 1 to 4 days of curing at 95 °F. All tests were conducted at a relative humidity of 95-100%. This study indicated that fruit curing at 95 °F for 48 hrs before packing could effectively control green mold. This physical method could be applied using packinghouse degreening rooms and integrated into the Florida fruit packing system to reduce chemical usage and increase economic returns for fresh fruit growers.

Response of Florida Grapefruit to Short Duration Heat Treatments Using Vapor Heat or Hot Water Dips

Mark A. Ritenour¹, T. Greg McCollum², Jeffrey K. Brecht³, Karthik-Joseph John¹, Robert R. Pelosi¹, Michael S. Burton¹, and Elizabeth A. Baldwin⁴. ¹Indian River Research and Education Center, IFAS – UF, Fort Pierce, ²USDA ARS US Horticultural Research Laboratory, Fort Pierce, ³Horticultural Sciences Department, IFAS – UF, Gainesville, ⁴USDA ARS US Horticultural Research Laboratory, Winter Haven.

Heat-treatments have been evaluated and utilized commercially to reduce postharvest decay, chilling sensitivity, and maintain quality of perishable horticultural products. Recent studies exposing grapefruit to short-duration, high-temperature water (e.g., 62 °C for 20 seconds) have shown promise at reducing subsequent development of mold (*Penicillium*) and increasing resistance to chilling injury. Among the most prevalent citrus decay organisms in Florida are the stem-end rots (*Diplodia natalensis* and *Phomopsis citri*). Whereas *Penicillium* species invade citrus tissue through wounds, the stem-end rot organisms develop latent infections within the button tissue that are more protected from physical and chemical treatments. Here we report on efforts to identify

heat-treatments that do not result in visible grapefruit peel injury, while reducing subsequent postharvest decay from natural infections. 'Marsh' white or 'Ruby' red grapefruit were exposed to a range of heat treatments for 0 to 120 seconds at water or vapor temperatures ranging from 50 to 65 °C (122 – 149 °F). Treatments were administered before or after washing. Fruit were usually not waxed, except for one test where fruit were washed and waxed immediately after heat treatments to simulate potential commercial packinghouse application. Fruit tolerance to heat injury followed a time x temperature relationship that was relatively consistent between experiments, even when vapor heat was used. In general, grapefruit could tolerate 10 seconds of 59 °C heat, but extending exposure time to 120 seconds required lowering the temperatures to 53 °C to prevent peel injury. Some time x temperature combinations were identified that reduced postharvest decay without causing peel injury. Injurious treatments were often associated with elevated fruit respiration. Simulated commercial degreening conditions before or after the heat-treatments had no effect on the development of peel injury.

Optimizing the Use of Hydrolytic Enzymes to Facilitate Peeling of Citrus Fruit

Mohamed A. Ismail and Huiqin Chen, Scientific Research, Florida Department of Citrus, Lake Alfred

Seven commercially produced enzyme preparations were tested for their effectiveness in facilitating the peeling of Florida oranges and grapefruit. An automated citrus peeling machine, developed by the Florida Department of Citrus was used to objectively assess peeling efficiency. Four enzyme preparations were very effective, achieving nearly 100% peel removal. Fruit were infused with 0.25 or 0.5% enzyme solution and incubated in water heated to 110°F (43.3°C) or 120°F (48.9°C) for 30 minutes. Incubation in 110°F heated water was more effective than 120°F water. Incubation in water was also more effective in facilitating peel removal than incubation in heated air, especially in 'Valencia' orange. Air incubation produced firmer fruit than water incubation. A treatment protocol was developed to maximize peeling efficiency and enhance product safety and quality.

Changes in Enzyme –Assisted Peeling Efficiency and Quality of Fresh 'Valencia' Orange and of Stored 'Valencia' Orange and 'Ruby Red' Grapefruit

M. A. Ismail, and H. Chen, Scientific Research, Florida Department of Citrus, Lake Alfred

'Valencia' oranges were harvested at three-week intervals, beginning on February 11 and ending on June 17, 2002. Fruit were peeled after infusion with 0.25% Peelzyme using an automated citrus peeling machine developed by the Florida Department of Citrus. Greater than 50% peeling efficiency was achieved in fruit harvested in March and May, compared to 11% in February, 30% in April and 45% in June. Flesh firmness remained high throughout the harvest season but declined during storage at 37°F (2.8°C) for 14 days. Slight increase in total soluble solids was measured accompanied by a steady decline in % citric acid equivalent, resulting in sharp increase in °Brix to acid ratio in April, May and June. Organoleptic evaluation of sectioned fruit was conducted after 1, 7

and 14-day storage at 37°F using approximately 20 trained taste panelists. Storage time had little effect on flavor score in sections prepared from fruit harvested in February, March and April, but declined in May and June. 'Valencia' orange and 'Ruby Red' grapefruit were effectively peeled during storage for 12 weeks. Peeling efficiency declined after 15 weeks of storage.

LC-MS Analysis of Methoxylated Flavanones in Orange Oil Residue

John A. Manthey and Béla S. Buslig, U.S. Citrus and Subtropical Products Laboratory, Agricultural Research Service, SAA, USDA, Winter Haven.

Interest in the recovery of the citrus polymethoxylated flavones from orange oil residues has renewed investigations of the phenols in these oil residues. Fractionation of the phenolic constituents in orange oil by silica gel chromatography facilitated the detection of a compound tentatively identified as citromitin (3',4',5,6,7,8-hexamethoxyflavanone) and a putative pentamethoxyflavanone by LC-MS. The HPLC peak of the compound, identified as citromitin in orange oil, overlaps with citromitin standard, and exhibits identical UV and MS properties. Citromitin has been reported in *C. mitis* (calamondin), but has not been previously reported in orange. The pentamethoxyflavanone also exhibits a UV spectrum similar to citromitin and has a [M+1] MS signal at 375 amu, consistent with its putative structure. Similar LC-MS analyses provided evidence of coumarins and other related compounds, and the identifications of these compounds are in progress.

Separation and Detection of Oligogalacturonides

Randall G. Cameron, Karel Grohmann (Retired), U. S. Department of Agriculture, Agricultural Research Service, South Atlantic Area, Citrus and Subtropical Products Laboratory, Winter Haven, FL 33881 and Arland T. Hotchkiss, U. S. Department of Agriculture, Agricultural Research Service, North Atlantic Area, Eastern Regional Research Center, 600 Mermaid Lane, Wyndmoor, PA

A major component of the citrus juice processing waste stream is fruit peel. Every ton of waste peel contains 300 - 400 pounds of pectin (15 - 20 % on a wet weight basis), a complex polysaccharide in which galacturonic acid (GA) is the major constituent, comprising 80 - 90% of the pectin dry weight. The majority of the GA residues are located in linear homogalacturonan regions in which a variable proportion may be methylated at the C6 position. The functional properties of pectin are largely dependent on the fraction of GA residues that are methylated and their distribution along the homogalacturonan stretches. In order to map pectin fine structure and determine the size and distribution of methylated and demethylated GAs it is necessary to separate, detect and quantify oligogalacturonic acid fragments. We have developed chromatographic methods to accomplish these tasks. Data will be presented on the separation, identification and quantification of oligogalacturonides produced by either enzymatic or chemical hydrolysis. Results from ion exchange and size exclusion chromatography (SEC) will be included. The development of methods compatible with an evaporative

light scattering detector (ELSD) have enabled us to accurately estimate masses associated with peak areas. Incorporating a post-column addition of potassium carbonate to a near neutral anion exchange buffer system has allowed us to use integrated amperometry to detect oligogalacturonides ranging in size from one to greater than 10 GA residues. Results from SEC coupled to either an ELSD or refractive index detector also will be presented.

Tuesday June 10

Morning Session 10:00 – 12:00

Measurement of internal gas concentrations of citrus fruit to determine peel diffusivity and other affects of coatings on fruit quality

Robert Hagenmaier, USDA/ARS Citrus and Subtropical Products Laboratory, Winter Haven

The gas exchange of fruit is important to postharvest quality because it affects respiration and retention of flavor volatiles. Gas exchange is markedly affected when fruit is coated, and therefore gas exchange information needs to be updated periodically as new coating formulations are developed. Measurement of interior gases have proven to be useful techniques for measurement of how coatings affect gas exchange, respiration and retention of flavor volatiles. For measurement of interior CO₂ and O₂ in two minutes, a hardy method involved use of two concentric packed columns sold by an equipment supplier. For measurement of gas diffusivity with ethane, interior gases were measured in less than one minute with another off-the-shelf column. These methods will be described as used for citrus fruit.

Decrease in Florida Citrus Acidity over the Last Fifty Years

P. F. Cancalon, Florida Department of Citrus, 700 Experiment Station Road, Lake Alfred

Data accumulated since 1949 has revealed a persistent trend in citrus juice composition. The changes are particularly important in the area of juice acidity. During that period, orange juice acidity has decreased by 27% and that of grapefruit juice by 30%. On the contrary, degree Brix values have remained fairly constant. As a consequence, Brix/Acid ratios have increased considerably. Multiple factors may have play a role in these changes. Over these fifty years many cultivars and rootstocks have been replaced and these substitutions appear to have affected acid levels. However, several other factors have to be taken into account, among them: weather patterns (rain, temperature), and migration of the production areas toward the southern section of the state. Changes agricultural and processing methods could also play a role.

GC/MS Determination of 1-p-menthen-8-thiol in Grapefruit Juice

K.L. Goodner, C.A. Margaría USDA, ARS, SAA, Citrus & Subtropical Products Laboratory, Winter Haven, FL

P-menthene-8-thiol is a very potent aroma compound found in grapefruit juice. It currently is not measured commercially because it is present in only trace quantities and due to the fact that it requires an expensive specialized detector. However, in this report, it is shown that utilizing a standard laboratory gas chromatography mass spectrometer (GC-MS) which is more likely to already be owned, it is possible to quantitate p-menthene-8-thiol with minimal sample and relatively short preparation time. Current methods use 1000-5000 mL while the method presented here uses only 30 mL. It was determined to be as effective as a sulfur specific detector (no difference in unknown concentration at 95% confidence level) and also to be able to quantitate much lower levels. A tentative limit of detection is reported to be 1 ng/g.

The effect of block deesterification on the pseudoplastic properties of pectin solutions for pulp stabilization.

Gary A. Luzzio. USDA/ARS Citrus & Subtropical Products Lab., Winter Haven

During deesterification, the ester groups on the pectin can be removed in a random or blockwise manner. When the ester groups are removed either at non-reducing ends or next to free carboxyl groups by a single-chain mechanism in a sequential manner, they are referred to as being deesterified in a "blockwise manner," as blocks of unesterified galacturonic acid units are created. The sequential or blockwise hydrolysis of esters is typically mediated by pectin methyl esterases. The unesterified galacturonic acid units formed by blockwise deesterification are highly reactive to divalent cations such as calcium. Pectins having such blocks of unesterified galacturonic acid are said to be "calcium sensitive." It can be shown that solutions of particular calcium sensitive pectins together with calcium ions can have pseudoplastic properties and exhibit yield stress behavior. Yield stress behavior can be important for pulp stabilization in citrus drinks while providing low viscosity for acceptable mouthfeel.

Microflorae of Orange Surfaces and Juice from Fruit in Processing Facilities and the Effect of Grading

R. M. Goodrich and M.E. Parish, Citrus Research and Education Center, University of Florida

Fruit surfaces and juice from such fruit was evaluated in order to better understand the effect of grading at a citrus processing facility and to investigate the prevalence of specific microorganisms. Testing included aerobic plate counts (APC), total coliforms (TC), fecal coliforms (FC), *E. coli* and *Salmonella*. Fruit from three points was collected and tested at the laboratory: Group 1 (washed, pre-grade), Group 2 (washed, graded), and Group 3 (culls that were washed but graded out). Fruit surfaces results were obtained by washing the fruit with sterile buffer, which was then plated, while fruit juice results

were obtained by surface sterilization of the fruit with subsequent aseptic juicing and plating of the juice sample. Group 3 fruit surface APC were 10 to 500 times higher than either Group 1 or Group 2 fruit surfaces APC, with recovery of *Salmonella* from the fruit surface occurring 3 times over the course of the sampling with Group 3 fruit. These results were consistent with significantly greater APC, TC, FC and *E. coli* detected in the juice of Group 3 fruit, indicating that contamination can occur on the surface as well as within the fruit.

Grapefruit Juice: FDOC's Schools Kid Flavor Evaluation Project.

S.M Barros, W.S. Stinson, and T. Flannery, Florida Dept. of Citrus, Lake Alfred

A Study of the Orange Juice Color Score Measured by ColorFlex Citrus Color Meter

Huating Dou, Jonq-Ying Lee, and Mark G. Brown. Florida Department of Citrus, Citrus Research and Education Center, 700 Experiment Station Road, Lake Alfred

Citrus juice color is an important juice quality criterion. A new colorimeter, ColorFlex, was adapted recently for the determination of orange juice color. In this study we analyzed the relationship between the color numbers measured by ColorFlex and Hunter D45D2 citrus colorimeter or Macbeth 3100 reflectance spectrophotometers. Color numbers were measured at three juice quality laboratories located in Central Florida. The statistical analyses show a significant correlation in color numbers between ColorFlex, Hunter D45D2, and Macbeth 3100 colorimeters. However, regression analysis results indicate that color numbers are not equal between the different colorimeters used.

Krome Section Abstracts
Jiang Lu, Presiding

Papaya Variety Development in Florida

Michael J. Davis, Thomas L. White, Jonathan H. Crane, Tropical Research and Education Center, UF, Homestead

A papaya variety development program was initiated using breeding lines with transgenic resistance to papaya ringspot virus. Selected PRSV-resistant transgenic lines (R_0) were all female and were crossed with six papaya genotypes to produce the R_1 generation. The R_1 generation was evaluated in the field in 2001-2002, and the R_2 generation, derived from self-pollinated R_1 selections, was evaluated in the field in 2002-2003. In the R_2 generation, a total of 1263 fruits were harvested from 150 hermaphroditic trees selected from the 1196 trees planted. Mean fruit weight was 1.2 kg for those lines with 'Solo Sunrise' papaya as the original pollen parent and was 2.4 kg for those lines with "Red Lady" as the original pollen parents. The mean weights for the other pollen parents, "Puerto Rico 6-65," 'Experimental No. 15,' 'Tainung No. 5' and "Solo 40" were between these values. Those lines with "Solo Sunrise" as an original pollen parent also had the highest mean concentration of soluble sugars in fruits. The concentration of soluble sugars declined in January and February when the temperatures were cool. Of the 1196 trees evaluated, 24 trees representing four transgenic lines and the six original pollen parents were selected for production of the next breeding generation.

Production of papaya transplants is affected by substrates and micronutrient fertilization

J. P. Morales-Payan and W. M. Stall. Horticultural Sciences Department, UF. P.O. Box 110690, Gainesville, FL, USA, 32611.

Experiments were conducted to determine the effect of substrates and micronutrient supply on the growth of papaya seedlings in the nursery stage. Papaya transplants were grown directly from seed on (1) sandy soil, (2) a commercial substrate based on sphagnum moss (SM), (3) a 1:1 mixture of sandy soil and manure, and (4) a 1:1:1 mixture of sandy soil, manure, and SM. The substrates received standard N-P-K fertilization. Foliar micronutrient fertilization was performed with three commercially available micronutrient mixtures (MM). A control without micronutrient fertilization was included for each substrate. Plant height, stem diameter, leaf number, and shoot dry matter were measured during the experiment. There were significant differences in growth and transplant quality by substrates and micronutrient treatments. At 35 days after emergence, the best overall growth was obtained with plants receiving micronutrients and grown on either the 1:1 mixture of sandy soil and manure, or on the 1:1:1 mixture of soil, manure, and SM.

Papaya (*Carica papaya*) response to foliar treatments with organic short-chain peptide and amino acid complexes.

J. P. Morales-Payan and W. M. Stall. Horticultural Sciences Department, UF. PO Box 110690. Gainesville, FL 32611.

A field study was conducted to determine the effects of foliar applications of two organic biostimulants based on amino acids + short-chain peptides (BAP) and acetylthioprolin (AP) on 'Sunrise' papaya. Treatments consisted of single applications or sequential applications of the same biostimulant (AP at 0.25 g per L, or BAP at 3 g per L) applied at the beginning of

flowering, followed by either six applications at 30-day intervals, four applications at 45-day intervals, three applications at 60-day intervals, two applications at 90-day intervals. BAP and AP treatments were compared to papayas without biostimulant treatments. Biostimulants significantly increased the exportable yield of papaya. Comparing the same application sequence, BAP was generally more effective than AP in increasing papaya yield. Applications at 30-day intervals resulted in higher yields than single application or applications at 45-, 60- or 90-day intervals.

Development of Three Sac Spiders Occurring on Lime Orchards at Homestead, Florida

D. M. Amalin, J. E. Peña, Tropical Research and Education Center, UF, and R. McSorley, Department of Entomology and Nematology, UF.

The development of three species of sac spiders known to prey on citrus leafminer was studied under laboratory condition. Males and females *Chiracanthium inclusum* had mean life span of 215±6 and 177±6 days, respectively. The mean life span of females and males *Hibana velox* was 311±4 and 240±9, respectively. *Trachelas volutus* females and males had mean life span of 253±8 and 212±19, respectively. Females of all species that matured and were fertilized in captivity produced 1-3 egg masses. Oviposition took place 2-7 days after mating for all species. *Chiracanthium inclusum* had an average of 57±10 eggs per egg mass; whereas, *H. velox* and *T. volutus* had averages of 110±5 and 56±4 eggs per egg mass, respectively.

Dieback Caused By *Verticillium dahliae* On *Blighia sapida*

R.T McMillan, Jr., W. R. Graves, T.F. Wood, University of Florida, Tropical Research and Education Center, Homestead, FL 33031 and R. M. Leahy, Plant Pathology, Department of Agriculture, DPI, Gainesville, FL 32608

Akee trees, *Blighia sapida* K. Koenig, with wilt/ dieback symptoms were found in a local south Florida commercial planting during the spring of 1999. A fungus, isolated from the roots onto V-8 agar, identified as *Verticillium dahliae* Kleb. by the Division of Plant Industry. Twenty Akee seedlings were transplanted into 3.85 liter plastic pots and grown in a greenhouse at 28C-day/23C-night temperature. When the plants were approximately 25 cm in height, the roots were severed by stabbing a 15 cm long knife, four times into the root zone. A standard plate of uninoculated V-8 Agar was blended with 160 ml of sterile water and 15 ml of this slurry was poured into the disturbed soil of each of 10 control plants. A slurry, made and applied as above, using a 2-week-old culture of *V. dahliae* on V-8 Agar, was used to infest the soil around the 10 treatment plants. Plants were kept in the greenhouse. After 6 ½ weeks, leaves of inoculated plants had symptoms of marginal leaf burn. No symptoms were seen on the control plants. *Verticillium dahliae*, was isolated from the roots of the inoculated plants.

Lychee Anthracnose Inoculum Sources

Michael J. Davis, Tropical Research and Education Center, UF, Homestead

The abundance of spores of *Colletotrichum gloeosporioides*, the cause of lychee anthracnose, on the surfaces of leaves, inflorescences, and fruits was measured in three groves of 'Mauritius' lychee (*Litchi chinensis* Sonn.) in south Florida. Few spores of the pathogen were detected until those portions of inflorescences, which did not set fruit, began to die and provide a substrate for growth and sporulation of the pathogen. Precipitation events and warm weather apparently aided development and dispersal of spores. Greater numbers of spores were consistently detected on

inflorescence tissues than on leaves. Few spores were detected on fruit surfaces, and then only when high populations were detected on leaves and peduncles. Nevertheless, mature fruits held in a moist chamber frequently developed necrotic lesions from which *C. gloeosporioides* was isolated. The results of the present study suggest the possibility that fungicide application for control of lychee anthracnose might be limited to periods of time conducive to inoculum build-up.

Evaluation of chelated iron fertilizers used for lychee trees grown on a calcareous soilY.C. Li, R. Rao and J. Crane, Tropical Research and Education Center, UF

Lychee along with most of other tropical and subtropical fruit trees (e.g. avocados, bananas, carambola, dates, lime, longan, mangos) grown in calcareous soils in south Florida suffers severe iron (Fe) deficiency. Iron deficiency causes leaf chlorosis, slow growth, yield loss, and, in severe cases, tree death. Chelated iron fertilizers have been widely used for crops grown on calcareous soils. The objective of this study was to determine effects of various chelated Fe fertilizers applied in a calcareous soil on soil Fe, leaf Fe and leaf color of lychee trees.

Water Conservation Survey of Miami Dade-County Agricultural and Golf/Landscape Commercial Water Users

R. Muñoz-Carpena, J.H. Crane, Tropical Research and Education Center, UF/IFAS, C. Yurgalevitch, Miami-Dade Cooperative Extension Office, G.D. Israel, Agricultural Education and Communication, UF/IFAS

Water use, management, and quality are major issues in south Florida's Miami Dade County where periods of excess rainfall and extended dry spells are experienced occasionally. Agricultural practices e.g., irrigation and fertilizer management potentially affect the water quality of our surficial Biscayne Aquifer in this environmentally sensitive area adjacent to Everglades and Biscayne National Parks. What the Miami-Dade community is doing to conserve and utilize water safely is, however, largely unknown. The University of Florida is undertaking extension and research programs in Miami-Dade County to assist the agricultural community conserve water, deal with flooding, and improve irrigation and fertilizer management. A comprehensive survey on water conservation practices across commodity groups i.e., vegetables, tropical fruits, ornamental plants and golf/landscape courses was conducted last year to provide essential information to help identify the practices adopted by these users to conserve and protect their supply of water. The approach is to quantify and learn about the existing water management and irrigation practices in place, information sources and motivations for the adoption of those practices, and attitudes about water conservation and management among producers. The evaluation research involved a random sample of over 1000 agricultural and golf/landscape water users in Miami-Dade County selected from lists obtained from the Miami-Dade County Cooperative Extension Service mailing lists, and growers' organizations in Miami-Dade County. This represents close to 50% of the sampled population. The survey instrument contained questions about water management and conservation practices, knowledge and competencies concerning irrigation practices, environmental attitudes, and relevant socio-demographic attributes.

Early Fall Defoliation Reduces Flower bud Initiation and Inhibits their Development in Southern Highbush Blueberry

J.G. Williamson, P.M. Lyrene and E.P. Miller, Horticultural Sciences Department., UF.

Blueberries are susceptible to a number of leaf spot diseases which can cause early fall defoliation. Depending on cultivar, weather and disease pressure, near complete defoliation can occur by early to mid-Oct. during some years. Flower bud initiation in blueberry is photoperiodic with short photoperiods and cool temperatures stimulating flower bud initiation. Since leaves are the organs that perceive photoperiod, it follows that early fall defoliation could have a negative impact on flower bud initiation. In 1998, representative canes of mature, field-grown, 'Misty' and 'Sharpblue' southern highbush blueberry were hand-defoliated on 4 Sept., 2 Oct., 6 Nov., 7 Dec., or not defoliated. The experiment was repeated in 1999. Also in 1999, entire plants of 'Star' were hand-defoliated at various times between Sept. and Dec. The early defoliation treatments (Sept. and 2 Oct.) resulted in reduced flower bud number for 'Misty' but not for 'Sharpblue' when compared with later defoliation treatments or controls. Flower buds that developed on canes defoliated on 4 Sept. or 2 Oct. were smaller than flower buds on canes defoliated on 6 Nov., 7 Dec., or on non-defoliated canes. During the following spring, fruit fresh weight per unit cane length was less for the Sept. and Oct. defoliation treatments than for the Dec. treatment or controls. Whole plant defoliation of 'Star' also resulted in delayed flowering and fruiting (Sept. defoliation), or reduced flower bud initiation and yield (Oct. defoliation) compared to controls.

Comparative Growth and Yield of 'Stover' Grape Grafted on 23 Different Rootstocks

John A. Mortensen and James W. Harris

'Stover' bunch grape, released in 1968, became one of the leading bunch grape cultivars for wine production in Florida by 1980. Since grafting increases yields of 'Stover', an experiment was begun in 1980 with 34 different rootstock clones planted as dormant cuttings in nursery rows. One year later 10 rooted plants of each were cleft-grafted with 'Stover' scions. The most promising 23 of the 34 clones were transplanted in 1982 as grafted vines to old vineyard soil in 5 rows, each row having 23 different rootstock in random order. Three rootstock- FL N5-42, FL BD7-19, and 'Dog Ridge' had greater 'Stover' wood production than 18 of the 20 other clones. FL BD7-19 was significantly higher yielding than the 16 lowest-yielding rootstocks, but root sprouting has reduced interest in FL BD7-19 as a commercial rootstock. Actually, none of the 21 other rootstock was significantly better in yields and wood weights than the currently recommended 'Dog Ridge' and 'Tampa'. Delay of scion budbreak by 3 of the rootstock- 'Dog Ridge', FL BD7-19, and 'Tampa' – allowed escape from spring frost damage in 1989. Suckering from stem tissue below the graft union was rare in 'Dog Ridge' plants that had been disbudded prior to planting in the nursery when compared with non-disbudded 'Dog Ridge'.

Glassy-Winged Sharp Shooter Population, Grapevine Resistance and Pierce's Disease Development

Jiang Lu, Z. Ren, X. Zhang, and X. Xu. Center for Viticulture and Small Fruit Research, Florida A&M University

Pierce's disease (PD) is a limited factor to production of non-native grapes in the southeastern United States. The disease has recently received national and international concerns due to its outbreak in California. Pierce's disease is caused by a bacterial pathogen known as *Xylella fastidiosa* (XF) and it has generally been believed that clogging the xylem vessels by XF results

in the typical PD symptoms: marginal necrosis, uneven lignifications of annual canes, abscissions occurring between leaf blades and petioles, and dead shoots. The PD bacteria are transmitted by leaf hoppers when they feed on grapevines. Glassy-winged sharp shooter (GWSS), a major vector transmitting the XF bacteria, were observed in late April and disappeared in November in North Florida vineyards. The GWSS populations appeared in two peaks (late June/early July and August). Severe PD symptoms were developed in susceptible grapes after second GWSS population peak. Our preliminary study indicated that GWSS has feeding preference for certain grapevines. The GWSS have the tendency to feed more likely on PD susceptible varieties than PD tolerance varieties.

Roles of Mineral Nutrients for Pierce's Disease Development of Grapevines

Xia Xu¹, J. Lu^{1*}, and M. F. French², ¹Center for Viticulture and Small Fruit Research, Florida A&M University; ² Division of Food Safety, Florida Department of Agriculture and Consumer Services

Pierce's disease (PD) is the greatest threat to the production of grapes in southeastern United States. PD infected leaves showed various abnormalities with symptoms similar to mineral nutrient imbalances such as phosphorous (P) deficiency and magnesium (Mg), manganese (Mn) and iron (Fe) toxicities. A study was initiated to investigate the roles of mineral nutrients in PD development of grapevines. Naturally *Xylella fastidiosa* infected/noninfected leaves and petioles were collected from field-growing grapevines of cultivars 'Carlos' and 'Blanc du Bois'. The mineral nutrients of potassium (K), magnesium (Mg), calcium (Ca), copper (Cu), zinc (Zn), manganese (Mn), and iron (Fe) were analyzed by Inductively Coupled Plasma emission spectrometry (ICP). The results showed that muscadine grape cultivar 'Carlos' had an average level of 9059.8, 2722.8, 18675.3, 5.1, 389.3, 89.1, and 45.0 ppm of K, Mg, Ca, Cu, Mn, Fe, and Zn in their leaf and petiole tissue. The bunch grape cultivar 'Blanc du Bois' had an average level of 11482.1, 4359.2, 28955.7, 6.6, 71.9, 86.2, and 41.6 ppm of K, Mg, Ca, Cu, Mn, Fe, and Zn. In addition, the PD infected leaves and petioles showed significant lower levels of K and higher levels of Fe, Cu, and Zn than those non-infected ones. The results obtained for the mineral nutrient study indicated that their contents in leaves and petioles were closely related to PD development in grapevines.

Muscadine Vine Dieback - an Emerging Problem to the Industry

Zhongbo Ren and J. Lu, Center for Viticulture and Small Fruit Research, Florida A&M University.

Muscadine grapes are generally believed to possess resistance to diseases commonly seen in the bunch grapes, such as the Pierce's disease, anthracnose, downy and powdery mildew. Since the establishment of the muscadine industry in the southeast, disease has not been a real issue facing the industry. However, with the recent expansion of muscadine planting, and many new varieties coming in production, some new emerged diseases are becoming a threat to the industry. Among them, the grapevine dieback has been very serious in some vineyards. A 15-acre commercial vineyard consisting of 5 cultivars were surveyed for the Eutypa-like dieback syndrome in 2001. Our survey data indicated that the disease was spreading throughout the vineyard. However, severity of the die-back syndromes did vary among the cultivars surveyed. The infected vines almost lost production completely in the first season, but they were recovered in the second or third year by proper vineyard management.

Methods of Monitoring Soil Water Content for Irrigation Scheduling in a Carambola (*Averrhoa carambola* L.) Orchard in Limestone Soil in South Florida

Rashid Al-Yahyai, Bruce Schaffer, Tropical Research and Education Center, UF, and Frederick S. Davies, Department of Horticultural Sciences, UF.

Multi-sensor capacitance probes, tensiometers, and a neutron probe were used for assessing soil moisture content and potentially scheduling irrigation in an 8-year-old carambola orchard in Krome very gravelly loam soil in south Florida. Four irrigation treatments were applied when soil water content reached 100-92%, 91-89%, 88-86%, or 85-83% of field capacity as determined with multi-sensor capacitance probes. The tensiometers and neutron probe gave a good estimation of absolute soil water content. The use of tensiometers was limited to a maximum of 20 cb. Whereas, the use of a neutron probe by growers may not be practical because it utilizes a radioactive source for detecting soil moisture and thus requires strict health and safety monitoring and it is labor intensive. Trees irrigated at 88-86% or 85-83% of field capacity showed signs of stress, including decreased net CO₂ assimilation and stem water potential. However, yield over a one-year period was not affected by any treatment because trees recovered from stress after re-irrigation. Using a pre-determined soil water depletion level as monitored by multi-sensor capacitance probes appears to be an effective tool for scheduling irrigation. However, the pre-set soil water depletion rate must be related to plant growth and yield.

Evaluation of Grape Germplasm for Resistance to Pierce's Disease (PD) and Glassy-winged Sharpshooter (GWSS)

*Elvis E. Clarke, Zhongbo Ren, and Jiang Lu

Center for Viticulture and Small Fruit Research, Florida Agricultural and Mechanical University. Field grown plants of over 100 grape cultivars/accessions representing the European, Asian and American species were evaluated for resistance / tolerance to Pierce's disease (PD) and the glassy-winged sharpshooter (*Homalodisca coagulata* Say), which is the major vector responsible for the transmission of the bacteria (*Xylella fastidiosa* Well) that cause the disease. Evaluation for resistance to PD was conducted bi-weekly by rating the disease on a scale of 0-5, where 0 = no symptoms, 1 = minor symptoms up to 10% of leaves with marginal necrosis (MN), 2 = 11%-30% of leaves with MN, 3 = 31%-50% of leaves with MN, 4 = 51%-75% of leaves with MN and 5 represented over 76% of leaves with MN or a dead vine. Evaluation for GWSS resistance was based on field observation of GWSS counts on individual vines. Results indicated that the European and Northern American species were very susceptible to PD, while the *Vitis* species native to the Gulf Coastal Plains of the United States, such as *V. rotundifolia* and *V. shuttleworthii* were resistant to PD. The Florida hybrid bunch grapes, such as 'Blanc du Bois' and 'Suwannee', showed some tolerance to PD with a disease rating of 3. However, the Asian species appeared to be highly susceptible to PD. There seemed to be a direct correlation between disease severity and GWSS counts and the PD susceptible grape cultivars had higher counts of GWSS in general. For example, cultivars of *V. rotundifolia*, such as 'Fry' and 'Carlos', had very low GWSS counts, which was consistent with the disease rating obtained.

Developmental Changes in the Phenolic and Non-Phenolic Content of the Muscadine and Florida Bunch Grapes

Dawn Erica Lewis*, Sheikh M. Basha and Neil James

Center for Viticulture and Small Fruit Research, Florida Agricultural and Mechanical University
Phenolic compounds are most important since they are responsible for the color and taste of the fruit and processed products. The phenolic compounds have received increased attention because of their antioxidant activities and positive health effects on humans. The aim of this study is to determine the variations in the phenolic and non-phenolic content of the leaves and the berries of Muscadine and Florida bunch grape genotypes. The leaves, skins and seeds of muscadine and Florida bunch grape cultivars were freeze dried and extracted with polar and non-polar solvents. Investigation of the fractions using TLC revealed the presence of seven major compounds in the hexane fraction of the muscadine leaves, and six major compounds in the hexane fraction of the leaves of Florida bunch grapes phenotype at the pre-flowering stage. HPLC with UV detection revealed the presence of four major compounds in the skin of both the muscadine and Florida bunch grapes genotype. However there was significant variation in the quantity of these compounds between the two market types. Additional studies are in progress to determine changes in the phenolic and non-phenolic compounds in developing grape leaves and berries.

Developmental Changes in Berry Composition of Anthracnose Susceptible and Tolerant Grape Genotypes

Alfred P. Mbele*, Hifza Mazhar and Sheikh M. Basha,

Center for Viticulture and Small Fruit Research, Florida Agricultural and Mechanical University
Anthracnose is a fungal disease caused by *Elsino ampelina*. Anthracnose infects grape leaves and berries during plant development and in certain grape genotypes causes serious quantitative and qualitative losses. Most of the bunch grape genotypes are susceptible to anthracnose while the Muscadine genotypes are tolerant to this disease. A study on determining differences in berry composition between anthracnose-susceptible and -tolerant genotypes can provide an understanding of plant innate defense system. Such differences might have a bearing on fungal invasion and disease development in a particular genotype. The aim of this study was to determine differences in berry protein, amino acid and sugar composition between anthracnose-susceptible and anthracnose-tolerant grape genotypes. Grape berries were collected from Florida A & M University Center for Viticulture at different stages of berry development and transported to the laboratory on ice. Berry was cut open and separated into skin, pulp and the seed. Protein, free amino acids and sugars were extracted and analyzed to determine differences in protein, free amino acids and soluble sugars. Data showed that protein composition of the seed changed significantly during seed maturation. A polypeptide with a molecular weight around 20000 accumulated in the seed during development. Studies are in progress to determine changes in free amino acids, soluble sugars and protein content of the grape genotypes during berry development.

Performance of Low-Chill Peach Cultivars in South Coastal California

D.A. Hagillih, South Coast Research and Extension Center, University of California (UC), Irvine, California, D.R. Hodel and R.A. Surls, Cooperative Extension, UC, Los Angeles, California, G.S. Bender and V.F. Lazaneo, Cooperative Extension, UC, San Diego, California

We evaluated 10 low-chill peach [*Prunus persica* (L.) Batch] cultivars for tree growth, fruit yield and fruit quality over three seasons. Growth was measured as tree trunk cross sectional area,

while fruit yield was measured as the marketable number and total fruit weight per tree. Fruit quality attributes included total soluble solids and sensory ratings by a panel of fruit tasters. The cultivars 'August Pride', 'Flordaprince' and 'Tropic Snow' were significantly the most vigorous in growth and significantly produced the greatest number of fruit and total fruit weight per tree. The least vigorous cultivars represented by 'Bonita', 'Saturn' and 'Red Baron' were also the lowest yielding cultivars and they differed significantly from the former category of cultivars in both growth and yield. However, these latter cultivars produced better quality fruit with significantly higher total soluble solids. Fruit from these cultivars also had significantly higher sensory ratings in both sweetness and flavor intensity in 2 out of the 3 years of the sensory fruit quality study. Moreover, we found that the cultivars with the higher fruit quality were also susceptible to severer powdery mildew infections.

Effective Chilling Temperatures For Low-Chill Subtropical Peaches

Robert E. Rouse* Southwest Florida Research and Education Center, UF, and Wayne B. Sherman, Department of Horticultural Sciences, UF

Low-chill peach (*Prunus persica*) cultivars adapted to subtropical conditions of south Florida with commercial quality have been developed and are available. These cultivars require from 150 to 200 chill units, ripen in April and May, and have fruit size greater than two inches in diameter. These cultivars have flowered profusely each year and fruited with acceptable crops over the past five years. During this period Florida has experienced some of the mildest winters of the past century. Weather records and chill unit models suggest that trees did not always experience the required chill units (hours of temperatures at or below the recognized requirement of 45 degrees F), yet they flowered and fruited. This would suggest that temperatures of 50 to 55 degrees or higher are effective at satisfying the chilling requirement of these low-chill subtropical cultivars.

Ornamental Section

Van Donnan, Presiding

*** Indicates Student Paper Competition**

Monday Afternoon 1:00-3:00

***Sclerotium rolfsii* Southern Blight On *Oncidium/Brassia* Hybrid Orchid.**

T.B. Pratt, R.T. McMillan Jr., and W.R. Graves, University of Florida, Tropical Research and Education Center, Homestead.

Oncidium/Brassia Reichb. F. hybrid orchid leaves were sent to the University of Florida, Plant Disease clinic in the summer of 2002. Signs on the leaves were a spreading, cottony, white mass of mycelium with necrotic centers 3-5 x 5-9 mm. Approximately 1% of the nursery plants were infected. *Sclerotium rolfsii* Sacc. was isolated from the affected leaves using acid potato dextrose agar (APDA). Two, black plastic boxes were lined with wet paper towels and 6 uninoculated leaves were placed in each. Three leaves in each box were treated as controls and received a 3mm square of APDA, while the other three leaves in each box received a 3mm square of *S. rolfsii* culture on APDA. All leaves were then misted with water and enclosed to maintain humidity. Twenty-four hours later, infection was visible on 2 treated leaves. Within 72 hours, significant infection was visible on over half the inoculated leaves. All control leaves remained uninfected. *Sclerotium rolfsii* was consistently reisolated from the inoculated leaves.

Management of Diaprepes Root Weevil, *Diaprepes abbreviatus* (Coleoptera: Curculionidae) in Ornamentals

C. Mannion and H. Glenn, Tropical Research and Education Center, Homestead.

Diaprepes abbreviatus (L.) (Coleoptera: Curculionidae), an introduced pest, has spread over a large area of central and southern Florida where it is damaging citrus, ornamental plants, sugar cane and numerous other crops. In addition to the damage caused by this pest, there are regulatory concerns of spreading *Diaprepes* to non-infested areas. This is particularly important in the ornamental industry in which plants are shipped throughout the U.S. and abroad. Previous research has demonstrated that bifenthrin (Talstar) is efficacious against neonates and young larvae and that some entomopathogenic nematodes are efficacious against various stages of larvae. Bifenthrin is currently recommended as a drench or incorporated into the potting media at a rate of 25 ppm based on the bulk density of the media. Tests were conducted to evaluate bifenthrin and entomopathogenic nematodes, alone and in combination, for control of older larvae (> fifth instar) in ornamentals. In all cases, the combination treatment of bifenthrin and the entomopathogenic nematodes provided the best control suggesting a synergy or additive effect between treatments. In a natural environment, the nematodes may be more efficacious against different aged larvae than the bifenthrin and therefore, improve control. The addition of nematodes may also provide a way to reduce the amount of insecticide currently recommended.

Comparison of 7 slow release N fertilizers and ammonium sulfate on perennial ryegrass

Stephanie Dickerson and J.B. Sartain, Soil and Water Science Department, UF, Gainesville.

Ammonium sulfate is the most commonly used fertilizer in southern turfgrass due to its ability to achieve a rich green color and its quick response time. Since it is a water-soluble compound, frequent applications are necessary to maintain a high level of turf quality. It would be beneficial to the turfgrass industry to have a slow-release compound that would provide the same quality of color as ammonium sulfate, yet require fewer applications. The purpose of this study is to compare the effects of a variety of slow-release fertilizers to that of ammonium sulfate. Seven slow-release fertilizers, including two experimental products, and ammonium sulfate were applied at 3 pounds of N/1000 sq. ft/90 days. and visually evaluated weekly for 28 days, then bi-weekly for the remainder of the study. Clippings were collected and weighed every 30 days to determine growth rate (kg/ha/day) and N uptake. The results of the first harvest showed that none of the slow-release fertilizers achieved the yield of ammonium sulfate (53.48 kg/ha/d). The yields of the slow-release compounds were 51.05 (Umaxx), 46.17 (Uflexx), 44.03 (nutralene), 43.83 (polyon), 36.50 (IBDU), 27.98 (organiform), and 24.45 (nitroform) kg/ha/d. The color-rating results do not seem to coincide with the yield ratings. Ammonium sulfate-treated plots had the highest color rating. Nutralene, Nitroform, and Umaxx provided high quality color, while Polyon, IBDU, Uflexx, and organiform yielded a lower quality of color.

Fumigant Alternatives to Methyl Bromide for Field Production of Cut Flowers

R. McSorley, K.-H. Wang, Department of Entomology and Nematology, UF, and G. Church, USDA-ARS, Ft. Pierce.

Impending restrictions on the soil fumigant methyl bromide will cause limitations in the field production of cut flowers, so that alternative fumigants may be needed. A field test was conducted near Stuart, FL, during the 2002-03 growing season to compare the performance of several soil fumigants in managing pests of snapdragon (*Antirrhinum majus* L.). Four treatments were applied in a randomized complete block design with four replications: methyl bromide (98%) + chloropicrin (2%) at 450 lbs/A; metam sodium at 75 gal/A; metam sodium (75 gal/A) + chloropicrin (150 lbs/A); and a nonfumigated control. All fumigants were equally effective and superior to the control for suppressing early-season weeds. Stubby-root nematodes (*Paratrichodorus* spp.) were suppressed initially by all fumigants, but soon resurged in all plots. Root-knot nematodes (*Meloidogyne* spp.) were not significantly affected by fumigation, but tended to occur mainly in control plots. Growth of snapdragon in the control plots was generally stunted compared to fumigation treatments. Effects were short-lived on the cultivar Pot Ivory, but persisted throughout the growing season on 'Pot Pink'. Overall, metam sodium or metal sodium + chloropicrin were similar in performance to methyl bromide + chloropicrin under the conditions of this test.

Effects of Controlled-release Fertilizer and Supplemental Magnesium on Leatherleaf Fern Frond Color, Chlorophyll and Element Content, Fresh Weight and Vaselife

R. H. Stamps and A. L. Chandler, University of Florida, Institute of Food and Agricultural Sciences, Environmental Horticulture Department, Mid-Florida Research and Education Center, Apopka.

There are economic and environmental reasons to reduce fertilizer application rates, especially of nitrogen, during the production of leatherleaf fern (*Rumohra adiantiformis*). However, the market demands that the fern be dark green in color. Therefore, there is interest in determining which nutrients might be the most important in producing green coloration of the fern fronds and what effects they might have on frond vase life. Chlorophyll *a* and *b* are the pigments responsible for the green color of fern fronds. Magnesium is an integral component of and the only mineral constituent of the chlorophyll molecule. Thus, supplemental Mg applications (50, 100 and 150 lb/acre/yr) were made using polymer-coated kieserite ($MgSO_4 \cdot 7H_2O$) to established leatherleaf fern beds being fertilized at two nitrogen application rates, 200 and 250 lb/acre/year, using a 15-2.2-12.6 (N-P-K) controlled-release fertilizer (CRF) containing 2% Mg. The fern was growing in a shadehouse and irrigated using overhead irrigation. Initially, fertilizer application rate had a slight effect on frond color; however, supplemental Mg had no effect. Treatments had no effect on frond chlorophyll content. Frond tissue analysis showed that Mg content increased with increasing supplemental Mg application rates but Mg and fertilizer treatments had no effect on frond calcium, copper, iron, manganese or zinc content. Fronds from plots treated with the higher CRF rate were heavier than those treated with the lower CRF rate. Initially, vase life increased with increasing supplemental Mg rate, but Mg rate had no effect at subsequent harvests. These results substantiate recommended Mg application rates.

The Importance of Testing Reclaimed Water Used in Nurseries

F. M. Melton. UF, Manatee County Extension Service, Palmetto.

Abstract not available.

Monday Afternoon 3:30-5:00

The Morphology of Sunflower (*Helianthus annuus*) ‘Sunbright’ Grown as Cut Flowers Changes With Planting Date and Frost/freeze Events

Emino, Everett R. and Becky Hamilton, Department of Environmental Horticulture, Institute of Food and Agricultural Sciences, UF, Gainesville.

Seeds of ‘Sunbright’ sunflower (*Helianthus annuus*) were planted weekly throughout the year as part of an overall scheduling experiment. Plants grown from seeds planted on 12/12/01 through 01/30/02 were exposed to naturally occurring frost/freezing temperatures during February 27-28 and on March 1. The purpose of this paper is to report on the observations made on these plants after they made additional growth and flowered subsequent to the frost/freeze events. These temperatures were not low enough to kill the plants but were cold enough to kill differentiated flower buds. Vegetative buds were not damaged. Thus, sunflowers that had set terminal and lateral flower buds and had flower buds in different stages of maturity were damaged by the freeze resulting in an altered plant morphology. Mature plants with flower buds within days of

opening were most severely damaged while immature plants with only vegetative buds were not damaged by the freeze events. However, those plants with dead differentiated terminal and lateral flower buds continue to grow vegetative lower lateral buds that were not damaged by the frost/freeze events as they were vegetative at that time and these subsequently flowered with short lateral stems very low on the main stem. While all plants with differentiated terminal buds had the buds killed, plants from planting dates closer to the frost/freeze events had more vegetative buds higher up the main stem. Plants with few differentiated buds were only thermally pinched resulting in a well branched plant with long lateral stems and numerous small marketable flowers from the surviving vegetative buds. Plants that were all vegetative at the time of the frost/freeze events produced single stem flowers without damage.

Dianthus 'Bouquet Purple' as a Potential Cut Flower for Florida is Influenced by Compost Amended Media as to Time of Harvest, Growth, Yield and Quality.

Emino, Everett R. and Becky Hamilton, Department of Environmental Horticulture, Institute of Food and Agricultural Sciences, UF, Gainesville.

The primary purpose of the University of Florida specialty cut flower program is to study the cultural physiology of crops that may be grown as speciality cut flowers in Florida. Plug seedlings of 'Bouquet Purple' Dianthus (*Dianthus x hybrida*) were planted on 15 cm centers in 1.2 m wide beds amended with two application of cured municipal solid waste/biosolids co-compost at rates of 1.5, 3.0, and 6.0 cubic meters per 100 square meter of bed space on January 9, 2002. The experimental design was a randomized complete block design with 3 replications. 'Bouquet Purple' is an interspecific hybrid of two Dianthus species and is a tall cut-flower Dianthus with potential for cut-flower growers in Florida. The first flowers were harvested on March 15, 2002 and the experiment terminated on May 6, 2002. Maximum harvest occurred on April 8. Results showed that increased rates of compost amended media positively influenced growth parameters such as quality, stem length and yield. The control yielded 2.1 stems greater than 45 cm stem length and as compost rate increased yield was 3.64, 4.03 and 7.06 harvested quality stems per plant respectively. These findings were expected from results previously reported on sunflower and results on other crops in the extensive literature on compost amended media. After the end of April the yield of non commercial grades dominated production while stems greater than 45 cm ceased for all treatments. Further the study demonstrates the potential for 'Bouquet Purple' as a specialty cut flower in Florida with high sustained yields of quality flowers as a cool season premium cut flower.

The Use of Mineral Wool in Horticulture

Van Donnan, Verlite Company, Tampa.

Mineral wool, sometimes known as rock wool or man made vitreous fiber, was developed in the mid 1800's by melting slag, basalt or combinations of the two into fiber. Both forms of man made vitreous fiber have been used in horticulture for the past 40 years. Mineral wool has some unique characteristics that make it a useful component in soilless growing substrates. Chemical and physical properties will be discussed.

Plant Evaluation Observations of Coleus (*Solenostemon scutellarioides*)

Robert Bowden, Harry P. Leu Gardens, Orlando.

Coleus (*Solenostemon scutellarioides*) is the common name for a group of plants with large colorful leaves native to tropical Asia, Africa and Australia. Several species are grown as ornamentals. Plants of the genus *Solenostemon* are in the family Labiatae (mint family). The form is small-to medium-sized herbaceous annual and cultivars are variable from 8" to 364" tall with a similar width, but taller when grouped together in mass plantings in the shade. The average coleus is upright pyramidal to upright rounded growth in habit. Coleus is grown primarily for the impact of its foliage. Coleus plants that have ornamental leaves are descended from *Solenostemon blumei*, which has nettle-like, bronze-colored leaves. The colors of their foliage range through yellow, red, crimson, and pink. The flowers that are produced on the varieties grown for their colorful leaves are hardly noticeable. Traditionally, most coleus will grow best in part shade or dappled light. Varieties that are not sun-tolerant will bleach and discolor in full sun. However, several new cultivars are available that will thrive in full hot sun. Harry P. Leu Gardens (USDA hardiness zone 9b) conducted trials on 195 cultivars and species of *Solenostemon* in 2000 and 2001.

Uncovering the Horticultural Roots of the Community of Gotha, Florida: the Importance of Henry Nehrling

Nancy M. Decker, Department of Foreign Languages, Rollins College, Winter Park.

Established in the 1870s as a German-American settlement, the community of Gotha was known for decades as the home of Henry Nehrling. Nehrling -- a naturalist, ornithologist, horticulturalist, and author of international renown -- established an experimental garden in Gotha. There he cultivated the amaryllis, caladium, bromeliads -- and other ornamental plants from around the world. The Henry Nehrling Society has been working feverishly to preserve the site of these early gardens and the cracker home where Nehrling made his residence.

Fort Lauderdale Winter Trial Garden

Kimberly K. Moore* University of Florida Fort Lauderdale Research & Education Center, Fort Lauderdale.

Rooted cuttings of 55 cultivars of New Guinea impatiens and 20 cultivars of geraniums were transplanted into 4" pots filled with Pro-mix 'BX' on October 15th. On December 6, 2002, plants were transplanted into the garden. Eighteen plants were planted with 3 groups of 6 plants randomly placed in the garden. Plants are watered 3 times a week for 30 minutes using overhead irrigation. Monthly evaluations are conducted to measure and record plant height and width (size); flower number, number of plants with flowers, insect and disease damage, and quality rating. Quality is based on a scale of 1 to 5 with 5 = excellent and 1 = poor. Two consumer preference surveys also were conducted. The first survey was conducted in January and the second in March. The New Guinea impatiens plants are planted under shade while the geraniums are planted in full sun.

Vegetable Special Session

Teresa Olczyk, Presiding

Monday, June 9

Morning Session 10:00-12:00

Hydroponic production of fresh ginger root (*Zingiber officinale*) as an alternative method for South Florida.

Ray Rafie, Teresa Olczyk, Miami-Dade County Cooperative Extension Service, UF and Waldo Guerrero, Shenandoah Growers, Homestead.

Fresh ginger root constitute an important ingredient in Asian cuisine. Most of the ginger root consumed in the United States is imported from Asia or South and Central America. Hawaii is the only state in the United States that is currently commercially producing ginger for the fresh market. In the months of December and January, there is higher demand for fresh ginger and prices reach their maximum. An experiment was conducted to compare the production and quality of ginger in the field with that under a hydroponic system. Results showed that on average, yields were 4.75 lb and 7.65 lb per plant for field and hydroponically grown ginger respectively- a significant difference. A higher percentage of the hydroponically grown ginger was graded number one, compared to the field grown crop.

Effect of Interplanting Secondary Crops on Strawberry Yield

J. R. Duval and E. A. Golden. Gulf Coast Research and Education Center - Dover, UF.

To increase the utility of land preparation, existing plastic mulch, and micro-irrigation, secondary crops are planted in beds with winter annual strawberries. This practice allows for earlier harvesting of the secondary crop. Planting takes place up to 5-6 weeks before the end of the strawberry production season dependant on strawberry variety. Common secondary crops are squash, musk melon, pickles, and peppers. A study was instituted that examined the effect of interplanting squash, musk melon, and pickles from seed, and musk melon and pepper from transplants, on yield of strawberry. Plantings of secondary crops occurred on 28 Feb, 7 March, 14 March, and 21 March, 2003 into a stand of 'Strawberry Festival' strawberries. Data was collected for marketable yield, number of marketable berries, and cull fruit until 31 March, 2003. No significant differences were detected among treatments.

Fruit Yield And Quality, Susceptibility To Powdery Mildew (*Sphaerotheca macularis*), And Aphid (*Aphis gossypii*) Infestation Trends For Seven Strawberry Cultivars Grown Without Pesticides In A Passive-ventilated Greenhouse Using Pinebark As Soilless Substrate

Ashwin V. Paranjpe, Daniel J. Cantliffe, Silvia Rondon, Horticultural Sciences Department, UF, Craig K. Chandler, Gulf Coast Research and Education Center-Dover, UF, Jeffrey K. Brecht, Elliot J. Brecht, and Kim Cordasco, Horticultural Sciences Department, UF

Growing strawberries (*Fragaria ananassa* Duch) in soilless substrates under protective structures can enhance winter production and reduce dependency on methyl bromide. However, most of the strawberry cultivars available in the U.S. are bred for production in open fields, and limited information on the performance of these cultivars under protected cultivation is presently available. The objective of our research was to evaluate fruit yield and quality, susceptibility to powdery mildew, and aphid infestation trends for seven strawberry cultivars grown under a passive-ventilated greenhouse in north-central Florida. In October, plug transplants were planted at a density of 22 plants per m² in Polygal Hanging Bed-pack troughs filled with pine bark. No insecticides or fungicides were sprayed and biological control agents such as *Aphidius colemani*, *Lysiphlebus testaceipes*, and *Neosiulus californicus* were used for controlling aphids (*Aphis gossypii*) and two-spotted spider mites (*Tetranychus urticae*) respectively. For the early season (Nov-Jan), the yield obtained from 'FL 97-39' was significantly greater than 'Strawberry Festival', but not significantly different from 'Carmine', 'Camarosa', 'Treasure', 'Earlibrite', and 'Sweet Charlie'. For the total season (Nov-Mar), the yields obtained from 'FL 97-39' and 'Carmine' were significantly greater than 'Camarosa' and 'Sweet Charlie', but not significantly different from 'Strawberry Festival', 'Treasure', and 'Earlibrite'. Percentage of marketable yield obtained from 'Treasure' was higher than that obtained from 'Camarosa' and 'Sweet Charlie', but not significantly different than that obtained from 'Strawberry Festival', 'FL 97-39', 'Carmine', and 'Earlibrite'. There were differences in firmness, color, ascorbic acid content, soluble solid content, and titratable acidity among fruits of different cultivars throughout the season. Powdery mildew (*Sphaerotheca macularis*) infected the leaves, petioles, flowers, and fruits of all cultivars. 'FL97-39' had very high susceptibility, 'Earlibrite' had high susceptibility, whereas the rest had moderate susceptibility to powdery mildew. Aphid (*Aphis gossypii*) infestations were most severe in 'Sweet Charlie' and 'Carmine', whereas the rest of the cultivars sustained significantly lower levels of aphid infestation.

Hydroponically Produced Mini-Cucumber with Improved Powdery Mildew Resistance

Nicole L. Shaw and Daniel J. Cantliffe, Horticultural Sciences Department, UF

The Beit Alpha (BA) cucumber has become a new commodity for the Florida greenhouse industry. In past trials, BA cultivars were compared to traditional 'Dutch' or 'Hothouse' cucumber cultivars in which the cultivar 'Sarig', a BA-type, produced three times more yield than the Dutch-type 'Kalunga'. The BA cucumber originated on an Israeli Kibbutz. More recently, several seed companies in Holland began distributing a similar BA cucumber, which has been termed the 'mini-cucumber' and which is proposed to have powdery mildew resistance (a trait lacking in some early BA cultivars). In Spring 2002, 7 Dutch mini-cucumber and 6 BA-type Israeli cultivars were grown hydroponically in

perlite in a passive-ventilated high-roof greenhouse in Gainesville, FL. Fruit were harvested 27 times from 14 March until 24 May 2002. Fruit were graded and weighed, and powdery mildew ratings were performed at the end of the season. 'Figaro', 'Manar', 'Sarawat', and 'Meitav' produced the greatest amount of fruit, an average of 238 fruit m⁻². The control cultivar 'Sarig' produced 213 fruit m⁻². Average fruit weight ranged from 103 g for 'Figaro' to 139 g for 'Diva'. For early control of powdery mildew, 'Quadris' fungicide was applied 2 and 4 weeks after transplanting, with 'Nova' applied during week 3. No other fungicide applications were made in order to allow powdery mildew to naturally attack susceptible cultivars. Ratings resulted in 'Sarig' with 90% leaf coverage and 'Meitav' with 100% leaf coverage with powdery mildew. The cultivar 'Sarawat' had approximately 40% leaf coverage with powdery mildew while all other cultivars had less than 25% coverage. Mini-cucumber cultivars 'Figaro' and 'Manar' were found comparable to 'Sarig' in fruit yield and quality and with the improved powdery mildew resistance of the plant may be an advantage when this fungi is present.

Oberon™: A New Tool for Arthropod Management in Florida Vegetables.

M. A. Toapanta, Bayer CropScience, Tampa, L. Buckelew, R. Morris, R. Steffens and R. Rudolph, Bayer CropScience, Research Triangle Park, NC

Oberon™ contains a novel insecticidal and acaricidal active ingredient, spiromesifen, from the new chemical class of cyclic tetrone acids. This new compound is active against whiteflies (*Bemisia* spp and *Trialeurodes* spp) and mites after foliar applications in different vegetable cropping systems. Oberon acts on mite and whitefly development, because it interferes with lipid biosynthesis. In field tests conducted between 2000 and 2002 in Florida, Oberon, as a 240 g AI/liter suspension concentrate (SC) formulation, at rates ranging from 100 to 150 g AI/ha provided significantly greater *B. argentifolii* control than conventional insecticides at commercial rates. Oberon 2 SC also provided excellent residual control of all instars of *B. argentifolii*, reduced the number of tomato yellow leaf curl virus infected plants, and suppressed adult populations on tomatoes. Moreover, Oberon has no cross-resistance to insecticides and acaricides currently available in the market and is safe to beneficial organisms, which offers a powerful tool for pest management in vegetables.

Initial Weed-free Period and Subsequent Yellow Nutsedge (*Cyperus esculentus*) Population Density Affect Yield and Grade of Tomato (*Lycopersicon esculentum*)

J. P. Morales-Payan, W. M. Stall, Horticultural Sciences Department, UF., D. G. Shilling, Mid-Florida REC, UF, J. A. Dusky, Extension Administration, UF, T. A. Bewick, USDA/CSREES, Washington, DC, and R. Charudattan, Plant Pathology Department, UF.

Field experiments were conducted in Live Oak and Gainesville, Florida, to determine the effect of yellow nutsedge (YN) time of emergence and population density on the yield and grade of fresh market tomato. YN was allowed to emerge on the crop beds at 1, 3, 5, 7, 9, and 11 weeks after transplanting tomato (WAT), at the initial densities of 25, 50, and 100 plants per m². Season-long weedy controls at each density and a season-long

control free of YN were also included. Tomato fruit size tended to decrease as the YN emerged earlier and as YN density increased. Season-long interference by YN at 25, 50, and 100 plants per m² resulted in 24, 53, and 62% marketable yield loss, respectively. Marketable yield losses were below 10% when tomato was kept YN-free for at least 3 WAT if YN was subsequently allowed to emerge at a density of 25 YN per m². When YN densities were 50 and 100 plants per m², the initial weed-free period necessary to avoid >10% marketable yield loss was 5 and 7 WAT, respectively.

Density and Time of Emergence of Purple Nutsedge (*Cyperus rotundus*) Effects on Bell Pepper (*Capsicum annuum*)

J. Pablo Morales-Payan and William M. Stall. Horticultural Sciences Department, UF

Studies were conducted in Gainesville and Citra, Florida, to determine the response of bell pepper yield and fruit grade to selected population densities of purple nutsedge (PN) emerging after different initial weed-free periods. PN densities 20, 40, 60, and 80 plants per m² emerged on the bell pepper beds at 0, 1, 3, 5, 7, and 11, and allowed to grow with the crop for the remainder of the season (11 WAT). The results show that the amount of fruits in the Fancy, US1 and US2 grades decreased as PN densities increased and as the weed-free period was shorter. Fancy fruit yield was more affected by PN interference than US1 and US2 yields. Total marketable yield loss was 30, 45, 60, and 70% when PN interfered with bell pepper season-long at the densities of 20, 40, 60, and 80 plants per m², respectively. Bell pepper yield loss was <10% when the initial PN-free period was >4 WAT for the PN density of 20 plant per m², and >5 WAT for 40 PN per m². At the density of 60 PN per m², a weed-free period of 6 WAT was required to prevent 10% yield loss. With a density of 80 PN per m², yield loss was >10% if PN emerged prior to 7 WAT.

Vegetable Section
Mary Lamberts, Presiding

Monday, June 9
Afternoon Sessions

1:30 – 300

Advanced Irrigation Techniques for Improving Competitiveness of Tomato Production in Today's Demanding Market

R. Muñoz-Carpena, H. Bryan, W. Klassen, Tropical Research and Education Center, UF/IFAS, M. Dukes, Agricultural and Biological Engineering Department, UF/IFAS.

With the imminent phase-out of methyl bromide in developed countries but not in developing countries, Florida growers fear they will be at an even greater disadvantage with competitors from Mexico. Through proper irrigation, average tomato yields in South Florida can be maintained (or possibly increased), while minimizing environmental impacts caused by excess water applied and concomitant chemical leaching. If so, precision irrigation may contribute greatly to reducing the cost of production per carton of tomatoes, and hence, make Florida's tomato industry more competitive and sustainable.

Based on an on-going experiment in Miami-Dade County, we present a discussion of the design and application of modern irrigation system that is based on the use of: a) high-frequency/low volume irrigations, b) real-time soil moisture data, and c) automatic operation. Irrigation schedulings based on use of two different soil moisture sensor types were compared side to side with two other fixed irrigation schedule treatments (one automatic by means of an irrigation controller and the other manual with a weekly schedule). Preliminary water savings, crop yields, pros and cons of the system, and technical aspects will be presented.

Assessing Length of Irrigation and Soil Humidity as Basis for Delivering Fumigants through Drip Lines in Florida Spodosols

Bielinski M. Santos, James P. Gilreath and Timothy N. Motis, Gulf Coast Research and Education Center, UF/IFAS.

Soil fumigant delivery through microirrigation lines has the potential to replace direct soil injection into planting beds. However, wetting coverage in these spodosols must be improved to increase soilborne pest and weed control. Field trials were carried out to determine the impact of soil humidity on the extent of water coverage obtained through varying irrigation times. Soil humidity contents were: a) field capacity (7% moisture) and saturation (20% moisture), along with 2, 4, 6, 8 and 10 h of irrigation. Pressed beds had 70 cm tops. Drip lines had emitters spaced 30 cm apart delivering 0.056 L/min per m of row at 55 KPa, and two drip lines were buried at 2.5 cm below the surface and 30 cm apart from each other. Water was mixed with a blue marking dye to analyze the water

distribution patterns. Beds were opened at the emitters and high-resolution digital pictures were taken for each treatment. Resulting images were adjusted using photographic software and covered areas across the beds were determined. Regression analysis showed significant quadratic equations for both soil moisture situations, with saturated soils obtaining the highest cross section coverage (90 and 94% after 8 and 10 h). In field capacity beds, the maximum cross section coverage obtained was 82%. Within each soil moisture situation, there were no differences between 8 and 10 h of irrigation.

Visualization of Water Movement in Mulched Beds with Injections of Dye with Drip Irrigation

Eric Simonne, and David Studstill, Horticultural Sciences Department, UF, Robert Hochmuth and Scott Kerr, Suwanee Valley Research and Education Center, UF, Gene McAvoy, Hendry County Cooperative Extension, UF, and Michael Dukes, Biological and Agricultural Engineering Department, UF and Scott Kerr

Adequate water, fertilizer and fumigant management in plasticulture production systems requires an understanding of water movement in mulched beds. Soluble blue dye and controlled irrigation conditions were used to visualize the wetting pattern of several common drip tapes on two Florida sandy soil. On a 15-ft deep Lakeland fine sandy soil near Live Oak, Fla., increasing irrigation volume from 24 to 192 gal/100ft (1 to 8 hours @ 24 gal/hr/100ft; 12-in emitter spacing) significantly increased depth (D), width (W) and emitter-to-emitter coverage (L) of the water front. The wetting front passed the bottom of the root depth (12 in) approximately after an irrigation volume of 72 gal/100ft (3 hours). After 8 hrs, W did not exceed 15 in. Complete emitter-to-emitter coverage was reached after approximately 3-hr irrigation (72 gal/100ft). Therefore, the highest volume of irrigation water that can be applied in this soil type when no leaching is expected is 72 gal/100ft (3 hr). On a Boca sand soil with a spodic layer at the 18 in depth in Collier county, Fla., the water front reached the impermeable layer after 96 gal/100ft (6 hrs @ 24 gal/hr/100ft; 18-in emitter spacing). Lateral, then upwards vertical occurred with greater irrigation volumes. At both locations, W did not exceed 30% of the bed, confirming that complete wetting of 32-in wide beds cannot be achieved with a single drip tape.

The University of Florida IFAS Livestock Waste Testing Laboratory

Justin Jones and George Hochmuth, North Florida Research and Education Center-Suwanee Valley, UF

The University of Florida IFAS has conducted analytical testing of livestock wastes and made recommendations for their use in fertilization of vegetable crops since 1991. The UF-IFAS Livestock Waste Testing Laboratory (LWTL) was begun with a Hydrologic Unit Area grant in the early 1990s under the direction of Drs. Roger Nordstedt and Jerry Kidder. The purpose of the grant was to provide waste testing and education for manure management in the Suwanee River basin of northern Florida, home to many dairy and

poultry operations. Today, the LWTL operations are funded by grants from a consortium of agencies, including FDACS, NRCS, the Suwannee River WMD, and poultry and dairy organizations such as GoldKist and Sunshine Milk Producers. The LWTL is very active assisting with the increasing demand for education about agricultural waste management associated with vegetable nutrient BMPs and water quality incentive programs. Each year the LWTL performs several thousand individual analyses on manure waste samples largely from poultry and dairy farms from all over Florida. Lab personnel lead research and demonstration projects on manure management with vegetables. Mulched eggplant, muskmelon, and watermelon have responded positively to poultry manure to 6 T/A, representing about 150 lbs. N/A. On-farm demonstrations have been carried out with muskmelon. In addition to presenting the research results, this paper will summarize the results of more than 10 years of agricultural waste analyses and nutrient management recommendations.

Response of 'Florida 47' Tomato to Soil- and Foliar-applied Biostimulants and N and K Rates

Alexander A. Csizinszky, Gulf Coast Research and Education Center, UF

The effect of soil-applied 'eN-ZONE' and 'C-CAT' biostimulants at two N and K rates, 1x and 1.5x (1X=195 N plus 324 K kg.ha⁻¹) were evaluated on fruit yield and nutrient uptake of 'Florida 47' tomato *Lycopersicon esculentum* Mill. The study was conducted during the winter-spring (Feb.-May) 2002 on an Eau Gallie fine sand. Production system was the full-bed polyethylene mulch with micro-(drip-) irrigation. Experimental design was a split-plot arranged in a randomized complete block with three replications. Main plots were biostimulant and water control, sub-plots were the two N and K rates. The 'eN-ZONE' and the 'C-CAT' each at 0.935 L.ha⁻¹ were applied to the plant beds through the microirrigation tubing immediately after transplanting. The 'C-CAT' at 2.34 L.ha⁻¹, was applied two more times during the season: at 55 and at 70 days after transplanting. Fruits were harvested four times and graded according to USDA standards. In the first harvest, biostimulant treatments at the 1x N and K rate, increased the yield of extra-large (5x6) and marketable fruit and reduced the yield of cull fruit compared to the control at the 1.5x N and K rate ($P \leq 0.05$). Seasonal total yields of extra-large and marketable fruit were similar with biostimulant or control treatments but large, medium and cull fruit yields were higher with the water control and 1.5 x N and K than with biostimulant treatments. Elemental concentrations in shoots and fruits were similar with biostimulant or with water control.

Effect of Reduced Phosphorus Fertilizer Rates on Yield and Quality of Sweet Corn Grown on Calcareous Soil in Miami-Dade County

Teresa Olczyk, Miami-Dade County Extension, UF, Yuncong Li, Tropical Research & Education Center, UF, Eric Simonne, Horticultural Sciences Department, UF, and Rao Mylavarapu, Soil and Water Science Department, UF

Sweet corn (*Zea mays*) is a major cash crop grown on about 14,300 acres in Miami-Dade County. A large-scale field trial with reduced phosphorus fertilizer applications was conducted in a grower's field during the 2002/2003 season. The treatments were 8-0-8 (100% P reduction), 8-8-8 (50% P reduction) and 8-15-8 (grower's fertilizer rate) with six replications.

Soil samples were collected pre-planting and before corn harvest and analyzed for plant available P and other nutrients. Plant population, plant height and leaf chlorophyll content were measured. Twenty feet of a row from each replication were harvested and graded for number of ears, marketable weight, size (length, diameter, tip fill), visual appearance and flag chlorophyll content. Reduced P treatments (0 and 50% of phosphorus fertilizer) showed no significant reduction in yield and quality of sweet corn compared to the grower's rate.

Monday Afternoon
3:30 – 5:00

Winter Strawberry Production in Greenhouses Using Soilless Substrates : An Alternative to Methyl Bromide

Ashwin V. Paranjpe, Daniel J. Cantliffe, Horticultural Sciences Department, UF, Elizabeth M. Lamb, Peter J. Stoffella and Charles Powell, Indian River Research and Education Center, UF

As an alternative to methyl bromide dependant strawberry (*Fragaria ananassa* Duch) production in the field, the Florida-Israeli Protected Agriculture Project, UF, has conducted research on soilless substrates, growing containers, plug transplants, plant densities, cultivars, and biological control for greenhouse strawberry production in north-central Florida. Soilless substrates such as peat-mix, pine bark, and perlite influenced total yield of field-grown and greenhouse-grown plugs when plants were grown in "Polygal" troughs or poly-bags placed at ground level. However, type of soilless substrate did not influence total yield when plants were grown in elevated poly-bags. Early yield of plugs from both sources was greater when grown in perlite, as compared to other soilless substrates, regardless of growing container. Twelve plant densities ranging from 1 to 2.6 plants/ft² (43,560 to 113,256 plants/acre) were evaluated. The yield/ft² increased linearly with plant density, however, yield per plant was reduced at a plant density of 2.6 plants/ft². Strawberry yields of 1.8 lb/ft² (6,534 12-lb flats/acre) were obtained from greenhouse production compared to a ten-year average yield of 2,392 12-lb flats/acre (FAFD, 2002) for field production. New cultivars such as 'FL97-39' and 'Carmine' produced high early yields, but 'FL97-39' was highly susceptible to powdery mildew (*Sphaerotheca macularis*), and 'Carmine' was susceptible to aphids. *Aphidius colemani* and *Lysiphlebus testaceipes* parasitic wasps, and *Neoseiulus californicus* predatory mites were effective in controlling aphids (*Aphis gossypii*) and two-spotted spider mites (*Tetranychus urticae*) respectively. Thus, protected strawberry culture can enhance early yield, improve harvest efficiency, reduce pesticide usage, and eliminate dependency on methyl bromide

Strawberry Daughter Plantlet Size Affects Transplant Growth and Development

Eric B. Bish, Daniel J. Cantliffe, Horticultural Sciences Department, UF, and Craig K. Chandler, Gulf Coast Research and Education Center – Dover, UF

A lack of high quality transplants is one of the most serious production problems facing the Florida strawberry industry. An experiment was conducted to determine what effect the stolon diameter and leaf number of strawberry plantlets have on the growth and development of plug transplants. ‘Sweet Charlie’ daughter plantlets from 2 and 4 mm diameter stolens, and with 0, 1, or 2 fully expanded leaves, were selected and grouped into a factorial set of treatments. These plantlets were first rooted in 1.2 inch³ (18.8 cm³) cells and then moved to 6.7 inch³ (110 cm³) cells. After a growth period of six weeks, the plants were placed in a growth chamber for two weeks under conditions suitable for flower bud initiation. The plants were then transplanted into a greenhouse hydroponic gutter system. Crown diameter, flower number, and root dry weight were recorded after plants had been in the gutter system for four weeks. Results suggest that two-leaf plantlets should produce field-ready transplants quicker than zero or one-leaf plantlets, and that plantlets from large diameter stolens should be used to produce early fruiting transplants.

Performance of Bell Pepper Varieties over Two Seasons in Southeast Florida, 2000-2002

K. D. Shuler, Palm Beach County Cooperative Extension Service, UF

Three demonstration trails were conducted to evaluate promising bell pepper varieties on sandland in Boynton Beach and Boca Raton, FL. Peppers were grown on sandy soil from transplants under commercial full bed plastic mulch culture using subsurface seepage irrigation. Sixty-two different varieties were evaluated at least once. Green fruits were evaluated from four blocks and an additional block was reserved for the evaluation of colored fruits (mature pepper). Peppers were evaluated for yield and average fruit size. Randomly selected fruits from multiple picks were evaluated for length and width, lobe number, and bluntness at the blossom end. Mature (colored) fruits were counted, weighed and evaluated for deformities including softness, misshapen, rot, sunburn, and stip.

Red-Skinned Potato (*Solanum tuberosum* L.) Variety Evaluation in a Sub-Tropical Climate

Chad M. Hutchinson and Doug M. Gergela, Horticultural Sciences Department, UF; Teresa Olczyk, Miami-Dade County Cooperative Extension, UF, Gene McAvoy, Hendry County Cooperative Extension, UF; James M. White, Mid-Florida REC, UF.

Potato is produced on approximately 2,000 ha annually in south Florida. Potatoes are grown for winter production when few other areas of the U.S. are producing. The predominant potato varieties planted are red-skinned. A trial was conducted during the 2002-2003 season at two grower farms each in Homestead and Immokalee, Florida.

Each site was managed by the grower following the standard university recommended production program. The experiments were arranged in a randomized complete block design with the same six varieties at each site: 'Red LaSoda', 'LaRouge', B0984-1, B1145-2, B1758-3, and B1758-4. Mean marketable yields for varieties at all sites were 15.3, 13.9, 7.8, 9.3, 10.8, 12.5 Mt ha⁻¹, respectively. On a scale of 1-9, the best overall appearance rating was 6.5 for B1758-4 compared to 4.8 and 5.3 for 'Red LaSoda' and 'LaRouge', respectively. Total cull weight was high for all clones but highest for B1758-4 at 1.1 MT ha⁻¹. Although the external quality of numbered clones was better than that of the two standards, tuber yields were not acceptable. Therefore, recommendation of the numbered clones for production in south Florida should be limited.

Watermelon Yield and Size when Grown on Four Plastic Mulch Colors.

James M. White, Mid-Florida Research and Education Center, UF

Six watermelon cultivars (*Citrullus lanatus*) were grown in a plastic mulch, drip irrigation system using four plastic mulch colors (red, blue, black, and silver). Plots were 45 feet long on 6 inch raised beds, 9 feet on center, with four replications in a randomized complete block design. Seeds were planted March 19, plants transplanted to the field with 36 inch spacing on April 12. Fruits were harvested June 19, 2002. The overall average yield by cultivar ranged from 451 to 220 cwt/acre. The width ranged from 9 to 8.1 inches, length from 14.7 to 9.7 inches and average fruit weight from 21.6 to 14.5 lbs. There were no differences for the % brix, but taste ranged from fair to good. Watermelon response to the four plastic colors differed by cultivar. Three cultivars had higher yields on red and black mulch, where one had highest yield on red and one on blue and one on silver and blue. For the average yields for the six cultivars, there were no differences for red, blue, and black.

Influence of Summer Cover Crops on Tomato Production in South Florida

Qingren Wang, Waldemar Klassen, Herbert Bryan, Yuncong Li, Tropical Research & Education Center, UF, Areaf Abdabaki and Zafar Handoo Agricultural Research Service, USDA, Beltsville, MD

An experiment to compare the capacities of four different summer cover crops and three chemical fumigants to suppress plant-parasitic nematodes in a tomato field and to support tomato yields was conducted at the Tropical Research and Education Center, Homestead, Florida. The cover crops were sorghum sudangrass, sunn hemp, cowpea and velvetbean, and the chemical fumigants were methyl bromide, methyl iodide and KPAM. The cover crops were grown from May or June to October, and then incorporated into the soil. The soil fumigants were applied three weeks before tomato seedlings were transplanted. The results indicated that the tomato yields were significantly improved, compared to fallow, by the cover crops, especially by the legumes, sunn hemp and velvetbean. Moreover the yields obtained from cover crop-treated plots were not inferior to those from the chemical fumigant-treated plots. The results showed that the summer legume cover crops, sunn hemp, velvetbean and cowpea, are effective in improving soil fertility and tomato

production, especially in Krome very gravelly loam soil. The suppressive effects on soil nematodes of these cover crops further suggests that in Miami-Dade County these nematode-antagonistic cover crops have the potential for use in a biologically-based system as an alternative to chemical fumigants.

Tuesday, June 10
Morning Session
10:00-12:00

History and Agricultural Contributions of the Hastings Research and Education Center, 1923 to 2002

D. P. Weingartner, Plant Pathology Department, UF

The Hastings Research and Education Center was initially established in 1923 as the Potato Investigations Laboratory. The center was officially “decommissioned” by UF, IFAS in 2002. The history of the center and notable contributions in made by Hastings scientists are chronicled. The original mission of the center was to conduct plant disease research and the first three scientists (1923 to 1940) at Hastings were plant pathologists. Programs were expanded during the 1940’s and 1950’s to include insect control, variety improvement, soil fertility, and crop management studies. Most research centered on potato, however, numerous other crops were studied including crucifers, other vegetables, cotton, gladioli, and various summer cover crops. Maximum faculty staffing was during 1952 to 1985 and included an entomologist, horticulturist, plant pathologist, and soils scientist. Average potato production increased from 55 cwt/acre in 1923 to nearly 300 cwt/acre today. Most of the increases in yield were due to production practices developed or tested at the Hastings Center. Some of these were: introduction of Sebago cv (1940’s), efficacy of EBDC fungicides (1940’s), benefits of seed certification (1920’s to 1930’s), seed-borne aspects of potato ring rot (1930’s), benefits of phosphorous fertilization of new land (1960’s), benefits of summer cover crops (1950’s), nematode and corky ringspot control (1970’s), Atlantic cv (1980’s), metribuzin herbicide (1960’s), successful management of late blight, early blight, bacterial wilt, nematodes (1970’s to present). Ten potato varieties in addition to Atlantic were named based on Hastings research in conjunction with other Atlantic seaboard states and the USDA.

Evaluation of Various Chemical Treatments as Potential Replacements of Methyl Bromide for Control of Soilborne Pests in Polyethylene-Mulched Tomato

(Lycopersicon esculentum)

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Weeds, fungi, and nematodes are commonly present in Florida soils, and tomato growers rely on methyl bromide (MBr) to eliminate these pests. An experiment was conducted in fall 2001 in Bradenton and Immokalee as part of the USDA-IR4 Methyl Bromide

Alternatives Program to evaluate the potential of various chemicals for replacement of MBr in polyethylene-mulched tomato (*Lycopersicon esculentum* Mill.). Treatment establishment began on 17 Aug. and 13 Dec. 2001 in Bradenton and Immokalee, respectively. In Bradenton, the nutsedge population (6 plants/ft²) with non-treated soil on 6 Nov. 2001 was reduced similarly by 84 to 90% with MBr-chloropicrin (Pic), metam-Na (drip-applied), and pebulate + fosthiazate + Pic. Treatments that failed to control nutsedge were 1.) iodomethane/Pic, 2.) metam-Na (rototilled) with either Pic, 1,3-dichloropropene (1,3-D), or PlantPro, and 3.) pebulate + Pic + enzone. Stunt (*Tylenchorhynchus* sp.) nematode populations on 3 Jan. 2002 were reduced by at least 94%, relative to the 35 nematodes per 100 cc soil with no treatment, with metam-Na (drip-applied), pebulate + fosthiazate + Pic, and basamid + 1,3-D with 35% Pic. Tomato yield in Bradenton increased from 51 lb/10 plants with non-treated soil to at least 84 lb/10 plants with all treatments. In Immokalee, weed and nematode populations were minimal; however, Fusarium crown rot (*Fusarium oxysporum* f. sp. *radicis-lycopersici*) infected 15% of the tomato plants with non-treated soil compared to incidences of 5% or less with metam-Na + PlantPro (20EC), pebulate + fosthiazate (drip-applied) + Pic, Nazide at 100 lb/A, and multiguard at 600 lb/A. Tomato yield in Immokalee was not influenced by treatments, possibly due to low pest pressure. No treatment controlled all pests; however, for each pest, one or more treatments performed as well as MBr.

Herbicide and Mulch Evaluations for Weed Management in West Central Florida Strawberries

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Two trials were conducted to evaluate the effects of herbicide and mulch combinations on weed management and strawberry yields under field conditions. Treatments were established in a split-plot design with 5 replications. Herbicides were the main plots and mulch types the subplots. The herbicides napropamide at rates of 4.50, 6.75 or 9.00 kg/ha; oxyfluorfen at 0.57 kg/ha; and napropamide + oxyfluorfen at 4.50 + 0.57 kg/ha were applied pretransplant on pressed beds covered with either low-density polyethylene mulch (LDPM) or virtually impermeable film (VIF). Weedy controls were also included. Ranked weed counts were analyzed by using a Kruskal-Wallis test (P=0.05) and fruit numbers and weights were examined with analysis of variance. Means were separated with a Fisher's protected LSD test at 5% significance. Results indicate that mulch types had no influence on weed counts and yields, whereas herbicides affected both variables. No significant herbicide by mulch interactions were found. The napropamide + oxyfluorfen treatment resulted in the highest fruit numbers and weights. This herbicide combination showed the best grass and broadleaf weed control.

Integrated Management of Thrips and Tomato Spotted Wilt in Field-Grown Fresh Market Tomatoes

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During the Spring tomato growing season in North Florida and South Georgia, the primary threat to yields is *Frankliniella occidentalis*, or Western Flower thrips. Thrips feed on flower tissue, pollen, and developing fruits and transmit Tomato Spotted Wilt virus (TSW), which may infect plants at a rate of 10% to 50% and above during an epidemic year. Of the different IPM practices currently available, resistant varieties, UV-reflective (metallized) mulches and Actigard® are three tools that have shown great potential for lowering thrips numbers and incidence of TSW in fields. A survey was conducted during August 2002 to determine which of these practices growers are currently using to combat this problem. Results showed that Actigard® was used by 55% of producers. Only 23% of growers are utilizing the new metallized mulches, while 50% used TSW-resistant varieties, and 28% used neither Actigard®, metallized mulches, or resistant varieties. Fields that used only black plastic mulch experienced thrips outbreaks averaging 17% loss, whereas metallized mulched fields experienced only 2% losses from TSW. It was found that although the majority of growers have adopted multiple tactics for combating thrips and TSW, efforts should continue until all tomato operations integrate a combination of these pest management tools into their production strategies.

Effect of 1,3 Dichloropropene and Chloropicrin on Purple Nutsedge (*Cyperus rotundus* L.) Under Two Mulches & Two Application Methods During the Spring of 2002

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Purple nutsedge (*Cyperus rotundus* L.) and yellow nutsedge (*Cyperus esculentus* L.) are serious problems in much of the vegetable production area of North Florida. Methyl bromide has traditionally provided excellent control of nutsedge in field plasticulture systems in Florida. This trial was conducted to evaluate alternative fumigants to methyl bromide due to the proposed phase out of methyl bromide in 2005. Plots were established in the spring of 2002 on a Lakeland fine sand at the North Florida Research and Education Center – Suwannee Valley, near Live Oak, FL. Main plots were soil fumigants and split plots were plastic mulch types. All fumigant and mulch treatments were applied on March 6, 2002. Three soil fumigant treatments were evaluated in the trial; 1) no fumigant, 2) Telone C-35 soil injected, and 3) InLine chemigated via drip tape. The two polyethylene mulch treatments included: 1) standard high density polyethylene and 2) a virtually impermeable film (VIF). Purple nutsedge populations were totally controlled when InLine via drip tape or Telone C-35 soil injected was used with VIF film. When high density polyethylene mulch was used, nutsedge populations were reduced by both InLine and Telone C-35 treatments when compared to the untreated plots. Soil gas levels of 1,3-D were consistently higher in VIF over high density polyethylene mulch plots.

New Miticides and Programs of Application for Control of Twospotted Spider Mite (*Tetranychus urticae* Koch (Acari: Tetranychidae)) on Strawberry

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The twospotted spider mite is a key pest of strawberry in Florida and around the world. In Florida, growers may choose biological or chemical methods for control and achieve good results. Chemical methods require reapplications throughout the season but control costs are spread over a longer period and costs can be halted if the crop becomes uneconomic early. Biological controls are applied once and can be effective as long as the crop is in the field, but the total cost of control must be borne early in the season. For these and other reasons some growers feel that they should not invest in the biological control and thus require a selection of effective miticides. Programs of acequinocyl, bifentazate, CX-7020, CX-7026 etoxazole, fenpyroximate, hexythiazox, and milbemectin alone and in combinations with other miticides were compared to a program of abamectin and to an untreated check during the 2001-2002 or 2002-2003 strawberry fruiting season or during both. All programs except that of CX-7020 provided good control and may be useful for Florida strawberry farmers. The not yet registered acquinocyl, CX-7026, etoxazole, fenpyroximate, and milbemectin may add to the diversity in miticidal modes of action that can stabilize the list of miticides effective in Florida's strawberry industry.

The Effect of Methyl Iodide on *Rhizoctonia solani*, *Meloidogyne incognita* and Yield in Florida 47 Tomato

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Methyl iodide (TM-42501) a nonionizing chemical was selected to determine effectiveness for control of soil borne plant pathogens. Four soil fumigants were evaluated for control of soil-borne *Rhizoctonia*, and root-knot nematode, and fruit yield: TM-425 + Chloropicrin at 300lb. and TM-425 + Chloropicrin + methyl-bromide at 300 lb., TM-425 at 100 lb., TM425 at 175 lb., Telone C35 at 35 gal., and chloropicrin(PIC) at 137 lb. per acre. A field trial was installed on January 29, 2002 at a site on sandy loam soil in Central Florida. Soil beds were formed 48 inches wide on 6 ft centers. Each plot was 500 feet long, replicated five times. Fumigants were injected through three shanks, 9 inches apart, at depth of 4 inches with 1.5-mil polyethylene film placed over the beds. After 7 days plastic was perforated to allow venting and 12 days later tomato cultivar 'Florida 47' transplants were planted at spacing of 24 inches in row on March 29, 2002. All of the fruits were harvested from 30 plants/plot. Following fruit harvest 10 plants/plot were pulled for root evaluation. TM-42501 plus Chloropicrin, TM-42501, and Methyl bromide plus Chloropicrin provided statistically significant control of root rot and root knot nematode as compared with untreated control. TM-42501 plus Chloropicrin, TM-42501, and Methyl bromide + Chloropicrin provided significantly more large fruit compared with control.

An Improved Management Program for Controlling Pepper Weevil , *Anthonomus eugenii* Cano (Coleoptera: Curculionidae)

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The pepper weevil (PW), *Anthonomus eugenii*, is an important pest of pepper. Use of one application of Cryolite followed by two applications of oxamyl, one application of Calypso and one application of thiamethoxam provided significant reduction of PW population. Use of flat-pan yellow sticky trap (Trece) or tubular yellow sticky trap (Plato Industries, Ltd) also reduced pepper weevil populations. Use of Malathion impregnated in the tubular yellow sticky trap provided 90-100% mortality of PW for three weeks.