

Abstracts of the 2015 Meeting of the Florida State Horticulture Society

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Poster Section

Celebrating the History and Future of the Florida Small Farms and Alternative Enterprises Conference

M.E. Henry, Polk County Extension, UF/IFAS, D. Treadwell, Department of Horticultural Sciences, Gainesville, UF/IFAS; R. Hochmuth, North Florida Research & Education Center, Live Oak, UF/IFAS.

Since establishment in 2005, the UF/IFAS Small Farms and Alternative Enterprises Team has developed a strong core of Extension Agents and innovative programming to meet the needs of small and mid-sized farms exploring new opportunities in agricultural production. Stakeholders expressed need for researched based information addressing emerging trends in smaller and alternative production and marketing and the Florida Small Farms and Alternative Enterprises Conference was born in response. From 2009 through 2014, in collaboration with FAMU, the conference delivered cutting edge information to more than 2,600 unique individuals, establishing itself as the premier event for quality, research-based small farms information and an outstanding networking opportunity. Concurrent sessions offered presentations, panel discussions and hands on activities in topic areas including organic and sustainable production, pest management, hydroponics, livestock production and business and marketing. The overall objectives of the program were to improve the ability of small farmers to locate and apply research-based information; improve the ability of small farmers to access resources, such as suppliers and assistance programs; provide a venue for advancing discussion on policies affecting small farms; and foster the networking of small farmers and others around the state. The program consistently boasted locally sourced food and an open atmosphere for connecting with a large exhibit hall, vendors, and educational posters. Livestock exhibits reflecting the diversity of Florida's small farms were featured and educational tours were added to the program in 2011.

Conference evaluations consistently reflected solid program outcomes. Evaluations for the 2014 program showed that 87% (n= 74-181) of respondents felt they could apply what they learned to

their farm or organization. Eighty-eight percent said they could locate useful information as a result of the conference. Sixty percent felt they could recognize how agricultural policies apply to operations and the associated roles, rights and responsibilities. Seventy eight percent felt they could increase their networking with small farms community members. Planned adoption of practices related to the sessions ranged from 40-78% (n= 27-80), with adoption of new hydroponic practices being the most popular. Respondents from 2014 that had also attended the 2013 conference reported improved pest management, networking, and marketing abilities, among others as a result of attending the previous conference.

Future of the program: An FDACS Specialty Crop Block Grant (SCBG) has provided significant funding to support the specialty crop components of the conference from the beginning, and will continue to provide support over the next two years. The delivery of the program is changing however, taking on a regional conference format. Five regional conferences are in the planning stages around the state, with the first conference in Jacksonville.

Pros and Cons of adopting this program: The Small Farms and Alternative Enterprises Conference has established a reputation for high quality program delivery and unmatched networking opportunities for small farmers. Participating in a regional conference team can help to develop program capacity of County small farms programming by building the framework of regional team programming, anchored by the program funding, marketing and networking resources of the statewide conference.

Evaluation of Fungicides Applied at the Cotyledon Stage for Control of Downy Mildew on Baby Kale Grown for Spring Mix

Christian F. Miller, Palm Beach County Extension, UF/IFAS, E. McAvoy, Hendry County Extension, UF/IFAS and R. N. Raid, Everglades Research & Education Center, Belle Glade, FL UF/IFAS.

Due to its versatility and nutritional benefits, kale has risen in popularity among U.S. consumers. One popular form is baby leaf kale for use in spring-mix salads. A short-season crop (usually 24-30 days), baby kale is planted at very high densities in rows spaced at only 5 cm and the canopy fills in rapidly. This reduces air flow through the crop and the resultant lengthy periods of leaf wetness are very conducive to downy mildew, incited by *Hyaloperonospora parasitica*. A field trial was conducted to evaluate various fungicides applied at the cotyledon stage for their efficacy in controlling this disease. The experiment consisted of a randomized complete block design with three replications of 12 treatments. Fluopicolide (Presidio, 292 ml/ha), mandipropamid (Revus, 584 ml/ha), dimethomorph (Forum, 453 ml/ha), cyazofamid (Ranman, 200 ml/ha), and potassium phosphite (Fosimax, 3.5 L/ha) were each trialed at a single rate, while mefenoxam (Ridomil Gold, 0.58, 1.16, 1.75 L/ha) and oxathiapiprolin (Syngenta experimental, 88, 176, 247 ml/ha) were each tested at three different rates. All treatments with the exception of the control also received a single application of potassium phosphite (Fosimax, 3.5 L/ha) one week after the initial application. Disease was assessed by visually estimating the percentage of canopy displaying symptoms at two randomly selected areas of each experimental unit 22 and 26 days after the initial treatment. Although disease pressure in the area was extreme, all fungicide

treatments provided significant downy mildew control, with mefenoxam, oxathiapiprolin, and mandipropamid providing the best results (no disease vs 37% severity in the untreated check on Day 22) (Figure 1). However, by Day 26, all treatments displayed some disease, and rate effects were significant among the three rates of mefenoxam and oxathiapiprolin. There was significant improvement in management when mefenoxam was increased from 0.58 L to 1.16 L, but not from 1.16 to 1.75 L. Control with oxathiapiprolin improved with increasing rates. The high levels of control with mefenoxam were a bit surprising given the history of fungicide resistance to the phenylalanine (FRAC Class 3) fungicides in the past. Apparently, the populations of *H. peronospora* present in this region of FL are still sensitive to this compound. Results demonstrate that preventative applications of efficacious fungicides can successfully manage downy mildew under even extreme conditions, but that one or more subsequent fungicide applications are necessary for full season control. Given that spring mix plantings are commonly staggered, with varying stages of growth present at any one time, there is a heightened prospect for downy mildew inoculum to be present in the area throughout much of the growing season. For this reason, it is highly recommended that fungicide applications be initiated at the cotyledon stage, to prevent early infections. By maintaining disease at low levels and rotating efficacious fungicides with dissimilar modes of action, the threat of fungicide resistance developing is likewise reduced.

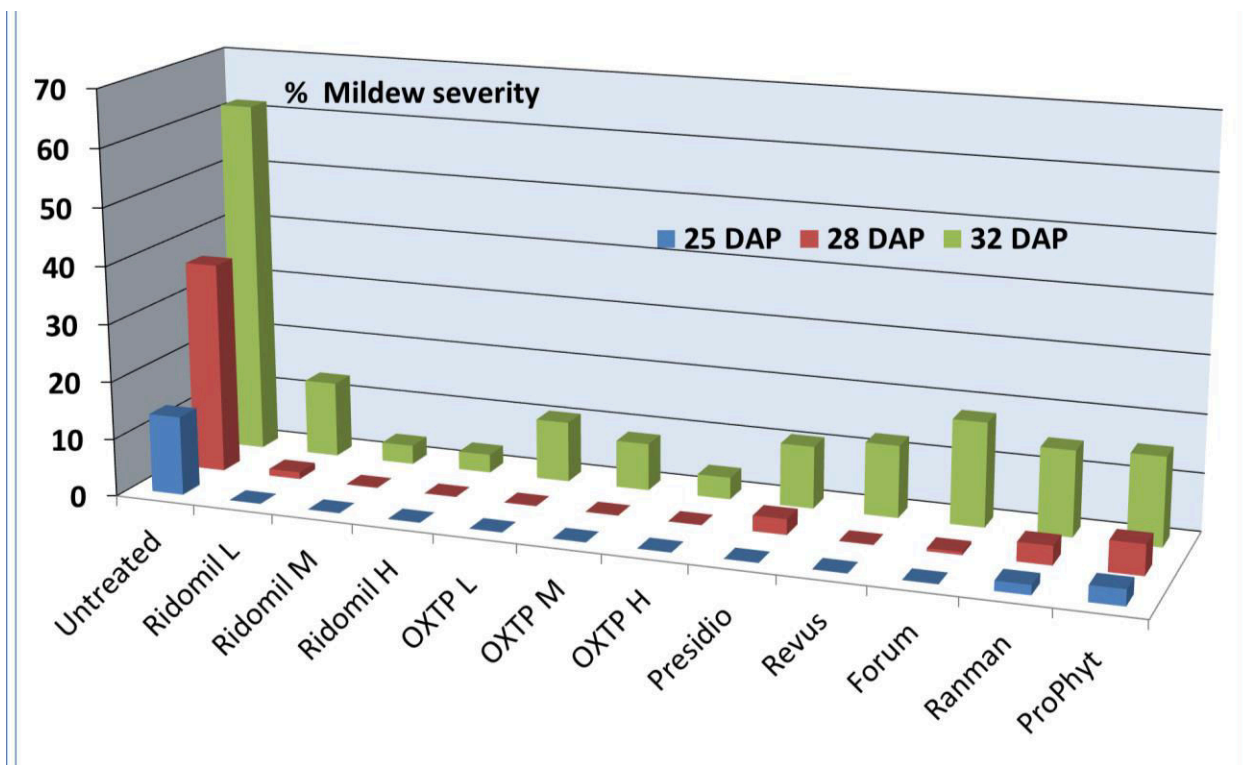


Figure 1. Downy mildew severity (%) observed in the various treatments 25, 28, and 32 days after planting. Ridomil (mefenoxam) and OXTP (oxathiapiprolin) were tested at three rates (low, medium, and high), while the other fungicides were each tested at a single rate. All were applied alone at the cotyledon stage, with one subsequent application of potassium

Expanding Florida's SNAP-Ed Program from Farm to Plate

Zach Glorioso, UF/IFAS, Sarasota County Extension, K. Korman, UF/IFAS, Family Youth and Community Sciences, D. Campbell, UF/IFAS, Family Youth and Community Sciences, C. Walmer, UF/IFAS, Escambia County Extension, B. Owens, UF/IFAS, Ft. Lauderdale Research and Education Center, C. Glatting, UF/IFAS, Orange County Extension and D. Treadwell, UF/IFAS, Horticultural Sciences.

Florida's robust agriculture industry has a growing community presence that is increasing access of fresh, locally grown produce to Florida residents. Efforts are underway to ensure this produce is accessible to the children and families in need of healthy food options. The UF-IFAS Farm to School, Farm to Community (F2SC) team strives to increase fresh food access in communities and encourages healthy eating behaviors through program initiatives addressing environmental factors influencing challenges and opportunities of children and adults eligible for Supplemental Nutrition Assistance Program – Education (SNAP-Ed) participation in Florida. Education and marketing campaigns coupled with hands-on learning experiences provide a holistic approach to increasing food access and consumption while providing economic, social, and environmental benefits to communities in Florida.

The F2SC team perceives several major challenges to a healthier population in Florida: 1) the number of citizens qualifying for SNAP-Ed is greater than UF's resources to educate them; 2) at a local level, food systems are culturally complex involving many individuals, companies, and partners, thus requiring significant investment to change practices including increasing the access to healthy foods and promoting healthy food choices; and 3) the state's increasingly urban population has little opportunity to become aware of the science and culture of food and farming.

To address these challenges, the team facilitates conversations and meetings with school food service authorities, extension agents, farmers and ranchers, and market managers, to expand food access in schools and communities. The F2SC team also interacts with school garden teachers, food service personnel, chefs, and other community partners to design positive food environments to encourage adoption of healthy eating behaviors. The team provides support through school and community garden implementation and trainings that focus on experiential learning, curricula integration, food production, and nutrition. Smarter Lunchroom trainings, based on behavioral economics, encourage healthy food choices at schools, and farmer food safety trainings are conducted to better equip local producers to sell their products to Florida schools.

In 2014, the F2SC team established or enhanced 78 school gardens, trained approximately 1200 participants, engaged 259 farmers, developed 300 recipes featuring Fresh from Florida fruits and vegetables, conducted 30 recipe taste tests, designed and debuted Florida Food Connect, an online platform that links farms to schools, completed three educational references for procurement, conducted three statewide surveys and one statewide census of school gardens, and published one full-color 74+ page Guide to School Gardens for teachers.

The successes of the F2SC team are based on widespread community acceptance of Farm to School and Farm to Community values that are adopted by individuals and organizations to

create a meaningful impact in their community. Cultural, financial, and educational barriers affect the rate at which communities implement program objectives, but the F2SC team is developing model projects to be implemented in communities and help overcome challenges. The Farm to School, Farm to Community team will continue to expand program goals as more community members and organizations understand the importance of local food access and consumption.

Table b. Farm to School, Farm to Community Initiatives in Florida

UF-IFAS Extension District	Farm to School	Farm to Community	Impact Potential
Northwest	School Gardens, Farm Food Safety, Local procurement; teacher and volunteer garden trainings	Northwest Florida Specialty Crop Block Grant; Community Gardens; Boys and Girls Club	Connecting farmers and regional markets; Assisting farmers in achieving food safety certifications; training teachers and communities to sustain their own garden programs
Northeast	Loften Farm to School to Work Hub; School Gardens; Local Procurement; Food Safety; Hydroponics	Community Gardens; Southern Heritage Seed Collective; Garden Resources	Loften provides food for 14 school cafeterias; Garden resource distribution and sustainability; Therapeutic learning environment
Central	Pine Grove Elementary School Garden and Farm	Community Gardens	Development of food safety plan allowed for schools to become a certified U-pick farm and allowed for use of products in the school cafeteria
South Central	Sarasota FNS \$100k USDA F2SC Grant; School Gardens; F2SC Steering Committee; Garden to Cafeteria; Garden Resources Distribution; Garden Trainings; Local Procurement; Food Safety	Community Gardens; Garden Resource Distribution; Market Gardens; Training Farms; Cooking Matters; Farm food safety trainings;	Adoption of behavior that increases participation in local food movements and benefits community members and organizations in social, economic, and environmental contexts.
South	School Gardens; Smarter Lunchrooms; Local Procurement; Food Safety	Miramar Community Garden; Growing Healthy Kids; Boys and Girls Club	Gardens implemented at many schools and afterschool programs to encourage consumption of fruits and vegetables

Expanding Pesticide Education and Safety Training Across County Lines

Crystal Snodgrass, Martha Glenn, Manatee County Extension, UF/IFAS, S. Steed, Hillsborough County Extension Service, UF/IFAS, C. Esmel McAvoy, Sumter County Extension Service, UF/IFAS, and M.E. Henry, Polk County Extension Service, UF/IFAS.

Many extension offices provide exam training classes, continuing education units (CEUs), and test administration for restricted-use pesticide (RUP) license holders. They also provide Worker Protection Standards (WPS) Train-the-Trainer classes. Often, agents are restricted on how often they can provide training and testing due to constraints. A group of agents in south and central Florida coordinated efforts to better meet the training and licensing needs of producers by providing Core and Private Applicator training and testing and WPS Train-The-Trainer programs regionally. Training locations included six sites.

Objectives of this program were to:

- Provide exam training and testing to more potential RUP license holders
- Ease responsibilities of individual agents while continuing to offer high quality programming monthly
- Provide more CEU opportunities to current license holders
- Achieve a passing rate higher than 75% for Private Applicator test takers

Agents met to coordinate future training, testing dates, and teaching responsibilities. Flyers were created and distributed announcing program dates and locations. Traditional classroom style presentations were delivered. Agents from the region traveled to other locations to assist with registration, class set-up, teaching and testing. Participants were provided with folders containing PowerPoint presentations, as well, as other educational materials including fact sheets and pertinent study materials. Other materials such as WPS posters, manuals, and scouting loops were provided as prizes to stimulate participant interaction.

Thirty classes have been held to date reaching approximately 450 test takers, WPS trainers, and current RUP license holders. Pre and post-tests indicated:

WPS Impacts

- 98% felt that they were more capable in protecting their employees from pesticides and complying with the law after attending the class.
- 85% of respondents would agree or strongly agree that they would adopt or change a practice in regards to the education provided for their Worker Protection Standards trainings.
- 72% of respondents either strongly agreed or agreed that the educational program would lead to positive social or economic impacts from attending the class and being able to train employees properly in pesticide safety and protection.

Private Applicator Impacts

- 98% of respondents reported that they would change at least one thing in their operation regarding pesticide topics covered.

- 87% had an increase in knowledge on the pesticide licensing topics and the increase gain was from 2.02 (1-4 scale) of knowledge in pesticide topics covered to a 3.14 after the class (55% gain).
- Respondents reported the team taught class would increase their economic condition by \$325,008 by passing the pesticide exam when expenses were subtracted. The passing rate was approximately 82% resulting in a total estimate of \$266,673 economic impact for the program.

Pros of adopting this program in another county include more training and testing opportunities provided, involving other agents in teaching puts a new “spin” on the same old material, and there is less of a burden on the individual agent to provide high quality training. Cons include increased travel for participants to regional locations.

For Registration and other information, contact the host County Extension Office

Pasco County Extension
Cami Esmel McAvoy
36702 CR 52
Dade City, FL 33525
352-509-8872 (host office)
cami13@ufl.edu
<http://multicountycommhort.eventbrite.com/>

Polk County Extension
Mary Beth Henry
1702 Highway 17 South
Bartow, FL 33830
863-519-1049
mbhenry@ufl.edu
http://polk.ifas.ufl.edu/AG_Safety/events/index.shtml

Hillsborough County Extension
Shawn Steed
5339 CR 579
Seffner, FL 33586
813-744-5519 x 54147
ststeed@ufl.edu
www.tiny.cc/envirohortprod

Manatee County Extension
(all GCREC-Balm classes as well)
Crystal Snodgrass
Martha Glenn
1303 17th St. West
Palmetto, FL 34221
941-722-4524
crys21@ufl.edu
mglenn7@ufl.edu
<http://oommercialveg.eventbrite.com>

2015 South Central Florida Pesticide Training & Testing Schedule

Exam Review Classes for Private Agricultural Applicator & CORE Standards

Registration Required—Cost \$15 per class—2 classes offered each day
Class start times vary!

Please check with the Local Host for more information
A license is necessary for persons who apply or supervise the application of restricted use pesticides for agricultural production such as nursery, greenhouse, farm, or grove. CEUs have been approved and available.


February 11, 2015	Palmetto
March 3, 2015	GCREC-Balm
April 16, 2015	Dade City
May 21, 2015	Seffner
June 11, 2015	GCREC-Balm
July 16, 2015	Dade City
August 27, 2015	Seffner
September 15, 2015	Palmetto
October 13, 2015	Bartow
December 15, 2015	GCREC-Balm

Worker Protection Standard Train the Trainer

Registration Required, Cost \$20, all WPS T-T-T start at 10:45am
Please Check with the Local Host for more information

The Worker Protection Standard (WPS) is a federal program designed to protect agricultural farm workers in the production of agricultural plants. A person is qualified to teach WPS to farm workers if he/she holds a restricted use pesticide license or if he/she has completed the WPS Train the trainer course. CEUs have been approved and available.

February 27, 2015	Palmetto
June 11, 2015	GCREC-Balm
September 15, 2015	Palmetto
December 15, 2015	GCREC-Balm



Picturing Youth in Horticulture

Keith Fuller, St. Johns County Extension, UF/IFAS.

To encourage youth to develop an interest in horticulture a photography workshop was conducted during a 4-H day camp. After being instructed on photo composition, campers were provided cameras to take plant photos at the St. Johns County Arboretum. Each camper selected their favorite photo. These were entered in the 2014 National Junior Horticulture Association (NJHA) photography contest and were on display at the NJHA Convention in Lexington, Kentucky. Of the nine photos submitted, one received Grand National recognition. Two were National winners and the other six photo entries were deemed worthy to outstanding.

County Extension faculty are required to do youth programming. Making youth aware of career activities related to horticulture may encourage them to pursue it as a career. Selfies are a popular trend which has sparked an interest in photography. Conducting a horticulture photography workshop for 4-H youth is one way to get them to really look at plants and learn more about them.

In August 2014, St. Augustine Camera Club members and St. Johns County Master Gardeners conducted a workshop to teach youth photography skills. Each youth would select a photo that would be entered in the National Junior Horticulture Association Photography Contest. Submitted photos were on display at the NJHA 2014 Convention in Lexington, Kentucky, November 2014 and were judged against entries from around the United States.

During the workshop, adult volunteers escorted 4-H members around the grounds of the St. Johns County Arboretum. Plants were identified to the youth and suggestions were made on how to compose a photo of them. The digital photos were downloaded onto a computer. Each youth picked their favorite photo. They then assisted with the digital editing of the photo for sizing, color enhancement and cropping. They also had to create a name for their composition. The volunteers printed out the edited photos and then mounted and framed them per contest requirements. Once prepared the photos were submitted to the 2014 NJHA Photography Contest.

The contest has established age brackets with varied types of photography categories. This activity allowed the youth to participate in a national event which they can use in their 4-H portfolio. Some of the 4-H members have requested to have the workshop repeated. This shows they have an interest in participating in a horticultural activity.



Fig. 1. Zinnia (*Zinnia Elegans*). A favorite of pollinators. The flower is being shared by a bumble bee and a katydid. Savannah Ponce (National Winner) was able to photograph the moment. The 4-H campers used the gardens of the St. Johns County Extension as their classroom.

This activity can be conducted in other areas. Cameras were borrowed from the volunteers. Editing was done in Power Point and finished photos were downloaded onto jump drives. Photo mounting for display was conducted by volunteers.

Community Coyote Awareness Toolkit

Lisa Hickey, Manatee County Extension Service, UF IFAS

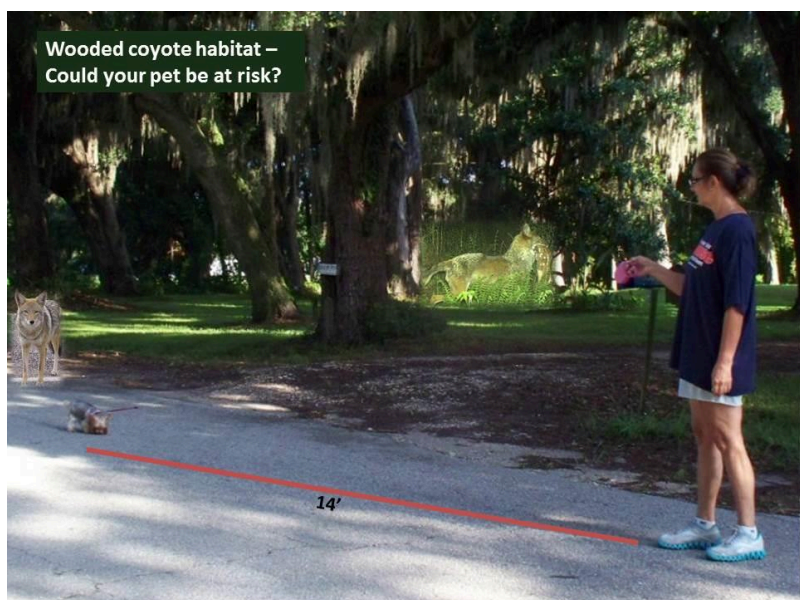
Introduction/Background: Prior to the turn of the twentieth century, wolves were nuisance wildlife to farmers and residential owners. After eradication of wolves, coyote population increased due to lack of predation by wolves. Coyotes expanded their territory into Florida. Their adaptability and behavior easily allows them to adjust in the urban environment (Coates, Main, and et.al. 2011).

Problem faced by target audience: During Manatee County's urban corridor increase, coyote activity in the residential landscapes increased. During the years 2012 - 2014, telephone calls tripled (n=146), expressing concern over the increased activity of coyotes. The Manatee County Commissioners were called on many occasions to “hunt and kill the coyotes”.

Educational approach: The County Commissioners requested Manatee County Extension Service to provide educational programming on coyote awareness. In the spring of 2014, a residential awareness program was fully launched to help residents understand coyote behavior.

Objective: At least 150 residents will attend coyote awareness outreach over a two year period. At least 20% will increase knowledge of coyote behavior as measured by pre and posttests. At least 10% of the attendees will adopt one behavior change in their landscape to reduce coyote encounters.

Teachings and Curriculum: A Powerpoint presentation was created complemented with a tool kit: a coyote fur, foot impression, a model of a coyote skull, jogger precautions, informational handouts by Florida Wildlife Commission and the University of Florida and a fact sheet with a series of four coyote awareness videos. The presentation was given at the Extension office, at homeowner associations, and at local libraries. The workshop lasts for 1.5 hours.



Outcomes and impacts: Two year attendance (n=465) has been rewarding, awareness/knowledge gained was recorded through pre/posttests (56% increase n=156 survey responses), and behavior changes are documented through follow-up phone and email surveys. To date, two homeowner associations have adopted changes in their community to reduce coyote encounters. A few adoptions include: an increase in awareness programs at the annual and monthly meetings, a delay in trash disposal by the curbside until morning (some owners built tighter trash receptacles deterring coyotes from foraging), a reduction of dogs on long, retractable leashes, and a reduction of outdoor pets and pet dishes unattended in the backyard settings in evening hours. The take home message of the workshops is to live in harmony with the coyotes. Residents do not need to become “coyote huggers” but simply make a few adjustments in their lifestyle to help reduce encounters, especially detrimental encounters.

The pros and cons to adopting this program in another county: **Pros** equate to more residents being aware and prepared for coyote encounters if a population exists in their neighborhood. Residents are also aware of stray dog issues versus coyote attacks. **Cons** – residents become agitated to learn someone (the authorities) will not do anything about the coyote population unless a human is harmed. No one is going to eradicate or remove the coyote from the area.

Right Plant – Right Place – Right Here:

The Florida-Friendly Landscaping™ Plant Selection Guide: A Mobile Web App.

E. Momol, G.Hansen, B. Schutzman, T. Wichman, C. J. Bain, C. Lewis, L. Trenholm, J. Marvin, J. Bossart, Environmental Horticulture, Florida-Friendly Landscaping™ Program UF/IFAS, Gainesville, FL and D. Rainey, UF/IFAS Extension Sarasota County.

The conservation and protection of Florida’s water resources begins at home. According to UF/IFAS researchers, homeowners’ landscaping choices can affect the health of Florida’s ground and surface waters. UF/IFAS Extension horticulture experts and the Florida-Friendly Landscaping™ (FFL) Program developed a mobile web application (app) to connect consumer plant choice to the fundamental FFL principle: right plant, right place. Users can browse or search by plant name, type, shape, light requirements, or native status to find specifications for over 400 Florida-Friendly plants. Each illustrated entry provides information such as size; soil, light and water preferences; drought, wind and salt tolerance; growth rate and appearance to help Floridians select the right plant for their purpose and site conditions. Users enter zip code or enable GPS to focus on plants for their USDA hardiness zone. The app’s data is consistent with the most recent research from UF/IFAS and *The Florida-Friendly Landscaping™ (FFL) Guide to Plant Selection & Landscape Design*, 2010. The app can be used on any computer or device with a web-enabled browser, such as iOS- or Android-based phones or tablets. The app is available at <https://ffl.ifas.ufl.edu/plants>. Full access to plant details requires a paid subscription (\$1.99 per year). Users have purchased 300 subscriptions to date. Recent testimonials indicate adoption, use and satisfaction.

A PDF user guide is available online at: http://ffl.ifas.ufl.edu/pdf/FFL-Plant-Guide_User-Guide.pdf and a media kit at: http://ffl.ifas.ufl.edu/materials/FFL-Plant-Guide_MediaKit.zip. The user’s subscription and preferences are tracked and maintained through a user account that is set up during the online

registration and subscription payment process. Access tabs at the bottom of the screen direct the user to the three ways to access plant information: use the guides, search by plant attributes, or browse the database. The *Guides* tab directs the user to the four different plant guides: Plant Type, Plant Shape, Sun/Shade, and Florida Native Status. The *Search* tab allows plant selection by their properties: shape, light needs, hardiness zone, and Florida native status. Individual plants thus identified are described by their scientific name, geographic considerations, yard conditions, appearance, and pest/disease considerations. The app provides a color photo of each plant. Users can enter a zip code to narrow the plant choices to those appropriate for south, central, or north Florida, or enable their device's GPS to focus on their current location. The *Browse* tab provides non-selective access to an alphabetical plant listing. The *Profile* tab allows the user to manage their subscription and preferences. Because the app is a mobile web application, it directly accesses the internet during each use. While access to the internet is required for each use, the user will never have to install updates as all updates are conducted directly to the website. With the app, Floridians can always find the right plant for the right place.

The FFL Plant Selection Guide app enables consumers to make the best plant choices for healthy, sustainable landscapes. Result: Low-consumer cost, low-maintenance, attractive landscapes that add value to the community while protecting and conserving Florida's water and natural resources.

UF/IFAS Extension
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Florida-Friendly
Landscaping™

Screening of Ornamental Herbicides: Small Demonstration Plots

C.E. McAvoy, Sumter & Pasco Counties Extension & S. Steed, Hillsborough County Extension, UF/ IFAS Extension.

One of the largest expenses for nursery crop production is weed control either through the use of chemical herbicides or intensive hand labor. Two commercial horticulture agents teamed up to develop a comprehensive and hands-on program on the following topics: weed identification, proper calibration of backpack sprayer or granular spreaders, and a demonstration of herbicide efficacy on common container weeds. The objectives of the workshops were to increase knowledge on herbicides effectiveness on common nursery weeds and change behavior through calibration of spray equipment and reduced herbicide use. Three hands-on workshops were held in the West Central Florida region that included herbicide/weed demonstration plots. A major component of this program was the herbicide demonstration plots that were set up 2 months before the program was executed. These demonstration plots consisted of 22 pre-emergent herbicide and cultural practice replicated twice in the first year and 11 pre-emergent herbicides replicated four times the second year in 2 locations. The programs attracted 177 attendees over 2 years. Post-evaluations of clientele (n=70) determined that 94% will save money from using the knowledge gained on pre-emergent herbicide trials and herbicide calibration with an estimated \$1627.60 per attendee per year. A follow-up survey (n=11) of workshop attendees confirmed estimates may actually be very low. Seventy-five percent are actually saving money and producers were seeing an average annual savings of \$11,241.94 per attendee in cost and labor savings or a total of \$86,380 from the small sample size. Clientele also indicated in a personal follow-up interview that despite some difficulty with some of the calibration techniques during the workshop, hands-on demonstrations are the best education methods. They reported a change in behavior by including calibration as part of their regular spray routine. Instead of just 'eye-balling' the amount needed for the application. From this, they determined that less than the label rate of herbicide was being use. There is a high potential of building-up herbicide resistant weeds from this improper application of herbicide. Therefore, the impact of this change in practice is linked to managing herbicide resistance due to the wrong rate and labor savings for reduced hand pulling of weeds. The potential benefits to this type of programming are as follows: clientele enjoy interactive programs, and large impacts in terms of behavior change are possible. Some drawbacks to this type of programming are as follows: the demonstration plots would not work in every location because of space allocation, and economic impacts could be variable due to different production practices. Overall, the results of this program enabled horticulture producers to reduce loss from weed pests through proper calibration techniques, correct weed identification, reduction in the amount of chemical herbicides entering the environment, increase water quality, and increase economic viability of the local nursery industry.

Workshop: Winter Strawberries for the Spring

Matthew Orwat, UF/IFAS, Washington County Extension.

Many home gardeners in Washington County love to grow a myriad of fruits and vegetable, but struggle with strawberries. This is due to the fact that local garden centers do not offer the correct

cultivars. In Northwest Florida, “short day” plants are best, and should be planted in October for April and May production. Many times strawberry plants are not available locally around this time. To address this problem, Washington County Extension offered a “Winter Strawberries for the Spring” workshop to teach home gardeners how to grow strawberries as winter-spring annuals. Class curriculum consisted of use of drip irrigation to conserve water, use of natural and slow release fertilizer, and integrated pest management (IPM) for pest control. Particularly, use of weed barrier was encouraged to reduce the need for hand weeding and herbicide application. In addition to lecture instruction, a hands-on planting demonstration was offered to show attendees how to construct their own strawberry bed. Freeze protection was also demonstrated. To insure that participants would be able to start their own strawberry garden, 10 plants of ‘Sweet Charlie’ strawberry were provided as a take home benefit. Participants were also provided with a materials list and instructions for building their own strawberry production bed. In summary, 24 clientele participated in lecture and hands-on activities during the “Winter Strawberries for the spring” workshop. At least six participants have constructed their own strawberry garden as a result of this workshop. Nineteen participants completed surveys, in which 16 (84%) indicated that they learned something new about strawberry bed construction and strawberry production. Eighteen (95%) indicated that they learned something new about strawberry production from the lecture portion and indicated that they will make changes in the way they grow winter food in their garden based on the information presented at the workshop. Also, eighteen (95%) of the students indicated that they will plant a strawberry garden as a result of the workshop. Follow-up surveys will indicate % that actually produced strawberries in April 2015, as well as, the additional gardens developed.

Vegetable Section

V-1

Inheritance of Fruit Traits in *Capsicum annuum* L.: Heirloom Varieties as Sources of Quality Parameters Relating to Pericarp Shape, Color, Thickness and Total Soluble Solids Content

L.B. Vilarinho^{1,2}, D.J.H. Silva^{1,3}, A. Greene¹, D. K. Salazar¹, C. Alves¹, M. Eveleth¹, B. Nichols¹, S. Tehseen^{1,4}, J.K. Khoury Jr.³, J. V. Johnson⁵, S. A Sargent¹, B. Rathinasabapathi^{1,*}
¹UF/IFAS, Horticultural Sciences Department ² Universidade Federal de Roraima, Av. Capitao E Garcez, 2500, Aeroporto – Boa Vista 69304220, RR-Brazil ³ Universidade Federal de Viçosa, Av P.H. Rolfs, S/N. Viçosa, 36570-000, MG- Brazil. ⁴Department of Horticulture, University of Agriculture, Faisalabad, Pakistan ⁵UF/IFAS, Chemistry Department

Inheritance of fruit-related traits was studied in a population generated by crossing two heirloom pepper cultivars (*Capsicum annuum*), ‘Round of Hungary’ and ‘Bulgarian carrot’. Inheritance of corrugated pericarp phenotype of ‘Round of Hungary’ behaved as a recessive trait controlled by two genes while round fruit shape behaved as a single gene. Pungent cultivar ‘Bulgarian carrot’ had significantly higher total soluble solids, titratable acidity, antioxidant activities and had significantly thinner pericarp than fruits of ‘Round of Hungary’. Pericarp thickness was related to differences in both cell number and cell size. Analyses of F₂ fruits indicated that fruit weight was positively correlated (p<0.01) to fruit width and pericarp thickness. Fruit width was

negatively correlated ($p < 0.01$) to fruit length and total soluble solids and positively correlated ($p < 0.01$) to pericarp thickness. Yellow color was negatively correlated ($p < 0.05$) to total soluble solids. Fruit length showed high inbreeding depression and transgressive segregation. Color measurements showed that yellow was correlated to lightness and the relationships between red and yellow color spaces were complex.

V-2

Evaluation of Jalapeño Peppers (*Capsicum annuum*) Production Under Different Shade Cloth

Wellington Farias Araujo¹, Visiting Scientist, UF/IFAS Tropical REC, and Associate Professor, UFRRR/Brazil, Kati White Migliaccio, Dakshina Seal, and Bruce Schaffer, UF/IFAS Tropical

Black shade cloth is commonly used in plant production in Florida, however different colors of shade cloth have been shown to impact plant growth and yield. Thus, the study objective was to investigate the growth and yield response of jalapeño, *Capsicum annuum*, to different shade cloth in field conditions. The experimental design was a randomized block (RBD) with six treatments and four replications. The treatments consisted of cages (1m x 1m x 1m) with a PVC framework that was covered with different shading cloths (Aluminet 50%, White 30%, Red 30%, Pearl 30%, Black 50% and Control- without cover). The Aluminet 50%, White 30%, Red 30% and Pearl 30% were made by Polysack Plastic Industries (ChromatiNet®). The cages were placed on the ground surface and enclosed four pots (volume of 1.5 liters) each. Plants were irrigated with a drip irrigation system. The seedlings were transplanted with four leaves. After transplanting, 70 mL of a commercial fertilizer solution was manually applied to each pot. The next week, 3g of KCl + 3g of Urea + 3g of osmocote plus (15-9-12) were manually applied to each pot. Thereafter, plants were fertilized with 20-20-20 commercial fertilizer (10 g per gallon) fortnightly at a rate of 75 ml per plant. To monitor plant growth under different treatments, the number of leaves, height, SPAD unit, photosynthesis and stem diameter were measured during the cycle. The results suggest that jalapeño production was greatest for White 30% and Aluminet 50% treatments.

V-3

Making Behavior Changes in Home Vegetable Gardening

Lisa Hickey, Manatee County Extension Service, UF

Forty-two million households across the United States have home vegetable gardens, an increase of 17% in a five-year period (Cristelli, 2014). As more people start their own vegetable garden, it is important for horticulture extension agents to meet the demand with residential workshops on the basics of starting a vegetable garden. Over the last eight years, Manatee County annually averages five vegetable gardening classes with an average of 465 participants annually. Over the last three years, pre and post tests were administered during residential workshops for knowledge gained in creating productive vegetable gardens. Three out of nine workshops were surveyed. (n=183respondents) During the last two years, behavior change was additionally measured. A

month after the workshop, an email survey based on knowledge retention and two “intent to adopt a behavior change” questions were sent to the same participants. (n=51 respondents). A follow-up phone call and/or email survey was sent three month post workshop, again measuring knowledge retention and which behaviors were adopted. Adopted practices measured were taking soil pH and soil nutrient samples prior to starting the garden and scouting for pest insects prior to spraying the least toxic pesticide. (n=58 respondents) Interestingly, results indicated participants responded better to the added personal call than to the survey. Precise results will be shared during the presentation.

V-4

Comparison of Water Usage Between Seepage and Sprinkler Irrigation For Snap Bean Production

Yuqi Cui, Xiaolin Liao, Guodong Liu, and Lincoln Zotarelli, UF/IFAS Horticultural Science Department

This trial was conducted with four replicates in a greenhouse to compare water usage of sprinkler irrigation with seepage irrigation for snap bean ‘Bronco’ production. Eight 32-gallon containers (22-inch diameter × 30-inch height) were filled with Arredondo fine sand from Citra, Florida. The containers were individually accommodated in larger containers which contained irrigation water for seepage to keep the water table at approximately 18 inches. Eight seeds were planted in each of the 32-gallon containers. The fertilizers applied were 100 lbs/acre each of N, P₂O₅, and K₂O as ammonium nitrate, triple superphosphate and muriate of potash. 100% P and 20% each of N and K were applied preplant and 80% each of the remaining N and K were evenly used at the first trifoliolate and at the flower bud stages. The results showed that with sprinkler irrigation, seeds germinated 24 hours earlier; plants were 2 inches taller. Bean yields were similar in both seepage irrigation (1.09±0.30 lbs/container) and sprinkler irrigation (1.00±0.17 lbs/container). The respective length and diameter of the beans were greater in seepage irrigation (128.9±18.8 and 8.31±1.1 mm) than in sprinkler irrigation (122.7±20.1 and 7.76±1.27 mm). Leaf greenness and soil nitrate contents were significantly greater in seepage than sprinkler. The overall water usage was 28.6 and 12.1 gallons/container for seepage and sprinkler, respectively. The water savings were 57.7%. These data indicate that sprinkler irrigation has significant advantage over seepage for snap bean production to maximize water use efficiency and maintain similar bean yields.

V-5

Optimizing Nitrogen Rates for Chipping and Tablestock Potato Production in Florida

Guodong Liu, Moshe Doron, and Steve Sargent, UF/IFAS Horticultural Sciences Department, David Dinkins, UF/IFAS Putnam County Extension, and Danny Johns Blue Sky Farms, Elkton, Florida

Nitrogen (N) fertilization is the major cost for fertilizers for commercial potato production. Two trials for chipping (var. ‘Atlantic’) and tablestock (‘Red LaSoda’) potatoes were conducted to

maximize N use efficiency in the Hastings area in 2014. Triple superphosphate and muriate of potash were used at 100 lb/A P₂O₅ and 250 lb/A K₂O with or without surfactant (SFT) with four replicates. The ‘Atlantic’ trial had 6 different N rates: 0, 120, 160, 200, 240, and 280 lb/A. The treatments without SFT were applied N fertilizer as ammonium nitrate preplant (30%), at emergence (30%), and 6- to 8-inch tall of potato plants (40%) while those with SFT were applied 100% N preplant. The marketable yields were 10,817, 32,067, 34,959, 37,458, 36,527, and 37,688 lb/A for 0, 120, 160, 200, 240, and 280 lb/A N, respectively. The yields were 22,144, 26,726, 30,563, and 30,831, and 25,100, 27,662 lb/A for 120 lb N, 160 lb N, 200 lb N, and 240 lb N each with 30 lb SFT, and 160 lb N with 10, or 20 lb SFT per acre. The ‘Red LaSoda’ trial had 5 different N rates (0, 160, 200, 240, and 280 lb/A) and had similar tuber yields for the treatments. This growing season had heavy rain events in early and mid February. Three split N applications without SFT were much better than a single N application with SFT. SFT didn’t work with heavy rains in the early growing season.

V-6

An Economic Analysis of Organic Strawberry Production in High Tunnel in Northern Florida

X. Zhao, Z. Black, UF/IFAS Horticultural Sciences Department and Z. Gao, UF/IFAS Food and Resource Economics Department

As an effective season extension tool, high tunnels offer multifaceted benefits for sustainable vegetable production. Many growers use high tunnels for producing high-value crops to obtain premium market prices with the goal of enhancing economic viability. While interest in high tunnel production is growing in Northern Florida, the high cost of initial investment remains a major concern. Based on an organic strawberry experiment conducted during the 2013-2014 season at the Plant Science Research and Education Unit in Citra, FL, an economic analysis was performed to explore the potential of employing high tunnels for improving profitability of organic strawberry production. Six commercial cultivars including Strawberry Festival, Florida Radiance, WinterstarTM, Treasure, Camarosa, and Albion were tested in the high tunnel and open field plots. Compared with the open field, plants grown in the high tunnel showed an increase in seasonal marketable fruit yield (on a per acre basis), with great variability among cultivars. Although the production cost of high tunnel was at least \$12,000/acre higher than that of open field, the net returns of high tunnel production for all strawberry cultivars were higher than that of open field production. This was mainly attributed to the significantly increased revenue of high tunnel production due to the increased marketable fruit yield. The advantages of high tunnel production are dependent on the strawberry market price. In addition, if the life span of high tunnel changes from 15 years to 10 years, some cultivars will demonstrate reduced net returns under high tunnel production.

V-7

Willingness to Pay for Fresh Strawberry Labeled with Different Sustainable Practices and Environmental Benefits

Zhifeng Gao, Xuqi Chen, Food and Resource Economics Department, UF, Xin Zhao, Horticultural Sciences Department, UF, and Mickie Swisher, Family Youth and Community Sciences Department, UF

Concerns about environmental degeneration due to excessive use of chemical fertilizers and pesticides have grown as farmers have increased reliance on these chemicals to maintain or increase crop yields. Although there are a variety of governmental programs that encourage farmers to adopt practices using less fertilizers and pesticides, many growers continue using conventional production methods in part because the economic benefits of using more environmentally sensitive techniques remains unproven or elusive to farmers. Growers, however, could potentially use labeling to differentiate products produced with environmentally sensitive methods from conventionally produced crops to reap financial rewards for adopting environmentally desirable practices. However, it remains unclear whether consumers are willing to pay a price premium for products produced with other environmentally sensitive techniques and then eco-labeled. This study fills this gap by estimating consumer WTP for fresh strawberries produced with different sustainable and environmental friendly practices. A sample of two thousand four hundred respondents was collected online in June and July of 2014 across the US. Results indicate that consumers' WTP for all types of fresh strawberries with environmentally sound techniques were significantly higher than WTP for conventionally produced berries. The highest WTP was for the berries produced with less pesticide, followed by those produced with less fertilizer and with less harm to water quality. Berries produced with less negative impact to soil and those with less negative impact to air quality received lower WTPs. Regression results showed that significant variables that affect consumer WTP included age, income, concern about origin, etc.

V-8

Crop Rotation and Pest Management for Vegetable Crops in Miami-Dade County, Florida

Qingren Wang, UF/IFAS Miami-Dade County Extension

Pest control is always challenging for vegetable growers in south Florida, especially in Miami-Dade County because of the favorable weather with high humidity and warmth through winter, with which, it is difficult to break out the life cycle of field pests. As a matter of fact, pest population can build up readily with mono-cropping system. In this regard, cover crops and crop rotation provide an opportunity to break some life cycles of pests simply due to the discontinuity of the food chain, and sometimes a suppressive effect on specific pests, such as root-knot nematodes suppressed by sunn hemp (*Crotalaria juncea*) – a summer cover crop, can be expected. This presentation provides some overview and evidences of experimental trials in crop rotation with efficacy in the pest management to improve the production of major winter fresh market vegetables, namely snap beans, squash, sweetcorn, and tomato, etc.

V-9

Management Practices For Controlling Various Thrips And Their Transmitted Tospoviruses, Groundnut Ring Spot Virus (GRSV) And Tomato Chlorotic Spot Virus, In Tomatoes.

Dakshina R. Seal, Mohammed Razzak and C. Sabines, UF/IFAS Tropical Research and Education Center

Tomato, *Lycopersicon esculentum* Miller, is an important vegetable crop in Florida, grown in almost 42,000 acres. Miami-Dade County contributes about 8% of the total Florida tomato production. Production cost for an acre of fresh market tomato is approximately \$6000-\$7000; 25% of which is related to pest management. Insect pests are an important limiting factor throughout tomato production season for causing economic damage by feeding and transmitting viral diseases. In a recent survey, we recorded four different species of thrips- melon thrips (*Thrips palmi* Karny), onion thrips (*Thrips tabaci* Lindeman, common blossom thrips (*Frankliniella schultzei* Trybom) and western flower thrips (*F. occidentalis* (Pergande). Melon thrips invasion has been documented first in the current year in all commercial production acreages. Other three species occur occasionally on tomato in Homestead. In the present study, we will investigate seasonal abundance of these thrips and their related tospoviruses on tomato.

V-10

Newly Labeled Nematicides for Vegetables in Florida

D. W. Dickson, J. E. Thomas, and M. L. Mendes. Entomology and Nematology Department, UF, Soil and Crop Science Department, UF, and Entomology and Nematology Department, Gainesville, FL 32611-0620

In Florida there is a great need for new chemistries to manage nematodes as well as other soilborne pests and phytopathogens. Our objectives have been to evaluate new chemistries for their efficacy both for broad-spectrum pest management as well as for nematode management. Dimethyl disulfide (DMDS) and fluensulfone were recently labeled as a broad-spectrum fumigant and nematicide, respectively, for vegetables. Since 2008, 19 vegetable trials (carrot, cucumber, eggplant, squash, white and sweet potato, and tomato) have been conducted with these products. These trials incorporated raised bed, high density or virtually impermeable polyethylene films, and drip irrigation technology. DMDS was applied either by chisel or drip, whereas fluensulfone was mostly applied as a spray over soil surface and immediately incorporated with a rototiller. After application, a 9-inch tall bed was formed with a power bedder, and covered with polyethylene film. DMDS provided season long control of most weeds, nematodes and soilborne fungi, and provided high crop yields. For fluensulfone, sweet potato and carrot had the best yield increases, whereas cucumber, eggplant, squash, and tomato responded with slightly better or similar yields to the nontreated control. In most trials fluensulfone reduced galling on plant roots or lowered root-knot nematode juveniles in soil as compared with the nontreated controls.

V-11

Managing Root-Knot Nematode (*Meloidogyne* spp.) in Grafted Watermelon.

Josh Freeman, UF/IFAS North Florida REC

Fusarium wilt of watermelon (*Fusarium oxysporum* f. sp. *niveum*) is a serious and expanding disease in many watermelon production areas of the southeast U.S. Grafted watermelons have been reported to provide control of Fusarium wilt. Unfortunately the rootstocks currently utilized for Fusarium control are very susceptible to root-knot nematodes which are also common in many production areas infested with Fusarium wilt. Two non-fumigant nematicides were compared with a fumigant nematicide in grafted and non-grafted watermelon. None of the nematicide treatments significantly reduced root gall index (RGI) in grafted or non-grafted watermelons. Grafted plants had significantly greater RGI and significantly lower yield compared with non-grafted plants. These data illustrate a significant hindrance to the adoption of grafted watermelons in commercial production.

V-12

Assessing Strawberry Canopy Size and Sting Nematode Impact Using Multispectral Reflectance and Color Digital Imaging.

J.W. Noling, A.W. Schumann and M. Cody, CREC, UF/ IFAS (jnoling@ufl.edu)

In Florida strawberry, plant stunting, yield losses, and patchy field distribution are well correlated with soil population densities of the Sting nematode, (*Belonolaimus longicaudatus*). For these studies, multispectral reflectance was used to characterize plant stunting to within row, green vegetative cover. A tractor mounted GreenSeeker® optical sensor was used to scan strawberry rows to provide estimates of green canopy cover (NDVI) against a backdrop of black plastic mulch covering the raised bed. Close-up, geo-referenced, digital photographs of the strawberry bed were also automatically and systematically collected at preset separations along the plant row from a boom mounted USB camera. Camera image greenness and Greenseeker NDVI were compared using regression analysis with and without regard to digital image quality. Even though image quality was quite poor, percent vegetative cover computed from green pixels was still very descriptive of NDVI, explaining 75% of the variation between the two parameters. Regression analysis using images which minimize boom or interior shading, washout, or images which include large portions of the row middle (off center) removed much of the variation and improved descriptive capability to 91%. Accurate maps and assessments of fumigant treatment performance, GPS location, and sting nematode stunting severity of strawberry plants was well described by NDVI field mapping of experimental fields. These results illustrate how digital imaging and greenness analysis can be used in lieu of NDVI to provide a quantitative measure of strawberry yield and to provide growers guidance on suitable alternatives to methyl bromide soil fumigation for nematode management. We are also confident that the USB cameras will add value to automated field surveys of differences in strawberry canopy size, disease and insect feeding damage, and may eventually serve as real-time sensors for on-the-go smart spraying in Florida strawberry.

V-13

Effects of Passive Ventilation and Pine Bark Volumes on Bell Pepper Growth and Yield in High Tunnels

Carlos Zambrano-Vaca, M.A. Olmstead, and L. Zotarelli, UF/IFAS Horticultural Sciences, N. Boyd, UF/IFAS Gulf Coast REC, and B.M. Santos

Bell pepper (*Capsicum annuum* L.) is one of the most important vegetable crops in Florida representing about 33% of the total U.S. production with a value of \$207 million dollars in 2011-12. Demand is increasing for bell peppers; however it is difficult to obtain high quality bell peppers in open field production, predominantly because of high humidity and frequent precipitation. Thus, there is a need to explore protected cultivation techniques for bell pepper production in Florida. The objective of this study was to determine the effect of passive ventilation in high tunnels and various pine bark volumes on colored bell pepper yield and fruit quality. Treatments consisted of the combination of two structure designs and four pine bark volumes. There was no significant effect of ventilation or pine bark volume on plant height, shoot or root dry biomass. However, pine bark volume alone had a significant effect on volumetric water content at 4 weeks after transplanting. Fruit grades (U.S. Fancy and U.S. No. One) and total marketable yield were not significantly affected by any of the pine bark volumes or by ventilation type.

V-14

Feeding Deterrence and Inhibitory Effects of the Bee Balm (*Monarda didyma*) Leaves on the Fall Armyworm (*Spodoptera frugiperda*)

Rabinowitz, R., Rowley, A., Brown, R., and Meagher, R, USDA-ARS CMAVE, Gainesville, FL and Rathinasabapathi, B, UF/IFAS Horticultural Sciences Department

The fall armyworm (*Spodoptera frugiperda*) is a serious pest to many vegetable crops. Because of the many advantages for the use of plant-derived pesticides, we tested whether bee balm (*Monarda didyma*) leaves would have feeding deterrence on fall armyworm. When *Spodoptera* larvae (instars 3-4) were supplied with freshly harvested *Zea mays*, *Monarda didyma* or *Melissa officinallis* leaves for 9 days, 94% of the insects survived on maize leaves, yet only 0.96% and 48% of the insects survived on *Monarda* and *Melissa* leaves respectively. Among the survived insects, the growth on *Monarda* and *Melissa* were highly significantly reduced ($P < 0.001$) than on corn leaves. When a choice between corn and *Monarda* leaves was given, the insect preferred the corn leaves. The nature of the feeding deterrence was likely phytochemical since fall armyworm larvae reared on artificial diet mixed with macerated *Monarda* leaves were significantly ($P < 0.05$) inhibited compared to those reared on artificial diet mixed with macerated corn leaves. Our results suggest that there is potential for the use of *Monarda* for fall armyworm control.

V-15

Field Evaluation of Resistant Tomato for Management of Root Knot Disease in Florida

S. J. Vau and D. W. Dickson, Department of Entomology and Nematology, PO. Box 110620, UF, Gainesville, FL 32611-0620

With few fumigant alternatives growers will be challenged to manage soilborne pest-pathogens on tomato in Florida. Our objective was to evaluate root-knot nematode resistance in tomato as an alternative to fumigation. Two trials were conducted comparing susceptible (BHN 602) and resistant (Amelia, fall or Crista, spring) cultivars. Treatments included in a split-plot field design were: nontreated; metam potassium; chloropicrin; 1,3-D; 1,3-D + chloropicrin; methyl bromide for fall; and dimethyl disulfide replaced methyl bromide for spring. For fall and spring total marketable yield for Amelia and Crista (482 kg/ha and 4,295 kg/ha) was lower compared with BHN 602 (775 kg/ha and 4,766 kg/ha), and was independent of treatments ($P \leq 0.05$). For both trials there was no interaction among cultivars for total marketable yield ($P \leq 0.05$). For fall and spring the highest yields were obtained in plots treated with metam potassium and chloropicrin, respectively. The galling percentages based on a 0 to 100 scale for both trials were similar averaging 2.5 for resistant cultivar and 24 for BHN 602, independent of treatments. Results from this study demonstrate that under field conditions there is good functioning of resistant tomato cultivars; however there is a low marketable yield when no fumigant is applied.

V-16

Developing Technologies for Florida-Produced Strawberry Plug Transplants

E. Torres-Quezada, V. M. Whitaker, Gulf Coast Research and Education Center, UF, L. Zotarelli, R. L. Darnell, Horticultural Sciences Department, UF and K. Morgan, Southwest Florida Research Education Center, UF. (Student Best oral Presentation Competition)

Most strawberry (*Fragaria × ananassa*) production in Florida is based in bare-root (BR) transplants, which is relatively inexpensive and provide acceptable yield. Overhead irrigation is required for establishment during the first 10 days after transplanting. Strawberry plugs (SP) are an alternative to BR transplants with reduced requirement for establishment water; however their cost is double compared to BR due to labor and shipment cost. This experiment evaluated the effect of time in nursery on Florida-produced SP for three cultivars. SP of 'Strawberry Festival', 'Florida Radiance' and 'Florida Sensation' were grown for four and six weeks in a passive-ventilated high tunnel between August and September 2014 and transplanted to the field in early October. The performance of SPs was compared to BR of each cultivar. 'Strawberry Radiance' and 'Florida Sensation' BR resulted in the highest early yield with 1.1 and 0.8 tons/acre, respectively. There was no difference between 'Strawberry Festival' BR and 4-week-old plugs with an average of 0.6 tons/acre for early yield production. 'Strawberry Festival' 6-weeks-old plugs resulted in the lowest early yield with 0.1 tons/acre. 'Florida Radiance' 6-weeks-old SP and 'Florida Sensation' 4-weeks-old SP resulted in the highest total yield with 13.7 and 12.9 tons/acre, respectively. 'Strawberry Festival' 4 and 6 weeks-old SP and BR resulted in the lowest total yield with an average of 8.5 tons/acre. 'Florida Radiance' 6-weeks-old SP and 'Florida Sensation' 4-weeks-old SP resulted in 26% and 8% higher total yield than BR controls.

Influence of Summer Cover Crops on Organic Strawberry Production

Y. Xie, X. Zhao, C.A. Chase, Z. Black, and D.J. Graves, Horticultural Sciences Department, UF

While the majority of the U.S. strawberry production is conventional, consumer demand for organic strawberries is increasing in recent years and interest in organic strawberry production is growing among producers. Summer cover crops have been used in organic strawberry systems in Florida; however, research-based information is rather limited. In this study, two summer legumes, i.e., sunn hemp and hairy indigo, were grown and incorporated into the soil before the strawberry planting season. The summer weedy fallow was included as a control. Plug plants of three strawberry cultivars ‘Florida127’, ‘WinterstarTM’, and ‘Strawberry Festival’ were transplanted on October 9, 2014. The experiment was carried out in the open field on certified organic land at the Plant Science Research and Education Unit in Citra, FL. A split plot design with four replications was used, with summer cover crop management as the whole plot factor and strawberry cultivar as the subplot factor. Summer cover crops did not show any significant effects on plant growth and strawberry yield performance during the early season, whereas some significant differences were observed among strawberry cultivars. ‘Strawberry Festival’ showed the lowest value of chlorophyll content index, while it also tended to exhibit a smaller canopy with a lower number of leaves. With respect to the early fruit yield, ‘Florida127’ had the greatest average fruit weight but the lowest number of marketable fruit as compared with the other cultivars. ‘WinterstarTM’ and ‘Florida127’ demonstrated significantly higher total and marketable fruit weight than ‘Strawberry Festival’.

Ornamentals, Garden, and Landscapes Section

OGL-1

Solarized Potting Soil Effects on Growth of *Lagerstroemia x ‘Natchez’* and *Viburnum suspensum*.

S. T. Steed, UF/IFAS Extension Hillsborough County

Large scale solarization has been used to sterilize used potting soil effectively and economically. Solarizing soil does not alter the physical attributes of potting soil structure. Some slight changes do occur with the chemical properties of the soil, namely, an increase in nitrate nitrogen and a decrease in soil pH. It was unclear if these changes would adversely affect the growth of woody ornamentals when using recycled solarized soil. A growth study was conducted to determine if solarized treated soil would be an acceptable medium for growing woody plants compared to untreated, fresh potting soil. Solarized soil and fresh potting soil was mixed at two rates 33% and 66% and compared with untreated fresh potting soil. A randomized complete block design was used with three replications. *Viburnum suspensum* and ‘Natchez’ crape myrtles were used as test plants. *Viburnum* height and width and crape myrtle heights were measured and compared. There were no statistical differences in growth parameters compared, proving that in this study, solarized soil could be used up to 66% of a soil mix and not adversely affect plant growth.

OGL-2

Evaluating the Plant Performance and Downy Mildew Resistance of Impatiens and New Guinea Impatiens Cultivars in Central Florida

Weining Wang and Zhanao Deng, UF/IFAS Gulf Coast Research and Education Center, and Aaron Palmateer, UF/IFAS Tropical Research and Education Center

Impatiens (*Impatiens walleriana*) is one of the top bedding plants in the United States and is widely used in the landscape. Due to its susceptibility to downy mildew (*Plasmopara obducens*) (DM), there has been a severe reduction of impatiens production and use in Florida in recent years. New Guinea impatiens (*Impatiens hawkeri*) (NGI) and their hybrids seem to be resistant to DM. In this study, 77 commercial cultivars of impatiens (seed-propagated) and NGI (cutting- and seed-propagated) were evaluated in the ground beds in central Florida in 2014. Plants were grown under shade or in full sun. Results showed that in general, plants of NGI cultivars grew to larger plant sizes (taller and/or wider) and produced larger flowers than plants of *I. walleriana* cultivars; a shady environment is more favorable for the growth of *I. walleriana* plants. All *I. walleriana* cultivars evaluated were highly susceptible to DM, becoming defoliated completely in 7 weeks after DM symptoms appeared. Minor differences were observed among some *I. walleriana* cultivars in DM severity. None of the NGI cultivars showed any DM symptom, suggesting that these cultivars were highly resistant to DM. Based on their plant performance in 2014, several cultivars were selected as strong performers. These trials are being repeated in 2015 to identify robust impatiens and NGI cultivars for commercial production and landscape use in central Florida.

OGL-3

A New Miticide PLP Natural Products LLC Provided Excellent Control of Spider Mites (*Teranychus* sp.) on (*Anthurium andreaenum*) ‘Misty Rose’

Robert T. McMillan Jr., Emeritus Professor, UF/IFAS Tropical Research and Education Center

Polyhouse grown Anthurium ‘Misty Rose’ were with 5 treatments and an untreated control. Two treatments were applied on July 10, 2013 and repeated on July 17, 2013. A randomized complete block design was used with four replications consisting of 120 potted Anthurium for each of the treatments. Plants were sprayed on the upper and lower surfaces until runoff with a 1-gallon CO₂-pressurized sprayer (25psi). Mite severity (Index) was rated prior to spraying on July 10 and July 17. Young foliage was selected for severity measurements because this observation gives an indication of the progress of the mite feeding through the crop. Old feeding damage thus did not influence rating. The trial was begun with mites already present. On July 12 all of the products were providing some mite control. However, at the termination of the trial on July 19 Spider Mite Killer, PLP, and Avid provided significantly better mite control as compared to the Palmolive Soap and the Insecticidal Soap and the untreated control. No phytotoxicity was noted. The trial was repeated again July 2014 with similar results.

OGL-4

OGL-5

Grafting *Buddleja* For Nematode Resistance

L. Barber, UF/IFAS Extension Hillsborough County, and S. Park Brown, UF/IFAS Gulf Coast Research and Education Center

Buddleja species are commonly known for their flower colors, fragrance, and ability to attract butterflies and other pollinators. They are usually short-lived in Florida due to root-knot nematodes (Crow and Dunn, 2002; Thetford and Kinloch, 1999). An exception, *B. officinalis*, is long-lived and appears to be resistant or tolerant to root knot nematodes, but small, modest flowers. The hypothesis for this research was that increased flower quality and longevity of *Buddleja* can be achieved by grafting improved cultivars onto nematode-resistant rootstock. The purpose of this preliminary research was to establish a propagation protocol to support this assumption. Rootstock and scion were selected and rooting and grafting methods determined. While cutting propagation of rootstock was extremely successful, wedge grafts were not. Further research should be focused on different propagation seasons, graft procedures, and scions.

OGL-6

Consumer Response to Novel Indoor Foliage Plant Attributes: Evidence from a Rating-based Conjoint Experiment and Gaze Analysis

Hayk Khachatryan and Alicia Rihn, UF/IFAS, Ben Campbell, University of Connecticut, Storrs, CT, Charles Hall, Texas A&M University, College Station, TX, and Bridget Behe, Michigan State University, East Lansing, MI

Rating-based conjoint experiments and eye-tracking analysis were used to investigate the use of unique attributes to stimulate consumer interest in indoor foliage plants. Plant type (*Dracaena marginata* Lam., *Guzmania lingulata*, *Spathiphyllum wallisii* Regel), volatile organic compound (VOC) removal capacity (high, low, no label), price (\$10.98-14.98), production method (certified organic, organic practices, conventional), and origin (in-state, domestic, import) attributes were investigated. Organic production methods, in-state and domestic origins, and high VOC removal all increased participants' purchase likelihood. Participant socio-demographics and visual attention to the plant attributes influenced their purchasing behavior. Purchasing barriers for indoor foliage plants are also discussed. Results have implications for indoor foliage plant growers and retailers as they produce, promote and sell their products.

OGL-7

Cryopreservation of Orchid Seeds, Protocorms and Pollen

Wagner A. Vendrame, UF/IFAS, Tropical Research and Education Center

The popularity of orchids has a worldwide reach, placing them as the top cut flower and potted plant in the international market. Last year, the United States Department of Agriculture (USDA) upgraded orchids ranking first as flowering potted plant in the US with wholesale value estimates of about \$200 million. Orchids are indicator plants to the health of a habitat. Over collection and habitat destruction have promoted the reduction in wild orchid natural populations. Therefore, conservation of orchids needs immediate attention. Cryopreservation is an efficient technique for long-term storage of orchid plant material and can assist in the preservation of endangered orchids. Furthermore, it offers an alternative for long-term storage of orchid genetic material for breeding and genetic improvement programs. In this presentation we summarize several studies with cryopreservation of orchid material, which have been developed in our laboratory at the University of Florida's Tropical Research Center for the past seven years. We have developed an efficient protocol for cryopreservation of hybrid mature seeds, protocorms, and pollen of *Dendrobium* species and hybrids. Improved cryopreservation protocols were developed using phloroglucinol as a cryoprotectant. Seedlings from cryopreserved *Oncidium flexuosum* seeds were also assessed for genetic stability after cryopreservation.

OGL-8

Effects of Control Release Fertilizers on Nutrient Leaching and Palm Growth

Angie Fleurissant, Pushpa Soti, Krish Jayachandran, Agroecology Program, Florida International University, Miami, FL 33199 and Reed, Stewart, USDA-ARS, Miami, FL

Palms, one of the most important ornamental plants in Florida landscapes, are subject to numerous nutrient deficiencies. The objective of this study was to evaluate the effect of different controlled release fertilizer formulations on nutrient leaching, plant growth parameters of two palm species, Chinese Fan (*Livistona chinensis*) and Queen (*Syagrus romanzoffiana*). We compared Nutri-Pak (controlled release 12-4-12) and Harrell's (controlled release 12-4-12) against Atlantic (8-4-12), the most commonly used palm fertilizer in south Florida. These nutrients were added at the manufacturers' recommended rate. Plants were grown in 10-inch pots under 70% shade, watered weekly with pest and weed control done as required. Plant growth parameters: number of leaves, leaf length and width, and basal diameter, were measured every two months. Leachate was collected weekly after irrigation and a two month composite sample was analyzed for concentrations of Ca^{2+} , Fe^{2+} , Mg^{2+} , Zn^{2+} , PO_4^{2-} and NO_3^- . There was no difference in the growth parameters among the three fertilizers for Chinese Fan plants. However for Queen, Atlantic and Harrell's had significantly thicker basal diameter than Nutri-Pak. Significant difference in the concentration of nutrients in the leachate was observed among the fertilizer types. Throughout the study period, Nutri-Pak had lowest concentration of nutrients in the leachate than Atlantic and Harrell's. Our research indicates that Nutri-Pak control release fertilizer is comparable to other commercial fertilizers in Chinese Fan growth but the larger Queen palms likely require an

additional packet. Nutri-Pak fertilizer resulted in less nutrient leaching and could be a better choice environmentally.

OGL-9

Phytotoxic Effects of Hypochlorous Acid, Chloramines, and Chlorine Dioxide in Irrigation Water Applied to Bedding and Vegetable Plants.

Catherine M. Donovan, Paul R. Fisher, and Jinsheng Huang, UF/IFAS Environmental Horticulture Department

To avoid the transmission of waterborne pathogens many producers sanitize recycled irrigation water before reapplication to crops. Previous research and grower experience has shown the potential for phytotoxicity when sanitizing agents including hypochlorous acid, chlorine dioxide, and chloramines are applied in irrigation water. The objective of this study was to apply from 0 to 100 ppm of these three sanitizers to 39 species of container-grown ornamental and vegetable plants in order to measure and photograph phytotoxic responses. In one trial, 0, 1, 2, 4, 8, and 16 ppm were applied once daily as a foliar spray at 15 mL/plant to gomphrena, pansy, and geranium in 144-count plug trays over three weeks. No phytotoxic or growth suppression effects were observed. In a second trial, 39 species received either no sanitizing agent, or 8 ppm of chloramine, chlorine, and chlorine dioxide applied five times a week for 6 weeks in both seedling plug trays and after transplant into 10-cm-diameter pots. Certain crops showed phytotoxicity symptoms from hypochlorous acid or chlorine dioxide on leaves. In a third trial, the 39 species received two applications of 0 or 100 ppm of the sanitizers, resulting in widespread damage on most plant species. No phytotoxicity was observed from chloramines. Given that typical applied concentrations of hypochlorous acid or chlorine dioxide are below 2 ppm, results indicate that at this level phytotoxicity is not likely when solutions are applied once daily. However, if chemical injector equipment malfunctions or a mixing error occurs, sanitizers can rapidly cause phytotoxicity.

OGL-10

Effects Of Pruning Height On Axillary Bud Development In *Dracaena* ‘Waikiki’ And *Dracaena* ‘Ruth Luka’ Grown From Stem Cuttings

Joel D. Stuckey and Malcolm M. Manners, Florida Southern College, Lakeland, FL, John L Griffis, Jr., Florida Gulf Coast University, Fort Myers, FL, Andrew Kawabata and Kheng Cheah, University of Hawaii, Honolulu, HI

While it is common practice to grow multiple cuttings of *Dracaena* in the same pot, the number of branches produced by a cutting will affect the finished appearance of the plant. We studied the ability of the plant to produce multiple shoots, when pruned to various heights, using newly introduced varieties ‘Waikiki’ and ‘Ruth Luka’. Rooted cuttings were pruned to 5.08 cm, 15.24 cm, or 25.4 cm (2, 6, or 10 inches) height and were grown at 60% or 30% shade. All ‘Waikiki’ pruned to 5.08 cm (2 inches) produced two bud breaks per plant at 60% shade; At 15.24 cm (6 inches), 83% produced two breaks and 17% only one break. At 25.4 cm (10 inches), 50% of plants produced two breaks and 50% produced one break, per plant. ‘Ruth Luka’ at 60% shade and pruned to 5.08 cm (2 inches) produced only one bud break on 92% of plants, and 8% produced two breaks. At 15.24 or 25.4 cm (6 or 10 inches), 83%

produced one break and 17% produced two breaks. In the 30% shade experiment, 50% of ‘Waikiki’ pruned to 5.08 cm (2 inches) produced two shoots while 50% produced only one. At 15.24 cm (6 inches), 67% produced two breaks while 33% produced only one. At 25.4 cm (10 inches), 50% of plants produced two shoots while 50% produced only one. With ‘Ruth Luka’ at 30% shade and pruned to 5.08 cm (2 inches), approximately 8% produced 4 shoots, 8% produced 3 shoots, 33% produced two, and 50% produced one. At 15.24 cm (6 inches), 33% produced two shoots and 67% produced only one. At 25.4 cm (10 inches), 50% produced two shoots and 50% produced one.

OGL-11

The Landscape Rodeo Five Years of Training and Fun in St. Lucie County

E. Skvarch, St. Lucie County Extension, UF, C. Kelly - Begazo, Indian River Extension, UF, D. Culbert, Okeechobee County Extension, UF, Y. Goodiel, Martin County Extension, UF, H. Myer, Miami-Dade Extension, UF, and A. Neal, St. Lucie County Extension UF

Over the past five years educators from the University of Florida / IFAS Extension have offered a landscape rodeo to green industry professionals along Florida’s Treasure Coast. The rodeo was introduced as a mechanism for students to reinforce what they learned in the classroom by providing a venue for hands-on learning. The rodeo is held once a year in January and consists of “education stations” where participants are rotated through each station every 50 minutes. At each rotation, participants are actively engaged in hands on activities including fertilizer calibration and application, pesticide spill cleanup, safe use of landscape equipment and landscape Integrated Pest Management. UF/IFAS Extension agents, alongside sales and service members from various green industry businesses provided the training and were encouraged to engage all students in the learning activities. Following the training, a landscape competition was held with events in calibration and application of fertilizer and safe navigation of an obstacle course with a lawn tractor. The top three winners of each competition were awarded gift cards ranging from twenty five dollars for third place to one hundred dollars for first.

OGL-12

T. Badurek and J. Morse, UF/IFAS Extension, Pinellas County

The UF/IFAS Extension Pinellas County Lawn and Garden Help Desk serves thousands of citizens every year. This help is provided via email, phone calls, and in person. In order to assess how our team was doing and to ensure the best education and customer service experience possible we implemented a client survey process. A survey was created to ask the following:

1. How satisfied were you with our service?
2. Did the provided information answer your question?
3. Did you learn something new?
4. As a direct result of this information did you do anything differently?
5. If you answered yes to the question above...What did you do differently?
6. Did the provided information help you solve the problem?
7. Did you share any of the information you received with anyone else?
8. How likely is it that you would recommend our services to a friend or colleague?

9. How did you find out about us?
10. Do you have any comments you would like to share with us?
11. What is your zip code?

The results were overwhelmingly positive and helped guide staffing, volunteer, and marketing efforts. Furthermore, we learned specific information not only about knowledge gain but also about what kinds of practice changes we were encouraging with our help desk work. This survey is sent out twice a year to continue to understand how our work impacts our citizens.

OGL-13

Repurposing Interesting Objects to Encourage Recycling in the Landscape or Garden

Lisa Hickey, Manatee County Extension Service, UF

The Florida-Friendly Landscaping™ Program is designed to educate Florida residents and visitors of techniques that can reduce personal impact Florida's environment in order to sustain the natural ecosystems, the flora and fauna, and teach concepts to increase water conservation and quality of Florida waterbodies. Using creative presentation talents to teach the nine principles of Florida-friendly can remove static from programming. The "reduce, reuse, or recycle" principle was used as a pilot workshop to determine our audience's receptivity to creativity. "Trash to Garden Treasures" workshop was not the typical slideshow presentation of the principle; items were gathered and ideas were shared with the workshop attendees. Products made from recycled material were prizes for class participation and knowledge of the other eight principles. Reused or recycled ideas introduced to the attendees included recycling old fish aquariums into terrariums or worm composting bins (children can view the worm's activity); old bathtubs become the base for a bog garden and plant ideas were shared; old wicker chairs become planters when the seat is removed; and 32-ounce ballpark Styrofoam cups become plant propagation greenhouses to name a few. Three attendees invited Extension back to their elementary classroom, garden club, and homeowner association meeting. A total of four workshops and 127 participants were receptive to our creativity. A brightly-painted, recycled toilet serving as a planter showed up in front of a nearby business shortly after the original workshop.

OGL-14

Updates to the Urban Turf Fertilizer Rule

Don Rainey, UF-IFAS Extension, Sarasota County and L. Trenholm, UF/IFAS Environmental Horticulture Department

In December 2007, the Florida Department of Agriculture and Consumer Services (FDACS) adopted a rule that regulates labeling on bags of fertilizers used on home lawns. The Urban Turf Fertilizer Rule (RE-1.003(2) FAC) regulates what can be sold and marketed as an urban turf fertilizer and requires specific wording on the fertilizer bag. The rule is in effect on fertilizer bags weighing less than 50 pounds. The rule was enacted in response to concerns over potential

pollution of water resources resulting from the nitrogen (N) and phosphorus (P) in these fertilizers. The rule was updated in January 2015 to change the allowable N rates, particularly for the maintenance of turf in parts of the state where a summertime ban on application of N and P exist. The change in the rule is based on UF-IFAS research results on nitrate-N leaching from turfgrass. The new rule allows for use of up to 2 lbs of N per 1,000 square feet for spring or summer applications. Annual N application rates must still follow the UF-IFAS recommendations.

OGL-15

Turfgrass Diagnostic Training Serve to Reduce Negative Environmental Impacts

S.R. Haddock, UF/IFAS Extension Hillsborough County, UF

Urban turfgrass management can be challenging especially under pest and rainy season pressures, and client expectations of perfect monocultures. Many landscape maintenance professionals struggle to manage declining turfgrass in urban settings. A lack of knowledge of general turfgrass culture, biotic vs. abiotic causes of decline, as well as not using a systematic approach to problem identification results in unnecessary or incorrect applications of fertilizers, pesticides and supplemental irrigation. Unintended consequences of misdiagnosis, unneeded chemical applications, and poor turfgrass quality can have an adverse effect on water quality including nutrient loading in aquatic systems. By completing the Turfgrass Diagnostics training, including interactive exercises and end of training test, attendees gain a broader understanding of the impact of management strategies on water quality, how to assess turfgrass health, determine causes of decline, and implement appropriate corrective actions that have a lower impact on water quality. Pre and post training program evaluation reveals that attendees have overall gain in knowledge on training topics, improve their level of confidence regarding recognizing and diagnosing turfgrass problems, and have a greater understanding of how management practices can impact water quality. Two and six month post training surveys reveal that attendees employ the systematic approach to diagnostics taught in the training, recommend alternative courses of action to clients, and have reduced reliance on chemical applications to improve turfgrass quality. Attendees also report improved professional client interactions when discussing turfgrass problems and making recommendations.

OGL-16

Educating Homeowner Associations on Hiring Landscape Contractors

M. Atkinson, Manatee County Extension, UF; P. Monaghan, E. Ott, Agricultural Education and Communication, UF

Homeowner association board members are tasked with evaluating and accepting contracts for landscape maintenance within their communities. Often due to lack of knowledge among board members regarding landscape maintenance the only criteria evaluated is cost, therefore, awarding the lowest bidder the contract. Associations soon find that the level of service is not what was expected, however, neglected to set specific criteria in the contract leaving them with

no recourse. The Environmental Horticulture program of the Manatee County Extension Service has partnered with Manatee County Neighborhood Services and local landscape professionals to offer educational programs to homeowner association board members as well as, property managers, architectural review boards, landscape committee, and other community members. The program, *Tips for Hiring a Landscape Contractor*, incorporates PowerPoint presentations as well as panel discussions with landscape professionals along with a question and answer session. The purpose of the program is to provide community decision makers with guidelines on best management practices in the landscape, the purpose of the best management practices, and items to consider for inclusion in their landscape contracts.

OGL-17

Soil pH and Fertility Test Interpretation on Homeowner Landscape Practices

Pinson, N.D., UF

County Extension Agents interpret soil pH and fertility tests to clientele on a routine basis. These interpretations require tailoring the information to the clients' landscape, needs, or situation. In many cases, clients submit soil samples to solve a problem or plan a landscape. Yet agents typically count these consultations only as client contacts. However, information obtained from soil pH and fertility tests can be used to select appropriate plants, correct nutrient deficiencies, and apply fertilizers or soil amendments. To learn how homeowners use the information provided to them through soil tests and Extension agents, we created and distributed a survey tool to measure potential outcomes of this information. Results show more than 90% of survey respondents are satisfied with the quality of service, 80% replied they know more about soil pH, and 50% responded they changed their fertilizer practices, applied lime or sulfur responsibly, and stated the pH information will help them choose appropriate plants. More than 60% of survey respondents reported the soil test information saved them money and time. Results of this survey demonstrate Extension agents can use survey tools to quantify homeowners' use of soil pH and fertility test interpretation on their landscape practices. Potential outcomes from appropriate plant selection, responsible use of soil amendments, and time or money savings can be useful to Extension agents quantifying their programmatic efforts.

OGL-18

Green and Growing: Peaking Youth Interest in Agriculture

Martha Glenn, Crystal Snodgrass, Diana Smith, Manatee County Extension, Palmetto, FL

Manatee County has over 313,000 acres of production agriculture and ranks 7th in the state of Florida in agricultural sales. However an aging workforce threatens the future viability of these enterprises. Therefore it is vital to inspire our youth to consider careers in agriculture. On June 27th 2014, the inaugural "Green & Growing Youth Field Day" introduced more than 25 youth ages 8-13 to the world of commercial agriculture through various educational field trips and activities designed to demonstrate that careers in agriculture are important and challenging. At the Gulf Coast Research and Education Center in Balm, the youth learned about the many

diverse agricultural careers by speaking with researchers and participating in scientific, hands-on activities. They then toured a local nursery where they learned about propagation, transplanting, growing, and selling native plants. They also toured the Manatee County Master Gardeners' demonstration gardens and learned to transplant and care for a seedling which they later took home. They discovered the art of butterfly farming, and played a variety of agriculture-themed games. Participants included a diverse group of youth from different areas of Manatee County. They were provided the opportunity to explore science and technology in an agricultural setting and became interested in careers in agriculture. Evaluation results showed the youth had a 39% increase in knowledge about agricultural science, a 36% increase in knowledge about the nursery business, and a 28% increase in interest in pursuing a career in agriculture.

OGL-19

School Garden Summer Camp

T. Badurek, UF/IFAS Extension, Pinellas County

School garden popularity increases every day in Pinellas County. Our objective was to increase Extension education in at least ten school gardens in Pinellas County in 2014, while also increasing the quality of those gardens. First we identified one of our horticultural staff who could assist this agent with providing information and guidance to new and expanding school gardens. Next, we reached out to every public school in the county through email to offer our services. This agent and staff provided site visits, emails, fact sheets, grant funding information, links to the Farm to School program for school gardens, curriculum material information, and a one day School Garden Summer Camp for teachers. This event was designed to guide teachers and volunteers through the process of designing, organizing, and implementing a successful school garden. We planned the event on a summer day so teachers could attend and offered continuing education credits for free. We worked with county school board staff to create this incentive. Topics included in the training were vegetable gardening basics, composting, Farm to School information, garden planning, and gardening within the school calendar. 53 teachers, parents, and other volunteers attended. One hundred percent of attendees showed knowledge gain as measured by a pre- and post-test on the topics covered. The results have been successful; we have aided in the establishment, expansion, or rejuvenation of eleven school gardens last year. We have also linked three Master Gardener volunteers closely with several of these new school gardens for ongoing education.

OGL-20

Your Florida Vegetable Garden: Video Series

T. Badurek and J. Morse, UF/IFAS Extension, Pinellas County

Your Florida Vegetable Garden is a six-part video series on vegetable gardening in Florida. The increasing popularity of vegetable gardening has created a demand for more information about gardening in Florida and many people rely on videos found online to learn. There are many videos on the internet on the topic of vegetable gardening but few targeted to Florida audiences

and fewer still with research-based information. Topics covered include fertilization, integrated pest management, micro-irrigation, plant selection and layout, site selection, and soils and composting. The Urban Horticulture and Commercial Horticulture Agents teamed up to plan, write, and record this video series with the help of Pinellas County Communications. The links to this series are available on the UF/IFAS Pinellas County Extension and Pinellas County YouTube channels and on our website at http://pinellas.ifas.ufl.edu/home_landscape/index.shtml. The target audience for this video series includes home vegetable gardeners as well as those gardening in school and community vegetable gardens. The series is sent to interested gardeners and has also been featured on our Facebook page. The videos already have 996 views and plans to evaluate viewers on what they have learned and or implemented are in progress.

OGL-21

Parks That Teach

R. E. Mitchell, Charlotte County, UF; T. S. Becker, Charlotte County, UF; D. Worthley, Charlotte County Master Gardener Volunteer, K. Preston, Charlotte County Master Gardener Volunteer, N. Johnson, CEO, Team Punta Gorda

Formally implemented in December of 2013, Parks That Teach is a public-private partnership between the City of Punta Gorda, The UF/IFAS Master Gardener Program, and Team Punta Gorda© with a grant from the Charlotte Community Foundation©. Part of the corridor of the Punta Gorda Pathways, Parks That Teach provides guided tours led by UF/IFAS Master Gardeners who walk participants through this special "teachable moment" trail. The tour starts on Charlotte Harbor and emphasizes the importance of protecting the estuary. The participating Master Gardeners conducting these tours receive specialized training regarding the flora and fauna along the pathways. On this pathway, visitors view the unique ecosystems of the mangroves, identify trees and shrubs, and learn how these plants can fit into a home landscape. Additionally, participants experience the habitats that support many different Florida creatures including birds, reptiles, fish, and mammals. The Master Gardener guides introduce Florida-Friendly Landscaping™ plants, many of which have signage, as well as invasive plants found in Southwest Florida. Special attention is also given to the extensive mangrove community as a valued habitat for fish, birds, crabs and other creatures as well as the ability of the mangroves to survive under low oxygen and saline environments. Data collected has included the number of participants and survey feedback providing impact to this effort.

OGL-22

Motivational Mentors for the Florida Master Gardener Program

Lisa Hickey, Manatee County Extension Service, UF

The Manatee County Master Gardener Program started a Master Gardener Mentoring Program in 1997. As agents retired, so did the mentoring program. By 2009, attrition had a strong impact on the number of volunteers. Going from over 150 Master Gardener volunteers to 56 by 2007, it was time to revitalize the mentoring program. Several objectives comprise the Master Gardener Mentoring Program: welcome new volunteer trainees into the Master Gardener training program,

encourage trainees to get involved in activities in the classroom, plant diagnostic clinic, and demonstration gardens, guide trainees through questions from the weekly training classes, homework assignments and quizzes, and support them when training becomes overwhelming, not to mention reviewing 100 new plants for the plant identification exam at the end of the training program. Motivational mentors start with the right individual passionate about volunteerism and gardening, knows proper horticultural practices, and loves to share their passion and knowledge with others. In 2013 - 2014, a tool kit was developed to help revitalize the mentoring program. It includes the duties of the mentor, expectations for a successful mentor/mentee relationship, a checklist with week-by-week tasks correlating to the training schedule, and scheduled trainings sessions and materials to mold an individual into motivational mentor. Motivational mentors listen with both ears and continually communicate with their assigned trainee and the horticulture extension agent. From 2007 to 2014, the number of volunteers increased to 95, a 70% increase in the number of volunteers.

OGL-23

Partnerships to Reach New Audiences: The Florida Creole GI-BMP Training Program

Marc Evenst Jn Jacques, E. Momol, L. Trenholm, J. Bossart, J. Marvin, C. J. Bain, Environmental Horticulture, UF/IFAS, Gainesville; D. Rainey, UF/IFAS Extension Sarasota County; B. Hebblethwaite, Department of Languages, Literatures and Cultures, UF/Gainesville; L. Albrecht, W. Schall, F. Dowdle; C. Asuaje, UF/IFAS Extension Palm Beach County; H. Mayer, UF/IFAS Extension Miami-Dade County; M. Orfanedes, UF/IFAS Extension Broward County; Misty Snyder, Florida Department of Environmental Protection, Naples.

Florida statutes mandate Green Industries Best Management Practices (GI-BMP) training for landscaping workers applying fertilizer commercially in the urban environment. The program promotes landscaping practices that minimize potential nonpoint source pollution. Landscaping industry owners and local UF/IFAS Extension Agents identified Haitian Creole speaking landscaping workers as an underserved target audience. Florida-Friendly Landscaping™ (FFL), Florida Department of Environmental Protection (FDEP), UF/IFAS Extension Agents and Specialists, landscaping industry owners, Haitian community leaders, and UF translators partnered to procure funding, translate class materials, recruit bilingual instructors, and promote the new Creole-based training opportunity. Results: a Haitian Creole version of all GI-BMP program materials, three Creole-fluent instructors, and three GI-BMP trainings delivered in Haitian Creole. Outcome: for three trial Creole GI-BMP classes in Palm Beach, Broward and Miami-Dade counties, 45 of 67 Creole-speaking attendees earned GI-BMP certification; pre-/post-test scores averaged a 29% knowledge gain and a 67% passing rate.

OGL-24

Extension and Industry: Spreading Roots and Branching Out with Tree Installation Training

Bolles, E.¹, Dunning, S.², Thaxton, B.³, and Davy, J.⁴

¹Extension Agent, UF/IFAS Extension Escambia Co., Cantonment, FL 32533

²Extension Agent, UF/IFAS Extension Okaloosa Co., Crestview, FL 32539

³Extension Agent, UF/IFAS Extension Santa Rosa Co., Milton, FL 32570

⁴Owner, Panhandle Growers, Milton, FL 32570

There are numerous businesses in Northwest Florida who specialize in installation of ornamental shrubs and trees. Sometimes smaller companies who do a majority of their work in lawn maintenance are contracted to install large shrubs and trees at their current accounts or new accounts. Panhandle Growers in Milton has seen the nursery industry take the blame for declining trees. Extension constantly make site visits to declining trees due to improper planting. UF/IFAS Extension and Panhandle Growers Ornamental and Shade Tree Nursery developed a training to help educate horticulture professionals to properly plant trees. The objective of the training was for 75% of participants to gain knowledge on several tree installation topics and techniques. The half day training began with presentations on common tree installation problems, container vs B&B trees, and proper tree installation. Following the instructional presentations, Panhandle Growers demonstrated proper installation of a large container tree and a B&B tree. A total of 39 horticulture professionals attended the training, 36 filled out an end of program post-test evaluation. Evaluations indicated 100% (36) gained knowledge on recognizing common tree installation problems, 100% (36) increased knowledge of tree planting techniques that promote tree establishment and survivability, 97% (35) increased knowledge of correct handling procedures for container or B&B landscape trees, and 94% (34) intended to use a practice learned in their horticulture job. The training was an example of industry and extension identifying and addressing a problem. Proper tree installation will bode well for nursery producers, installers, and maintainers.

Krome Section

K-1

A Step by Step Guide of Pruning and Shaping Young Tropical Fruit Trees

Jeff Wasielewski, Commercial Tropical Fruit Extension Agent, UF/IFAS, Miami-Dade County Extension

A successful tropical fruit tree is highly productive and able to be harvested and cared for with relative ease. Tree size and shape are important when dealing with fruit trees as large trees can quickly become unwieldy and difficult to manage. Foliar fertilizations, insecticide applications, and harvesting become very difficult when tropical fruit trees are left to their natural size and shape. Minor selective pruning of younger trees can greatly increase the likelihood of well-formed trees that will be able to be kept at the optimum height for ease of harvest and

maintenance. Young trees should be encouraged to have multiple growing points through tipping, as well as to grow laterally by selectively pruning strong vertical shoots.

K-2

Fertilization of Tissue-Culture Bananas Grown in Sugarcane Filter Press Mud and Sphagnum Peat Based Media

N. A. Larsen, Everglades Research and Education Center, UF, and K. K. Moore, Fort Lauderdale Research and Education Center, UF.

Bananas destined for orchards and backyards are often grown from tissue-culture plantlets in nurseries. Little research has been done to determine the proper fertilization rate to produce field-ready plants. Furthermore, research into growing media for banana plantlets is sparse. This study examines the growth response of bananas to fertilization in two medias, one an industry standard, and the other widely used in tropical America. The growing media mixtures consisted of 90% or 55% by volume sugarcane filter press mud or sphagnum peat mixed with perlite and vermiculite. The perlite and vermiculite were mixed in equal parts to make up the compliment of each mixture. Three fertilization treatments of Osmocote 15-9-13, 3-4 month release were incorporated prior to planting: 1.8 g/L, 3.9 g/L and 5.6 g/L. Plants were monitored for color, growth and development until reaching 50 cm in height. The highest rate of fertilizer produced the tallest plants except for plants grown in 55% sugarcane filter press mud. Stem diameter and dry weight were always largest at the highest rate of fertilization; however, only in the 55% sugarcane filter press mud grown plants were these values significantly different from those obtained with the medium rate of fertilizer. SPAD readings were lower for sugarcane filter press mud grown plants than sphagnum peat grown plants. Both growing media and fertilizer rate affect banana plant growth and development in the greenhouse. Results indicate that foliage color, growth, and development do not benefit from fertilization beyond the medium rate of fertilization.

K-3

The Performance of Blackberry Cultivars in North Florida

Peter C. Andersen, Professor, UF/IFAS, North Florida Research and Education Center

Plant vigor, yield, berry weight and soluble solids were determined for six blackberry cultivars at the North Florida Research and Education Center-Quincy. Five University of Arkansas cultivars ('Apache', 'Arapaho', 'Kiowa', 'Natchez', and "Ouachita"), and a cultivar from Brazil ('Tupi') were evaluated over a three year period. Most cultivars were fairly vigorous with the exception of 'Arapaho' and 'Kiowa' which were low in vigor. Yield estimates and yield estimates and berry weights were about 50% of that reported from trials in Arkansas, while soluble solids (°Brix) were similar to published values. Average yield estimate across all cultivars was about 4,300 pounds/acre (4,800 kg/ha), average berry weight was 4.4 g, and average soluble solids was 10.2 °Brix. 'Natchez' and 'Ouachita' (both thornless) and 'Tupi' (very thorny) had the best overall performance. Data were not collected for 'Chester' and Triple Crown', because they both have a

much too high a chilling requirement for north Florida. Blackberries offer good potential for organic culture under the climate and edaphic conditions of north Florida.

K-4

Myanmar's Emerging Tobadee (Avocado) Industry

J.H. Crane¹, U Soe Than Min Din², U Win Aung Kyaw², R. C. Ploetz¹, A. Thanda Kyaw³, Y. Y. Thant³, U Soe Nyunt² and T.T. Sein². ¹Tropical Research and Education Center, UF/IFAS, ²MFFVPEA, Yangon, Myanmar and ³Winrock International, Yangon, Myanmar

Myanmar is located in Southeast Asia and is bordered by Bangladesh, China, India, Laos, and Thailand. The terrain varies from sea level low-lands to mountainous regions up to 5,800 ft. Seedling avocados were initially introduced to the Pyin Oo Lwin area (northeast of Mandalay) during the 1940s. Currently the major producing regions are Shan, Chin and Kaya States and the Mandalay Division, Shan State is the leading producer. During the past 10 to 15 years there has been an effort by the government and more recently by the Avocado Sector of the Myanmar Fruit, Flower, and Vegetable Producer and Exporter Association (MFFVPEA) to expand commercial production. During September-October 2014, TREC faculty advised Winrock International (a USAID-supported NGO) on the status of the industry in Southern Shan State. After surveying production areas and presenting training workshops for producers, recommendations were made to improve cultural practices and manage diseases and pests. Currently, the industry is based on seedling trees with Guatemalan (G), Mexican (M), and hybrid (G x M) backgrounds. The industry has good potential to develop both internal and export markets if several constraints can be overcome. Most importantly, superior seedlings with high yields, good quality fruit and resistance to significant diseases should be selected and clonally propagated to enhance market development. A description of the status of and challenges faced by this emerging industry will be discussed.

K-5

Estate Mango Farming For Farmers Markets and Direct Sale

Thiago B. Campbell and Richard J. Campbell, Fairchild Tropical Botanic Garden, Coral Gables, FL

The mango (*Mangifera indica*) has been cultivated in Florida for over a century. It was grown on a commercial scale since the 1950s and the mango industry of Florida reached its pinnacle in terms of acreage in the 1990s. Hurricane Andrew and pressure from development and low prices due to off-shore competition has considerably reduced the profitability and acreage in Florida. Increasingly there are opportunities for the production of mango using innovative production systems and using new cultivars that can distinguish from those commercially available and that will allow for the pushing of price to make activities profitable. This work details the principles and mechanics of estate mango farming for direct sales and for farmer's markets using a quarter-acre mango project in Miami-Dade County. Due to the small scale and nature of the market, significant opportunities are available in terms of cultivar and production systems that will allow

the grower to be profitable. Scale is key to success. Small acreage (less than 5 acres), high density, organic and/or sustainable practices, innovative pruning and superior cultivars are paramount.

K-6

South Florida Cottage Industry with Canistel (*Pouteria campechiana*)

Noris Ledesma and Richard Campbell, Fairchild Tropical Botanic Garden, Coral Gables, FL 33156

Canistel (*Pouteria campechiana*) (Sapotacea) is a fruit tree species native to Central America. It is grown in many Central and South American, African and Asian countries and some states of the USA (Morton, 1992), but nowhere on a large scale. The canistel is commercially a minor fruit crop in South Florida. Its attractive color, high carotene content, sweet flavor and moist flesh of superior types can increase its potential to be grown on a larger commercial scale. The objective of this study is to deliver a reliable overview of the suitability of a canistel industry based on cottage industry products and services. Cottage industry products have been tested using different canistel varieties at the Fairchild Farm in Homestead, Florida, where we have a collection of 12 superior cultivars. Trees have been in production for 9 to 10 years, with a high, stable yield capacity. The results include recommendations of harvest, postharvest and processing of the fruit.

K-7

The Prospects of Commercial Etrog Production in South Florida, a Culturally Significant Citron

C. F. Miller, Palm Beach County Extension, UF, Steven Silvers, and Naftali Mannosse, Esrog Delights, Loxahatchee Groves, FL.

The traditional etrog is a type of yellow Citron, *Citrus medica* L., with many uses. It also plays a role in Jewish ceremonies during the holiday of Sukkot. During this joyous week-long celebration of the agricultural harvest, people of the Jewish faith also commemorate the forty-year period during which the children of Israel are said to have wandered the Sinai desert some three thousand years ago. The Jewish population has since spread across the globe with a great many settling in Florida. The United States is home to a Jewish population of 5.7 million and 750,000 reside in Florida. South Florida has become such a popular destination that it possesses the single largest concentration of Jewish people outside of Israel. Potential for disease, insect pests, freezes, and a variety of other factors, make growing any type of citrus in south Florida a serious challenge. Etrogs grown for ceremonial purposes are even more problematic because the fruit must undergo the scrutiny of a rabbi prior to use. Defects in shape and blemishes on the skin may render the fruit useless for Sukkot but still suitable for other commercial purposes. The popularity and limited supply of etrogs for use by the faithful often results in prices ranging between \$30 to \$100 per individual fruit and upwards of \$1000 for choice specimens. With a growing Jewish population and increasing demand for the highly valued citron, there exists the potential for a locally grown supply of etrogs if commercial production challenges can be met.

K-8

Economic Feasibility of Small-Scale Specialty Mango Production in South Florida

Noris Ledesma, Fairchild Tropical Botanic Garden, Coral Gables, FL

The local food movement and sustainable food production are gaining considerable interest in South Florida. Both of these innovative approaches to local farming warrant taking another look at mango production in South Florida. This research provides information that may aid farmers in the decision to invest in the specialty mango production in South Florida. The primary objective was to determine the expected profitability for a 1- to 2-acre fresh fruit mango farm in South Florida. Data on production, costs and returns were collected from a private mango farm in South Florida. The project includes budgets and market observations. It was assumed that the farmer would market their production via local markets and specialty whole sale.

K-9

Impact of Cross and Self-Pollination on Fruit Set, Fruit Size, Seed Number, and Harvest Timing in Thirteen Southern Highbush Blueberry Cultivars

Sarah K. Taber and James W. Olmstead, UF/IFAS, Gainesville, FL

Cross-pollination has been associated with improved fruit set, weight, and shortened time to ripening in southern highbush blueberry (SHB; *Vaccinium corymbosum* interspecific hybrids). Because of this, growers commonly plant two or more cultivars in small block sizes to facilitate cross pollination. However, many SHB cultivars may vary in the degree of improvement in each parameter after cross pollination. Understanding the impact of cross pollination for a cultivar is crucial to forming planting recommendations, particularly as growers begin to transition to fields designed for machine harvest where large solid blocks would increase the harvest efficiency. The objective of this study was to examine the effect of self and cross-pollination on thirteen commonly planted or newly released SHB cultivars. Cross pollination typically improved fruit set, fruit size, and seed number while decreasing the average days to harvest. Cross-pollinated fruit always weighed more than self-pollinated fruit from the same cultivar, which was highly correlated to seed number per fruit. Although there was variation for each trait, interplanting with another cultivar sharing a similar bloom time remains the best recommendation to ensure early, high yield in these SHB cultivars.

K-10

Efficacy of Three Macroinfused Fungicides to Control Laurel Wilt on Avocado in Martin and Brevard Counties

J.H. Crane¹, R.C. Ploetz¹, T. White¹, G.C. Krogstad², T. Prosser², J. Konkol¹, and R. Wideman¹.
¹Tropical Research and Education Center, UF/IFAS and ²Rainbow Treecare, Minnetonka, MN

Laurel wilt (LW), a lethal disease of trees in the Lauraceae, is caused by *Raffaelea lauricola* (*Raf*) and vectored by several ambrosia beetle species. Three rates each of macroinfused

thiabendazole (Arbotect[®] 20-S), propiconazole (PropiconazolePro[®]), and tebuconazole (Rainbow Treecare) were tested for efficacy against LW on avocado trees in Martin and Brevard Counties. Seven trees were not treated with fungicide, and five to six were infused with Arbotect[®] (30, 59 or 89 ml of product per inch trunk diameter), or PropiconazolePro[®] or tebuconazole (20, 30, or 40 ml) on 12-13 July 2011. On 13-14 October 2011, all trees were inoculated with the pathogen, and 60, 239 and 558 days after inoculation (dai) laurel wilt development was rated. Laurel wilt developed to a greater extent on trees treated with either tebuconazole or Arbotect[®], 60 dai, than those treated with PropiconazolePro[®] (no symptoms developed at any rate of this fungicide). However, by 239 dai a large proportion of the treated trees had developed symptoms, regardless of the fungicide that was used (mean incidences of 83, 89 and 94% for, respectively, PropiconazolePro[®], tebuconazole and Arbotect[®]). By 239 and 558 dai, disease severities and the recovery of the pathogen were lower in trees treated with PropiconazolePro[®] or tebuconazole, compared to Arbotect[®]. Although lower disease severities developed in the former trees, disease variability among trees within any given treatment suggest other factors (e.g., cultivar and rootstock) may have influenced the results. Current recommendations for managing this disease will be discussed.

K-11

Potential Distribution of *Mylokerus undecimpustulatus undatus* (Sri Lankan Weevil) in North America

A. S. Neal, R. D. Cave, Indian River Research and Education Center, UF, R. Diaz, LSU, Baton Rouge, Louisiana

Mylokerus undecimpustulatus undatus Marshall, the Sri Lankan weevil, is a serious plant pest with a wide range of hosts. First identified in the United States on *Citrus* sp. in Pompano Beach, Broward County, Florida on 15 September 2000, this weevil has over 150 different host plant species including fruits, nuts, vegetables, and ornamentals. It has been detected in 26 counties in Florida by December 2012. Historical data from 2000-2012 obtained from the Division of Plant Industry's field agent submissions were entered into DIVA-GIS, a computer program for mapping and geographic data analysis. The BIOCLIM tool within this program predicted the potential distribution of the Sri Lankan weevil in North America. Cold tolerance data indicate adults are acclimated to lower temperatures until reaching 0°C and -5°C. The cold tolerance data are correlated with the DIVA-GIS predictions to project potential distribution of the invasive species. A sustained and multiple exposure experiment that more closely resembles actual cold events in Florida and other potential areas tested insects gathered in summer and winter to determine increased cold hardiness. This may provide valuable information to assist Extension agents and pest management professionals in preparing control strategies.

K-12

In Pursuit of the Perfect Peach: Consumer-Assisted Selection of Peach Fruit Traits

Mercy A. Olmstead, Jessica L. Gilbert, UF/IFAS Horticultural Sciences Department, Thomas A. Colquhoun, David G. Clark, UF/IFAS Environmental Horticulture Department, Robert Kluson, UF/IFAS Sarasota County Extension, Howard R. Moskowitz, Moskowitz Jacobs, Inc. White Plains, NY

Subtropical peach production has steadily increased as growers realize a distinct market advantage with the first domestically produced peach in the U.S. To support continued growth, the industry and breeding programs would benefit from incorporating desired peach attributes for specific consumer market segments. Thus, a nationwide peach survey assayed peach consumers for their perception of desired peach characteristics and verified these with farmers' market intercept studies during 2013-2014. The top elements that fostered purchase likelihood included categories of flavor, texture, size, and firmness. Consumers preferred peaches that were sweet, juicy, round, with freestone or semi-freestone characteristics. Negative elements were predominantly related to mealy, dry, or meaty textures, indicative of chilling injury that occurs in the postharvest chain. Young consumers (18-24 age group) preferred crisp, firm peaches, with good flavor, while older consumers (51-65 age group) preferred melting texture peaches. Consumers segmented into four distinct groups based on top and bottom elements, and correlated with demographic categories. Farmers' market intercept studies captured predominantly females, over the age of 45, with preferences for melting texture peaches with higher total soluble sugars (TSS). However, aroma and flavor were important attributes in both years, with these being highly correlated with overall liking. Interestingly, TSS was not correlated with overall liking, demonstrating that elements other than sweetness contribute to overall peach preferences. This study provides information for industry, marketers and breeding programs for subtropical peach production on elements that consumers prefer in their "ideal" peach as well as market niches for non-mainstream breeding selections.

K-13

Root-knot Disease on Peach in Florida

Sai Qiu, Entomology and Nematology Department, UF, Janete A. Brito, FDACS-DPI, J. X. Chaparro, Horticultural Sciences Department, UF, M. L. Mendes and D. W. Dickson, Entomology and Nematology Department, UF. Gainesville, Florida 32611.

Peach, *Prunus persica* (L.) Batsch, orchards are increasing in Florida as a result of low-chill high yielding cultivars introduced after many years of breeding. Root-knot, a disease caused by *Meloidogyne* spp. (root-knot nematodes), is considered a limiting factor in peach production. Peach trees infected with root-knot nematodes are typically stunted, bloom prematurely in the fall, and tend to retain foliage during the winter. Disease management depends mainly on the use of improved resistant rootstocks. 'Flordaguard' was introduced as having a broad spectrum of resistance to the most common species found in Florida, namely *M. arenaria*, *M. floridensis*, *M. incognita*, and *M. javanica*. In a preliminary survey of several peach orchards in central Florida, soil and roots were collected from stunted peach trees. Root-knot nematode second-

stage juveniles were extracted from soil and females were dissected from roots and submitted to polyacrylamide gel electrophoresis for species identification based on isozyme analysis. Molecular analysis (PCR-RFLP) using the mtDNA C2F3/1108 primer set and the restriction enzyme *Hinf*I were used to aid in the identification when needed. None of the peach trees were infected with *M. incognita*. However, *M. arenaria* and *M. javanica* were found in about equal numbers in all orchards. *M. floridensis* was found in only one orchard. Research is underway to determine whether these three species represent variant populations capable of infecting the resistant peach rootstock, Flordaguard, or if the infected rootstocks are not true to type.

K-14

Evaluation of Container-Grown Blueberry Cultivars and the Effects of Gibberellic Acid on Fruit Set and Fruit Quality

Victor A. Zayas and Paul R. Fisher, Environmental Horticulture Dept., UF

There is increasing market interest in blueberry as a container ornamental plant with intact flowers or fruit for retail sale to home owners. The objective was to evaluate the performance of several blueberry cultivars as container ornamental plants under natural day conditions in an unheated greenhouse in Gainesville FL, and the potential for use of gibberellic acid sprays to increase fruit set without decreasing fruit quality. The three southern highbush (*Vaccinium corymbosum*) cultivars tested ('Sunshine Blue', 'Emerald', and 'Biloxi' had high reproductive bud count (109, 59, and 83 buds per plant, respectively). 'Sunshine Blue' had the earliest flowering of these three cultivars (Dec 13 2013, Jan 17 2014, or Jan 5 2014, respectively). The upright habit and poor branching of 'Biloxi' were not desirable attributes as an ornamental container plant. Gibberellic acid was applied to 'Emerald' and "Sunshine Blue' at 100 mg.L⁻¹ GA₃ as a foliar spray three times 14 days apart, beginning when each cultivar had the maximum percentage of open flowers. Gibberellic acid hastened date of first green fruit by 17 days and increased fruit number by 47% (to an average 72 fruit/plant), but did not affect the date of first ripe fruit. Fruit weight was increased by 25% using GA₃, but there was no effect on sugar or acid content. Ornamental production of 'Sunshine Blue' and 'Emerald' using GA₃ sprays in greenhouses where pollinators may not be present produced attractive container blueberry plants.

K-15

In Vitro Propagation of Camu-Camu (*Myrciaria dubia*), an Important Medicinal Plant

Maria C. R. Araújo and Wagner A. Vendrame, UF/IFAS, Tropical Research and Education Center, Edvan A. Chagas, Embrapa CPAFRR Roraima, Departamento de Fruticultura, Rodovia 174, Km 8, 69301970 - Boa Vista, RR - Brazil

Camu-camu (*Myrciaria dubia*) belongs to the Myrtaceae family and is a native bush from the Amazonian region, found on the margins of rivers and lakes. This species has great nutritional value, mainly due to the higher levels of potassium and ascorbic acid (vitamin C) values range from 1000 to 6000 mg/100 g in its pulp. In spite of its economic importance, little is known about the aspects of propagation of camu-camu, particularly in vitro multiplication, which could significantly increase yields. Therefore, the objective of this study was to evaluate different concentrations of a cytokinin and an auxin for in vitro multiplication of camu-camu using somatic embryogenesis. Embryogenic callus was induced from leaf and stems explants on two different culture media; Murashige and Skoog (MS) and Woody Plant Media (WPM), supplemented with various concentrations of 2,4-dichlorophenoxy acetic acid (2,4D) (0, 1.0, 2.0 and 4.0 mg/l) along with Benzylaminopurine (BAP) (0, 0.25, 0.5 and 1.0 mg/l). Preliminary results are presented showing induction of somatic embryogenesis on WPM medium with higher concentrations of 2,4-D and BAP, and using stem segments as the source of explants.

K-16

“O42-21-5”, a Potential Early Ripening Breeding Selection for Florida Muscadine Grape Industry

Z. Ren, J. Lu, and V. Tsoлова, Center for Viticulture & Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317

“O42-21-5” is a muscadine hybrid grape from the open pollination of O26-1-8 (Supreme x Ison, 1998) in 2005. The seedling was planted out in 2007. It was noticed in 2012 for its early and uniform ripening. Its horticultural characteristics were further evaluated since 2013. This selection is self-fertile, produce about 60 lb fruits per vine, with high dry scar rate, low fruit ripening rot, and uniform fruit ripening. Its dark red fruits ripen in the middle of August at Tallahassee, FL, about 2 to 3 week earlier than most of the fresh fruit muscadine grapes. Average fruit weight 11.2g, sugar content (SSC) 17.2%, with pleasant crunchy and sweet taste.

Handling and Processing Section

[HP-1]

Anthocyanins and *in vitro* antioxidant capacity of strawberries from different disease control treatments

Marvin Aboutiolas and M. Cecilia do Nascimento Nunes, Department of Cell Biology, Microbiology and Molecular Biology, University of South Florida, Tampa, Florida

Strawberry is one of the most appreciated fruits worldwide due to its delicate flavor, and it is also an important source of bioactive compounds. However, in order to control pests and diseases the current agricultural practices involve almost weekly pesticide applications which may result in chemical contamination of the fruit and possible reduction of its flavor and nutritional value. The objective of this work was to determine the effect of conventional, reduced-fungicide or no-fungicide applications on anthocyanins, the major polyphenols in strawberry, and *in vitro* antioxidant capacity (AOC) of strawberries. ‘Strawberry Festival’ and ‘Florida Radiance’ strawberries from three different cultivation methods were harvested twice from commercial fields in Florida, stored at 1.5 °C and 85% RH and evaluated daily during a seven-day storage period for total anthocyanin contents and AOC. Results from this study showed that total anthocyanins and AOC of strawberries significantly decreased during storage, regardless of the cultivar and disease control treatment. Although at harvest, anthocyanin contents and AOC was significantly higher in organic fruit, after storage the differences between organic and reduced-pesticide fruit were slight or non-significant. Overall, strawberries from the reduced-pesticide treatment, particularly ‘Florida Radiance’, showed better or similar anthocyanin contents and AOC than fruit from the conventional disease control treatment. These results indicate that growing strawberries with reduced-fungicide applications can be an alternative to conventional disease control or organic practices as it reduces production costs and fungicide residues on the fruit while still retaining strawberry anthocyanins and AOC.

[HP-2]

Kitchen practices impact on volatile flavors in ripe tomatoes: effects of refrigeration and blanching.

Libin Wang and Zhifang Yu, Nanjing Agricultural University, Nanjing, China; Elizabeth A. Baldwin, Anne Plotto and Jinhe Bai, USDA, ARS, USHRL, Ft. Pierce.

Both blanching and refrigeration of ripe tomatoes are common practices in kitchen and food service prior to being sliced. However, little is reported on the impact of such treatments on volatile profiles in tomato fruit. In this study, ‘FL 47’ tomatoes at full red stage were dipped in 52 °C hot water for 5 min or exposed to 5 °C for 4 days to simulate the kitchen practices. Of 42 volatile compounds detected, refrigeration generally suppressed production of aldehydes, alcohols, and nitrogen- and oxygen- containing heterocyclic compounds, including the following abundant and/or important volatiles: pentanal, 3-methylbutanal, 2-methylbutanal, hexanal, *cis*-3-hexanal, *trans*-2-hexenal, phenylacetaldehyde, pentanol, 3-methylbutanol, 2-phenylethanol, 1-penten-3-one, and geranyl acetone. On the other hand, the production of aldehydes, alcohols, hydrocarbons, and nitrogen- and oxygen- containing heterocyclic compounds were reduced by heating, associated with low concentrations of 2-methylbutanal, pentanal, *cis*-3-hexanal, *trans*-2-hexenal, phenylacetaldehyde, pentanol, 2-methylbutanol and 2-phenylethanol. The results indicate that a very short blanching prior to slicing or storage of tomatoes in refrigerator instead of at room temperature substantially impact tomato flavor quality and are not recommended kitchen practices.

[HP-3]

Orange Juice Improve the Food Intake and Cholesterol Concentration in Patient with Chronic Hepatitis C

Danielle Raquel Gonçalves, Cláudia Gonçalves de Lima, Paula Souza Ferreira, and Thais Borges Cesar, Department of Food and Nutrition and Paulo Inácio da Costa, Department of Clinical Analysis, São Paulo State University-UNESP, Araraquara, São Paulo, Brazil.

Chronic infection by HCV causes liver inflammation and cancer in the long term. HCV cycle life follows the lipoprotein pathway inside the hepatocytes to survive in the host, and antiviral therapy administered to HCV carriers is associated with side effects which cause nutritional depletion and reduced health quality. Antioxidant supplements have been suggested to minimize the deleterious effects caused by HCV. Orange juice is a well-known source of vitamin C and citrus flavonoids which exhibit antioxidant, hypolipidemic and anti-inflammatory properties. The objective of this study was to evaluate the effects of the consumption of orange juice on the nutritional status and biochemical in patients with chronic hepatitis C under antiviral therapy. 66 patients with chronic hepatitis C, who were being treated with pegylated interferon /ribavirin were supplemented with orange juice 100% commercial pasteurized (n = 46) or not (n = 20), for eight consecutive weeks. Anthropometric, hemodynamic, dietary and biochemical parameters were measured. Following the intervention with orange juice, increased protein (21%), iron (15%), vitamin C (209%) and folate intake were found in the juice group. No alterations were found in the patients' body weight, BMI, body fat, waist and arm circumference or blood pressure. In the post-intervention assessment, the serum concentrations of total cholesterol and LDL-cholesterol decreased only in the juice group (by 9.5% and 12.5%, respectively). In conclusion, the harmful effects of chronic hepatitis C on patients' health quality might be improved by orange juice intake, which can serve as a potential adjuvant for patients with hepatitis C.

[HP-4]

Effect of Pectinmethylesterase On Flow Behavior of 'Valencia' Orange Pulp

Xuan Li, and J. Reyes De Corcuera, Department of Food Science and Technology, University of Georgia, Athens, GA.

Orange pulp has a complex flow behavior displaying slippage at very low shear rates, in addition to changing rapidly with storage time. That change is attributed to pectinmethylesterase (PME) activity prior to pasteurization but has not been characterized. The determination of the effect of PME on the flow behavior of 'Valencia' orange pulp was done on a pilot scale experimental setup with computerized data acquisition system. It consisted of a tank, a steel pipe test loop, measuring devices and data acquisition system. The driving force was provided by a positive cavity pump. The flow rate in the test loop was controlled by frequency of the pump. An electro-magnetic flow meter and two pressure sensors were applied to measured flow rate and pressure drop, respectively. The temperature was measured at the entrance and the exit of system for each

test to make sure the difference is less than ± 2 °C. Pectinmethylesterase was added back to pasteurized orange pulp sample and stored at room temperature (23 °C) for 2, 4, 8, 12, 16, 20, 24, or 48 h. After storage, the pulp was pumped at different flow rates that were set by adjusting the frequency (20, 30, 40, 50, or 60 Hz) of a variable frequency drive. Flow rate and pressure drop data were recorded. Measurements were taken for 2 min while pumping at the selected frequency. Pressure drop in the flow system ranged from 98 psi at time 0 and 20 Hz to 196 psi 48 h after addition of PME, at 60 Hz. In conjunction with rheological parameters achieved from rotational rheometer, apparent viscosity was calculated. The consistency coefficient at very low shear rate (<0.6 s⁻¹) increased by 23% as storage time in the presence of PME increased. Above that shear rate, pulp showed slippage at all storage times.

[HP-5]

A Quality Assessment of HLB-Affected Cold Pressed Oils and Juice from Florida Hamlin and Valencia Oranges

Brittany M. Hubbard and Renee M. Goodrich Schneider, Food Science and Human Nutrition Department, University of Florida IFAS, Gainesville, FL.

Four samples each of Hamlin and Valencia oranges from the 2015 harvest season were assessed. Hamlin oranges were harvested in December 2014 and January 2015 from Lake Alfred, Florida. Valencia oranges were harvested in February and March 2015 from Lake Alfred, Florida. For each harvest date, HLB symptomatic and asymptomatic oranges were collected. Samples were processed into juice and cold pressed oil in the Pilot Plant at the Citrus Research and Education Center in Lake Alfred, Florida. Basic quality analyses were performed on the juice while more extensive tests were performed on the cold pressed oils. The juice analyses included measuring acid, Brix, and Brix:acid ratio (BAR). ANOVA with Tukey's HSD showed significant differences among the four Hamlin samples for acid content ($p<0.05$), Brix ($p<0.001$), and BAR ($p<0.001$). Scott oil tests showed no significant differences in oil yield among the four Hamlin samples. Valencia analysis is ongoing, as well as gas chromatography, optical rotation, aldehyde content, specific gravity, and refractometry tests for both Hamlin and Valencia orange oil, in order to determine if CP oil quality can be predicted from juice parameters.

[HP-6]

The effects of hot water on growth of *Guignardia citricarpa*, the causal agent of citrus black spot on 'Valencia' orange fruit

Jiaqi Yan and Mark A. Ritenour Indian River Research and Education Center, University of Florida IFAS, Fort Pierce, FL, Pamela Roberts, Southwest Florida Research and Education Center, Megan Dewdney, Citrus Research and Education Center

Citrus black spot (CBS), caused by *Guignardia citricarpa*, is a fungal disease in Florida that was first discovered in Southwest Florida in 2010. Lesions can develop after harvest and affect the marketability of fresh citrus. Hot water treatments have been shown to reduce postharvest decay and can also induce fruit resistance to disease and physiological disorders. An *in vitro* test on three isolates of *G. citricarpa* indicated that mycelial growth was suppressed up to 30% by heat treatments: 56 °C for 2 minutes, 59 °C for 1 minute, and 62 °C for 30 seconds. Subsequent *in vivo* tests dipped 'Valencia' oranges from CBS-infected trees into one of the above heat treatments. The harvested fruit was separated into asymptomatic and symptomatic groups, dipped, and evaluated separately. After dipping, fruit were kept at 12°C, with 90% relative humidity, and exposed to 5-10 ppm ethylene and continuous light to speed lesion appearance. On asymptomatic fruit, hot water had no effect on disease incidence, but the treatments did affect symptom severity. Fruit dipped in 56 °C water for 2 minutes, 59 °C for 1 minute, or 62 °C for 30 seconds developed 45%, 29%, and 38 %, respectively, fewer lesions during storage than the control. On symptomatic fruit, the same heat treatments inhibited subsequent lesion appearance by 35%, 18%, and 33%, respectively. Future studies will combine heat with other treatments (i.e., fungicides and essential oils) to develop practical control options.

[HP-7]

1-MCP reduces development of chilling injury symptoms in yellow summer squash

Maria Pittsiouni, University of Foggia, Dept. Science Agriculture, Food, & Environment, Foggia, Italy, and Jeffrey K. Brecht, and Donald J. Huber, Horticultural Sciences Department, University of Florida IFAS, Gainesville, FL.

Summer squash (*Cucurbita pepo* L.) is a high value fresh produce item, but its marketability is limited by sensitivity to low temperature, which varies among different types of summer squash. In particular, symptoms of chilling injury (CI) develop quickly and are highly visible in the yellow type of summer squash at temperatures below 12 °C and the product quickly becomes unappealing to consumers, rendering it unmarketable. Ethylene production has been associated with development of CI. The purpose of this research was to observe the effect of 1-methylcyclopropane (1-MCP; SmartFresh™), which blocks ethylene action, on CI development in yellow summer squash fruit. 'Colorado 601' yellow summer squash that had been treated or not with 1-MCP were held at 1 or 10 °C for 1 or 2 weeks, then transferred to 20 °C for 2 d. Ethylene production was reduced by 1-MCP at both storage temperatures as well as after transfer to 20 °C. Electrolyte leakage was increased by 1-MCP after 2 weeks at 1 °C, but EL was reduced by 1-MCP after both 1 and 2 weeks at 10 °C. Electrolyte leakage appears to be a better

indicator of senescence than CI in yellow summer squash. Chilling injury symptoms of pitting, lenticel discoloration, and surface scald increased in severity during storage at both temperatures, but more so at 1 °C, and CI was reduced by 1-MCP. Treatment with 1-MCP extended the shelf life of yellow summer squash by limiting both CI and senescence and thereby maintaining postharvest quality factors.

[HP-8]

Pre-Storage Application of Oxalic Acid With or Without Quarantine Hot Water Treatment to Alleviate Chilling Injury in Mango Fruit.

Peiyan Li, Xiaolin Zheng, Zhejiang Gongshang University, College of Food Science and Biotechnology, Hangzhou 310018, PR China, Md. Golam Ferdous Chowdhury, Kim Cordasco, and Jeffrey K. Brecht, Horticultural Sciences Department, University of Florida IFAS, Gainesville, FL

Effects of postharvest oxalic acid (OA) application on chilling injury in harvested mango fruit (*Mangifera indica* L.) was investigated using ‘Tommy Atkins’ fruit from Florida that had received a quarantine hot water treatment (QHWT) and ‘Zill’ fruit from Hangzhou that did not receive QHWT. Oxalic acid was applied to harvested fruit as a 5 or 10 mM drench for 10 or 15 min at 25 °C. ‘Tommy Atkins’ fruit typically develop external CI symptoms while ‘Zill’ develops internal symptoms. Oxalic acid treatment significantly reduced CI symptoms in ‘Tommy Atkins’ stored for 18 d at 5 °C and also slowed the rate of softening upon transfer to 25 °C for 4 d. However, OA treatment did not substantially control fruit decay. For ‘Zill’, OA significantly inhibited CI development during storage at 10 °C for 49 d and subsequently for 4 d at 25 °C, enhanced membrane integrity, increased activities of superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (APX), and glutathione reductase (GR) along with decrease in both H₂O₂ content and superoxide radical production, and increased activities of succinic dehydrogenase (SDH), cytochrome C oxidase (CCO), H⁺-adenosine triphosphatase (H⁺-ATPase) and Ca²⁺-adenosine triphosphatase (Ca²⁺-ATPase). Thus, OA may enhance CI tolerance in mango fruit by maintaining membrane integrity associated with enhanced antioxidant activity and regulation of energy metabolism. Application of 5 mM OA appears to be beneficial in controlling postharvest CI in mango fruit.

[HP-9]

Effect of Pulp Temperature and Drop Height on Blueberry Quality

Merce T. A. Santana, Stephen A. Sargent, and Adrian D. Berry, Horticultural Sciences Department, University of Florida IFAS, Gainesville, FL

Blueberry (*Vaccinium ashei*) fruit variety Meadowlark were harvested at a commercial blueberry farm in Archer, FL, during May 2014. Fruit were hand harvested into plastic lugs and transported to the Postharvest Horticulture Laboratory in Gainesville, FL. Twenty blueberries were placed

into individual clamshells and four clamshells were used for each treatment. Clamshells were held at five different temperatures (5, 10, 15, 20, and 30 °C) for 5 or 24 hours for preconditioning, then drop tests were performed at the various temperatures. All 20 fruit from each clamshell were either dropped 0 (control) or 60 cm then evaluated for weight loss and firmness. Fruit was then frozen at -30 °C for later chemical analysis of soluble solids content (SSC) and total titratable acidity (TTA). Weight loss was higher in dropped blueberries compared to undropped. Both dropped and control fruit held at higher temperatures also showed increased weight loss. There was no effect from temperature or time on blueberry firmness. However, blueberries that were dropped had 12% lower firmness than control fruit. The SSC ranged from 13.7 to 15.1 °Brix and 13.7 to 14.6 °Brix for dropped and control fruit, respectively. Blueberry TTA values, reported at percent citric acid, were similar between dropped (0.22 to 0.28) and control fruit (0.24 to 0.31). These results indicated that even short exposure to higher temperatures can impact weight loss. Also, a single drop from 60 cm can reduce firmness.

[HP-10]

Consumer knowledge on handling of high-value specialty crops in the United States: Potential implications for producers and educators.

Amy Simonne, M. Daniels, S. Jensen, D. Diehl, K.P. Shelnut, C. Bruhn, J.K. Brecht, E. Mitcham, Family, Youth and Community Sciences Department, University of Florida IFAS, Gainesville, FL

Fruit and vegetable consumption has been associated with better health and a decreased risk for certain chronic diseases. Despite this common knowledge the consumption remains below dietary recommendations in the U.S.A. In order to better understand this trend, a national online survey was created to explore consumers' attitudes, behaviors, and quality perceptions of five high-value specialty crops including tomatoes (*Solanum Lycopersicum*), strawberries (*Fragaria ananassa*), blueberries (*Vaccinium sp.*), melons (specialty melons [*Cucumis melo*] such as muskmelons, honeydews and watermelons [*Citrullus lanatus*], peaches [*Prunus persica*], and pears [*Pyrus communis*]. Because fruit and vegetable quality can be a complicated issue involving many factors, such as variety, production, and postharvest handling, the survey questions include how consumers handle produce at home after purchase. Based on the survey results (N=1220), it appears that flavor is the most important factor that determines fresh fruit purchasing. While consumers expect producers and retailers to provide the best tasting produce, consumers have very little knowledge on how to select these fruits. In addition, majority of consumers lack specific knowledge on how to ripen and store these fruits and they consistently make mistakes storing climacteric fruits such as tomatoes, peaches and pears in the refrigerator after purchase and before proper ripening, resulting in poor flavor development. Consumers seem to know the correct storage procedures for berries (in refrigerator). This study revealed that consumer education on different quality factors of specialty crops should be a part of the equation for bringing better quality high- value specialty crops to consumers.

[HP-11]

Fate of *Salmonella* spp. on Whole and Fresh Cut Cucumbers.

Laura Strawn, and S. Riedout, Eastern Shores Agricultural Research and Education Center, Virginia Polytechnic University, Painer, VA, Michelle D. Danyluk Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL

In 2014, a *Salmonella* Newport outbreak associated with cucumbers caused 275 illnesses and 1 death in 29 U.S. states and Washington DC. The source of the outbreak was traced back to cucumbers grown at a farm in the Delmarva region of Maryland. Little is known about the behavior of *Salmonella* on whole and fresh cut cucumber. As a result of this recent outbreak, an ongoing study is being performed to examine the growth and survival of *Salmonella* on whole and fresh cut cucumber. The objective of the study was to evaluate the fate of *Salmonella* on whole and fresh cut cucumbers held at 4 and 23°C. Whole and fresh cut cucumbers will be spot inoculated with either a four-strain or five-strain cocktail of *Salmonella*. Inoculated samples will be air dried, placed in containers and stored at 4 and 23±2°C. Samples will be enumerated following stomaching on nonselective and selective media at days 0, 1, 3, 5, 7, 10, 14, 21 and 28 and 0, 1, 3, 5 and 7 for cucumbers held at 4 and 23±2°C, respectively. Population levels will be calculated. It is hypothesized that similar to other produce commodities, *Salmonella* will survive on the surface of whole cucumbers and grow on temperature-abused fresh cut cucumbers (23°C). This study is very relevant due to the recent *Salmonella* outbreak associated with cucumbers (in 2014), and also will provide experimental derived data to determine if whole and fresh cut cucumbers are potential vectors for *Salmonella* transmission.

[HP-12]

Prevention of *Salmonella* cross-contamination between green round tomatoes in a model flume system.

Aswathy Sreedharan, Y. Li, R. Silverberg, A. Gutierrez, and K. Schneider, Food Science and Human Nutrition Department, University of Florida IFAS, Gainesville, FL

Tomatoes were associated with numerous outbreaks of foodborne illnesses between 1990 and 2006, the majority of which are caused by non-typhoidal *Salmonella*. Once the tomatoes are contaminated, minimal processing makes the removal of pathogens difficult. In Florida, harvested green round tomatoes are typically transferred from field bins to packing lines utilizing a flume system. The Florida Tomato Best Management Practices (T-BMPs) require packers to treat tomatoes in a flume system containing 150-200 ppm free chlorine or other approved sanitizers. The amount of chemistry needed is further increased as the level of organic material (as measured by chemical oxygen demand (COD)) builds up in the water as processing continues throughout the day. The amount of sodium hypochlorite necessary to maintain the mandated free chlorine levels increases about 10-fold when the COD levels are increased from 100 to 500 ppm. Preliminary studies indicate that the currently required minimum free chlorine concentrations in packinghouse flume systems may exceed necessity. In this study, the minimum levels (0, 25, 50,

75 and 100 ppm) of sanitizer needed to prevent *Salmonella* cross-contamination between tomatoes in a model flume system under clean and organic loading conditions (0, 500 and 1000 ppm OD) were evaluated. The ability of packers to use less sanitizer could reduce associated chemical and disposal costs, and mitigate negative environmental impact, while still maintaining the safety of the product.

[HP-13]

Microbiological Evaluation of Florida Cantaloupe Packinghouses

Lorrie Friedrich, , and M.D. Danyluk, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL, A. Whidden, Hillsborough County Extension, University of Florida IFAS, Seffner, FL, L. Strawn Eastern Shores Agricultural Research and Education Center, Virginia Polytechnic University, Painer, VA

During the 2013 cantaloupe season, FDA initiated nationwide cantaloupe packinghouse inspections with sampling components targeting *Listeria monocytogenes*. The purpose of this study was to evaluate the sanitary conditions of Florida cantaloupe packinghouses prior to FDA inspections. In May 2013, five Florida cantaloupe packinghouses were visited in advance of FDA. Up to 60 swabs per facility were collected from food contact and non-contact surfaces, and water. Each sample was enumerated for total plate counts (TPC), generic *E. coli*, and coliforms, and enriched for *Listeria* spp. and *L. monocytogenes* by standard methods. Presumptive *L. monocytogenes* colonies were confirmed by amplification of the *sigB* gene by PCR and analyzed by PFGE. Environmental samples (270 swabs and 1 water sample; 172 'zone 1' food contact swabs) were collected. Average zone 1 TPC for all facilities was 5.54 ± 1.40 log CFU/swab; within facilities zone 1 TPC's ranged from 5.21 ± 1.22 (facility E) to 6.05 ± 1.46 (facility C) log CFU/swab. Coliforms and *Listeria* spp. were recovered from 36.6% and 73.2% of zone 1 swabs from all facilities samples, ranging between 27.8% (facility A) - 47.1% (facility D) and 50.0% (facility D) - 86.5.4% (facility A), respectively. *E. coli* was not recovered from any facility (limit of detection 50 CFU/swab). *Listeria monocytogenes* was recovered from 2/270 swabs (0.7%) in one facility; both food contact surfaces. PFGE patterns of the two isolates were identical. Following additional facility sanitation, *L. monocytogenes* was not detected upon retesting.

[HP-14]

Flavor quality evaluation of USDA Sweet Orange-like Hybrids.

Jinhe Bai, Elizabeth Baldwin, Randall Driggers, Jack Hearn and Ed Stover. USDA, ARS, , Fort Pierce, FL.)(Jinhe.bai@ars.usda.gov) [HP-14]

Four citrus hybrids, containing 1/2-3/4 sweet orange balanced by mandarin, which were similar to sweet orange in fruit size, color and taste, were tested for their potential to be classified as new sweet orange cultivars by volatile profile. The sweet orange varieties used for comparison were early to mid-season fruit including 'Hamlin' and 'Midsweet' as well as three others. 'Dancy' was

also included for a typical mandarin volatile profile. Fruit samples were picked on Jan. 23, 2014, Dec. 30, 2014 and Jan. 27, 2015. A total of 114 volatiles were detected and separated into the following 7 clusters: 12 components in Cluster 1 were detected from all varieties and hybrids; 15 components were found in Cluster 2, which were detected frequently in many lines but not in all, with no clear pattern between oranges, mandarins and hybrids; and finally 16 components in Cluster 7, which were rarely detected. These three clusters, with 43 volatile components, were not useful in classification of sweet orange versus mandarin. On the other hand, the rest of the 71 volatiles more or less contributed to this classification, where 34 compounds from Cluster 3 were detected in all oranges and the hybrid, FF-1-74-52, but were not all found in Dancy or the other hybrids; 21 Cluster 4 volatiles were detected in FF-1-74-52 and some of them (13) also in oranges, but none in Dancy or the other hybrids; 5 Cluster 5 compounds were detected in some oranges but never in Dancy nor in any hybrids; and 11 Cluster 6 compounds which were not detected in oranges or the hybrid, FF-1-74-52, but were detected in Dancy and some of the other hybrids. The above volatile profile comparisons showed that FF-1-74-52 had all of the typical sweet orange volatiles, no distinctive mandarin compounds, and could be classified as a sweet orange. The other hybrids were not so similar to sweet orange.

[HP-15]

Evaluation of Postharvest Quality of Six Recently Released Citrus Cultivars in Florida.

Cuifeng Hu, Mark A. Ritenour, Indian River Research and Education Center, University of Florida IFAS, Fort Pierce, FL. F. Gmitter and G. Grosser, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL,

Since 2008, promising new citrus selections developed by UF/IFAS have been evaluated for postharvest quality and quality retention during marketing. Thus far, six released selections have been evaluated over at least three seasons. These include two mandarins (900 and C4-15-19), two sweet oranges (SF14W-62 and OLL 8), and two pummelo hybrids (UKP-1 and 5-1-99-2). The fruit were evaluated during cold storage (40°F for mandarins and sweet orange, 50°F for pummelo hybrids) and received no postharvest fungicide treatments. Compared to 'Fallglo' with total soluble solids (TSS) averaging 11.4%, titratable acidity of 1.09%, and TSS:TA ratio of 10.6, 900 had comparable TSS (11.9), but lower TA (0.76), and thus a higher ratio (14.5). C4-15-19 tended to have even higher TSS (15.7%), TA of 0.77%, and a high ratio of 20.3. The two new selection also had much better peel color at harvest (a^*/b^* between 0.22 and 0.53) than 'Fallglo' (-0.11) and they tended to have more healthy fruit (>90% vs. 77%) after 5 weeks storage. The two sweet oranges had decent color (0.15 - 0.22), TSS (11.4 - 12.6%), TA (0.72 - 0.97%), and ratio (13.0 - 16.3). However, after 6 weeks of storage, OLL 8 still had 91.2% healthy fruit while SF15W-62 only had 84.2%. The two pummelo hybrids had similar TSS (~ 11%), ratio (~13), and peel color (~0.1) at harvest. After 6 weeks storage, 5-1-99-2 had 83% healthy fruit while UKP-1 had only 57%.

[HP-16]

Color evaluation of natural colorants and their application on citrus fruit as alternatives to Citrus Red II.

Xiuxiu Sun, Elizabeth Baldwin, Anne Plotto and Jinhe Bai, USDA, ARS, USHRL, Ft. Pierce; and Mark A. Ritenour, Indian River Research and Education Center, UF

The poor peel color of some varieties of oranges and the hybrids, especially the early season fruits, caused by the subtropical climate of Florida, has resulted in the use of a red dye on the peel to improve their market appearance. Citrus Red II (CR2), the commercial citrus color aid in Florida, has been listed by the European Union (EU) and the International Agency for Research on Cancer (IARC) as a group 2B carcinogen. Thus, there is an urgent need in the citrus industry for natural or food grade colorants to replace CR2. In this research, three out of five oil-soluble natural red/orange colorants, annatto extract, paprika extract and paprika oleoresin, were selected based on their color values. The stability of the natural colorants along with CR2 was evaluated by applying them on test papers and orange fruits. All natural colorants were easily oxidized and faded when applied on test papers. However, application of a carnauba wax to cover the colorants substantially blocked the decoloration. All natural colorants showed stable colors at 5 °C and dark condition, to simulate cold storage, however, only annatto extract kept stable color after 23 °C and light condition, to simulate shelf exhibition.

[HP-17]

Relationship of Multi-Year Hand Hygiene Training to Florida Fresh Citrus Packinghouse Workers and their Reported Attitudes, Awarenesses, and Practices Away From the Workplace

Karla Lenfesty, St. Lucie County Extension University of Florida IFAS, Vero Beach, FL.

Social Cognitive Theory identifies reciprocal determinism, a person can be both an agent for and a responder to change, as a key construct. Transition of employee hand-hygiene training, knowledge, attitudes and behavior skill to hand-hygiene practices away from the workplace for packinghouse workers (PHWs) is lacking. As part of a larger Florida Citrus Packinghouse Worker Training Program, a 45 minute interactive personal hygiene module, modeled after Cornell GAP and GlobalG.A.P. curricula, has been offered annually since 2008, resulting in implemented, supported, and reinforced hand hygiene programs in many of the participating packinghouses. To evaluate the impact of multi-year trainings on workers' self-reported hand hygiene attitudes, awareness and practices away from the workplace, a quantitative survey was designed and administered to volunteer English-speaking participants with ≥ 2 trainings from five packinghouses (N=74) (Phase 1), and to a control group of volunteers (N = 75) without any packinghouse training (Phase 2). Frequencies, means, standard deviations, t-tests and Pearson correlations ($p \leq 0.05$ was considered significant) were used for data analysis and to answer research questions. Results showed there is a relationship between multi-year hand hygiene training and the citrus packinghouse workers' attitudes, awareness, and practices away from the

workplace. When compared to the control group, the packers 1) demonstrate stronger collective attitudes and beliefs about hand washing, and 2) exhibit higher awareness and frequency of self-reported practices regarding hand hygiene in non-work environments than the control group, showing that the impact and value of multi-year worker training extends beyond the packinghouse

[HP-18]

Chemical and nutraceutical properties of polymethoxyflavones in orange peel.

Yu Wang, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL.

Citrus is rich in a variety of flavonoids, which possess health beneficial properties such as anti-oxidant, attenuation of tumor growth, inhibition of inflammatory biomarkers, reduction of hyperglycemia and hyperlipidemia etc. Polymethoxyflavones (PMFs) are the major flavonoids in orange peel. Chemical and biological properties of polymethoxyflavones will be discussed in this presentation; an example of anti-cancer activity of a mixed citrus peel, which contains large amount of PMFs will demonstrate the potential usage of citrus by-product for nutraceutical or medicinal purposes.

[HP-19]

Changes in the volatile profile of citrus peel oils caused by HLB disease

Huqing Yang, Zhejiang A & F University, China; Elise Bourcier, Wei Zhao, Anne Plotto, Elizabeth A. Baldwin and Jinhe Bai, USDA, ARS, USHRL, Ft. Pierce; and Mike Irey, Southern Garden Citrus, Clewiston.

Orange fruit and juice from Huanglongbing (HLB) affected trees have been reported to be off-flavored, and this is the first report on volatile components of citrus peel oil affected by HLB disease. 'Valencia' oranges were harvested from commercial groves in South Florida. Fruit samples (26), each obtained from 3-5 visually HLB symptomatic, or asymptomatic trees were harvested, and processed for juice and peel was cold pressed to extract oil. The juice of each sample was analyzed by qPCR for the HLB presumed pathogen (*Candidatus Liberibacter asiaticus*, CLAs) DNA, and cold-pressed peel oil volatile components were analyzed by gas chromatography-mass spectrometry (GC-MS). Based on qPCR Ct values using Li and LJ primers, samples were divided into three groups: 1) healthy (HLBh, 8 out of 15 asymptomatic samples confirmed as CLAs free), 2) HLB severe (HLBs, 5 out of 11 symptomatic HLB samples were confirmed with high CLAs titer), and rest of the samples that were possibly HLB affected (HLBp), with low CLAs titer (6 symptomatic and 7 asymptomatic). A total of 57 volatile compounds were identified in peel oil samples, including 9 monoterpenes, 16 sesquiterpenes, 12 alcohols, 13 aldehydes, 1 alkane, 2 ketones, 2 esters, and 2 terpene oxides. Of those, 14 compounds were found to be significantly different among the three groups. Hexanal, (E,E)-2,4-decadienal, δ -cadinene and α -copaene were significantly lower in HLBs samples than in the healthy samples, while sabinene, (E)-p-mentha-

2,8-dien-1-ol, α -terpineneol, 3,7-dimethyl-6-octen-1-ol, (Z)-3,7-dimethyl-2,6-octadien-1-ol, carvone, cyclodecane, β -cubebene, (E)- β -farnesene, α -humulene and α -farnesene were significantly higher in HLBs samples. The contents of those volatiles in HLBp were in between. Principal component analysis discriminated HLBs from HLBh samples in PC2, with HLBp samples not separated from either HLBh or HLBs. Similar results were observed by using peel oil solvent extractions in both 'Valencia' and 'Hamlin' fruits with more components.

[HP-20]

Examination of citrus Pectins by Field Flow Fractionation

Gary Luzio, and R. Cameron, USDA-ARS, United States Horticulture Research Laboratory, Fort Pierce, FL.

After removal of soluble sugars and other compounds by washing, citrus peel is largely composed of pectin, cellulose and hemicellulose. In order to utilize the greatest amount of citrus peel product, it would appear reasonable that one or all three of these polysaccharides be converted to a useful material. One of the components, pectin (an esterified polymer of galacturonic acid) can be modified using enzymes or alkali and utility in the food industry and industrial applications. Once extracted, pectin is composed of a complex mixture of molecules of various sizes, molecular weights and degrees of esterification. In order to understand these pectin populations, one needs to separate them according the molecular size and charge and look at the individual molecules and then relate this to physical and chemical properties. We currently have excellent ion chromatography techniques for separating pectins based on charge, but improved separations based on size were not available until recently. Pectins are known to have molecular sizes from approximately 10,000 daltons up to 100,000,000 daltons and perhaps even larger. Conventional size exclusion techniques are unable to carry out separations above 5,000,000 daltons which is 20 times smaller than the largest known pectin molecules. A new technique is now available, called field flow fractionation which can fully separate molecules that are 100,000,000 daltons and larger. This method is also able to separate virus and bacteria organisms which of course are much larger than most polysaccharides such as citrus pectin. The field flow fractionation technique will be discussed together with a examples of pectins separated by this technique.

Citrus Section

#1

Plant Growth Regulator Trials to Reduce Preharvest Fruit Drop of HLB Affected Florida Citrus

L. Gene Albrigo, Citrus Research and Education Center, University of Florida, Lake Alfred, FL

With the general spread of HLB in Florida, preharvest fruit drop of citrus has been severe for the past three seasons. The 10 to 20 % increase in preharvest drop rates translate into over \$150 million annually in lost fruit. Stress factors lead to ethylene production in plants including citrus, which can lead to fruit abscission. The auxin substitute, 2, 4-D, has been shown to reduction preharvest fruit drop in healthy citrus trees, and gibberellic acid can reduce ethylene production caused by water stress. These studies were intended to see if some plant growth regulators (PGRs) could reduce preharvest fruit drop associated with HLB. Hamlin and Valencia were selected in groves throughout Central Florida. In 2014-15, several grower trials were put out with 4 to 5 acre plots, with adjacent Control plots, and replicated plot trials containing 6 to 10 trees were also set out. Materials tested included GA (ProGibb), 2, 4-D (Citrus Fix), Ascend and Headline. Hamlin trees were treated in September or October 2014 and Valencia trees in December 2014. ProGibb plus Citrus Fix combined significantly reduced fruit drop in about half of 6 trials in Hamlin blocks, while in Ascend and Headline trials only about 1/3rd of the time did treatments have a positive results in reducing preharvest fruit drop. Valencia trials also are reported.

#2

Effect of a Single Application of 2,4-D on Pre-Harvest Fruit Drop in HLB-Affected Valencia Orange Tree

J.P. Syvertsen, Citrus Research and Education Center, University of Florida, T. Minter, Florida Pesticide Research, Inc. Oviedo, FL, H. Yonce, KAC Agricultural Research, Inc., Deland, FL, and W. Bandaranayake, Citrus Research and Education Center, University of Florida

The goal of this field experiment was to determine if a single spray of 2,4-D in late December could mitigate Valencia preharvest fruit drop from HLB affected trees. A single application of 2,4-D (Citrus Fix) was applied to mature Valencia trees at four different sites in the central Florida ridge area in Dec 2013 and repeated in Dec 2014. All trees had HLB symptoms; some early blooming was visible in Dec 2013 and Jan 2014. There were four reps of 6 trees sprayed at each site along with 4 reps of 6 unsprayed trees to serve as untreated control (UTC) trees. Fruit drop counts in 2014 and 2015 came from 4 middle trees in each rep so there were 16 trees in each sprayed and untreated control treatment at each site. It was necessary to rake the grove floor clean prior to counting fruit approximately every two weeks from after the application of 2,4-D until harvest in March. The percentage of fruit drop was calculated after counting the remaining fruit at harvest and dividing the number of fruit dropped on each sampling day by the total number of fruit dropped + fruit harvested. At three sites in 2014, average total fruit drop ranged from 24.9 % to 76.3 % and there was no significant effect of the 2,4-D treatment on fruit drop.

There was a significant treatment effect at one site however, where there was 19.7 % drop from the 2,4-D treatment trees and a 47.9% drop in the UTC trees. Fruit drop data from the same sites in 2015 will be discussed.

#3

Evaluation of Chemical and Microbial-Based Pesticides for Control of Asian Citrus Psyllid in Organic Citrus Production. M.E. Rogers and B. McLean III, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL

#4

Spectral Band Selection for Citrus Black Spot Disease Detection

A. Pourreza, W.S. Lee, Department of Agricultural and Biological Engineering, University of Florida, Gainesville FL, Mark .A. Ritenour, Indian River Research and Education Center, University of Florida, Fort Pierce, FL

Citrus black spot (CBS) is a fungal disease caused by *Phyllosticta citricarpa* McAlp Van der Aa. CBS was first seen in Florida in March 2010. CBS causes fruit blotch and substantial yield loss in all citrus species. Sweet oranges species such as Valencia variety is extremely susceptible to this infection. CBS also causes a wide range of symptoms, but the most distinguishing one is called hard spot which is a circular lesion (with a 3-10 mm diameter) with gray fatal tissue at the center surrounded by a black margin. Spectral characteristic of citrus black spot (CBS) disease was investigated and compared with spectral signature of healthy fruits to determine the most significant waveband. Also spectral reflectance of the same symptomatic spot was acquired six times over a two month period to determine the variation of symptom's spectral signatures over time after being harvested. The results showed that the spectral signature of CBS symptomatic spot did not change significantly over almost two months. The wavelengths between 587 nm and 589 nm were identified as the important band to develop a monochrome vision based sensor for CBS diagnosis. The overall accuracies of 93.3% to 94.6% were achieved using the spectral reflectance data at the selected bands and a support vector machine classifier.

#5

Evidence for Alternative Pathways of CLas Movement in Citrus Trees

E. Etxeberria, P. Gonzalez and C. Brodersen, University of Florida, Citrus Research and Education Center, Lake Alfred, FL

Inconsistencies between the general notion of CLas movement within a citrus tree and laboratory/field observations led us to further investigate some anatomical and physiological aspects of the citrus tree in relation to HLB development. From a series of girdling, grafting and budding experiments, we observed that, despite robust anatomical barriers, CLas (or a signal) moves laterally across the phloem tissue. In addition, determinations of phloem and xylem movement indicate that, at times, CLas-signal moves in the opposite direction to the phloem flow

and capable of moving in the xylem. CLas-signal is also capable of traveling through non-vascular tissues as evidenced by its presence in juice cells, albedo and flavedo. Based on the type of symplastic/apoplastic connections between various plant parts, the presence and/or absence of CLas signal in different tissues indicate a separate form of HLB transmission throughout the tree.

#6

Revisiting the Parson Brown Sweet Orange

G. K. England, Lake County Extension, University of Florida IFAS Extension, Tavares, FL

Carney (1923) described the origin of the ‘Parson Brown’ sweet orange. Historically this was a common cultivar, especially in north central Florida. Many of the ‘Parson Brown’ plantings were lost in the series of freezes from 1962 through the late 1980s and replaced with other cultivars for various reasons. Since the onsets of citrus greening (HLB), there have been reports of surviving ‘Parson Brown’ trees not being as affected as some other cultivars. Observations made on some trees reputed to be over 100 years old in the original area where Parson Brown was cultivated revealed little apparent affect from HLB. Initial PCR testing on a set of these trees in 2014 indicated no HLB detected, although some visible symptoms often associated with HLB infection were observed. Additional PCR testing on the original trees plus some others was initiated in 2015. Budwood from the original trees was collected and propagated to challenge with HLB infected Asian citrus psyllid *Diaphorina citri*.

#7

Update on ‘US Early Pride’ in Florida

G. McCollum, J. Salvatore, USDA-ARS, United States Horticulture Research Laboratory, Fort Pierce, FL, S. Rogers, Ecostat Inc., Highland City, FL, G. Roe, W.G. Roe & Sons, Inc., Winter Haven, FL

‘US Early Pride’ is a very low-seeded mandarin hybrid that that was released, under patent, by the USDA in 2009. ‘US Early Pride’ was produced by irradiation of ‘Fallglo’ budwood in 1989. Other than seed count, ‘US Early Pride’ has proven to be essentially identical to ‘Fallglo’. Seed counts in ‘US Early Pride’ are typically less than two per fruit, and frequently the fruit are completely seedless, compared to ‘Fallglo’ which can contain as many as forty seeds per fruit. Industry interest in ‘US Early Pride’ is evidenced in the fact that it has been the most propagated specialty fruit in Florida in recent years. Early on there was a question regarding the need for a pollinizer for ‘US Early Pride’, and if so, what would be suitable pollinizers. We have collected data from three experiments conducted to address pollination requirements of ‘US Early Pride’. To date, results suggest that ‘US Early Pride’ does not require an alternate source of pollen, but may benefit from it. Several growers have reported that ‘US Early Pride’ can suffer from a dieback. The dieback is not unique to ‘US Early Pride’, it also seen in ‘Fallglo’. Observations suggest that larger nursery trees are less susceptible to dieback than are smaller trees, and that any girdling of the tree may contribute to the problem. Interestingly, we have observed that ‘US Early Pride’ is proving to be among the cultivars least impacted by HLB.

#8

Relevance of Epidemiology to Identifying Huanglongbing Resistance

D.J. Anco, North Carolina State University, National Science Foundation Center for Integrated Pest Management, 1730 Varsity Drive, Suite 110, Raleigh, NC and T.R. Gottwald, Agricultural Research Service, US Department of Agriculture, US Horticultural Research Laboratory, Fort Pierce

Biological phenomena are influenced by numerous factors and interactions. As such, their observation as affected by different treatments often takes on a distribution of responses, the perceived form of which depends on aspects of experimental design. If sampling sizes or replicates are too few, misleading conclusions may ensue, since relatively limited data presents only a slice of the full range of responses an individual treatment might contribute towards under varying conditions. An analysis involving simulated subsampling of actual huanglongbing data was conducted to illustrate the effect of varying sample sizes and replicates on results. At one end of the spectrum, increased sample sizes while maintaining only one replicate increased the rate of significantly different ($\alpha = 0.05$) estimates of disease incidence under one treatment as compared to the control (complete sampling: 150 trees per treatment, three replicates) to ~33%. Conversely, with a fixed per treatment sample size of 10 trees, estimates of disease incidence were respectively up to 75, 40, or 25% different from complete sampling estimates when one, two, or three replicates were utilized. Thus, too few replicates or too few samples per replicate can lead an investigator to infer apparent differences among treatments when larger sample sizes and/or more replicates would demonstrate a lack of statistical difference. Though the analyzed data was based on the effects of various control strategies on development of huanglongbing disease incidence, results are analogously applicable towards alternative investigations, such as evaluation of resistant lines.

#9

Ornamentals: Development of Genetically Modified Anthocyanin Overexpressing Citrus

M. Dutt, D. Stanton and J. Grosser, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL

Anthocyanins are beneficial bioflavonoids that have numerous roles in human health maintenance, disease prevention and over-all well-being. In addition, anthocyanins are key to the consumer appeal of many ornamental plants. Most citrus plants do not produce anthocyanins under warm tropical and subtropical conditions. Anthocyanin pigments responsible for the "blood" color of blood oranges are produced after exposure to cold conditions during the fruit's development. The transcriptional factor gene *ruby* is responsible for the production of anthocyanin in blood oranges. Functionally similar genes exist in other fruit crops such as grapes (*VvMybA1* and *VvMybA2*) and apples (*MdMYB10*) among others. *VvMybA1* and *ruby* genes were overexpressed in three ornamental citrus cultivars that grow well under Florida's humid environment (Mexican Lime, Calamondin and Sinton citrangequat). Over-expression of

VvMybA1 or *ruby* resulted in anthocyanin pigmentation in the leaves, stems, flowers, and fruit. An increased pigmentation of the outer layer(s) of stem tissue was observed in all three cultivars overexpressing the *VvMybA1*, while lower anthocyanin levels were observed in plants overexpressing *ruby*. Enhanced pigmentation was also observed in the young flush, however, pigment intensity levels decreased as the leaves matured. Flower color ranged from light pink to fuschia and the fruit pulp of several Mexican Lime lines were maroon; similar to a blood orange. The results demonstrate that expression of anthocyanin-related genes can affect temporal pigmentation patterns in citrus. It also opens up the possibility for the development of modified “blood” Sweet Oranges and other cultivars adapted to the Florida environment.

#10

Citrus Scion Cultivar Performance Under Severe Huanglongbing Disease Pressure

E. Stover and S. Inch, USDA-ARS, United States Horticulture Research Laboratory, Fort Pierce, FL

Although there are no known huanglongbing (HLB)-resistant commercial citrus varieties, some field tolerance has been observed. The objective of this study was to assess cultivar field tolerance to HLB compared to sweet orange. To expedite the trial, nursery trees were purchased on rootstock varieties as available. The trial included ‘Hamlin/Kinkoji’, ‘Hamlin/Cleo’, ‘Temple/Cleo’, ‘Fallglo/Kinkoji’, ‘Sugar Belle/SourOrange’, ‘Tango/Kuharske’, and ‘Ruby Red/Kinkoji’. A randomized complete block experiment with 10-20 trees per scion/rootstock was established at Ft. Pierce, FL in September 2010. Disease severity was rated on a scale of 0 to 3 and growth of trees was recorded starting in April 2012 and continued on a regular basis. At each sample time, three leaves were collected from each tree for quantitative real time PCR of CLAs and citrus dehydrin. All trees exhibited symptoms of HLB and tested positive for CLAs, with similar titers measured at most sample dates. There were significant differences ($p \leq 0.05$) in disease severity, diameter, and CLAs titer (at some time points) between the varieties tested. Overall ‘Fallglo’ had the lowest incidence and ‘Ruby Red’ the highest incidence of distinctive HLB mottling. ‘SugarBelle’ had the greatest overall increase in diameter, and was among the healthiest in overall appearance. In Nov. 2014 ‘Temple’ trees had significantly greater fruit load, with 26 fruit/tree, followed by ‘Tango’ with 10 fruit/tree, ‘Hamlin/Kinkoji’ with 5 fruit/tree and all others with 0-1.4 fruit/tree. Production was compromised in all varieties by the severe HLB pressure at this site, and commercial value of the observed tolerance remains uncertain.

#11

Evaluation of Foliar Nutrition Fertilizers to Enhance Growth and Productivity in HLB Affected Citrus Trees

D. Ramirez, B.R. Gruber, B.J. Boman, M.A. Ritenour, IRREC, UF. R. Rouse, K. Morgan, P. Roberts, F. Roka, Southwest Florida Research and Education Center, University of Florida IFAS, Immokalee, FL, A.W. Schumann, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL. and J. Chaparro, Department of Horticultural Sciences, University of Florida IFAS, Gainesville, FL.

Huanglongbing (HLB) is an important disease for citrus, caused by *Candidatus Liberibacter asiaticus* and transmitted by the Asian Citrus Psyllid (ACP) *Diaphorina Citri*. Consequences of disease development include vascular system blocking, alteration of the absorption and translocation of nutrients, massive fruit fall and eventually tree death. Foliar fertilization programs (FFP) have been used by growers to maintain productivity in HLB-affected trees. This research started in 2014 and is focused on understanding the effect of nutrients applied through FFP in different combinations on HLB-affected trees. Two grapefruit groves were selected with different characteristics (age, variety), in randomized block designs, to evaluate FFP treatments that systematically include or exclude macro and micronutrients. Tree growth, fruit fall, HLB incidence, ACP population, fruit production and size and concentration of macro and microelements in leaves were evaluated. Results showed that HLB incidence and ACP were not affected by treatments but HLB incidence increased in groves through time (from 20-60% to 60-100%). Treatments without micronutrients showed significant decrease in Mn and Zn concentration through time. Production of fruit did not differ among treatments but the size of fruit showed a slight relation with micronutrients, where some treatments without these minerals produced lower diameter fruit. Treatments did not differ with regards to tree growth and fruit fall, where only in some cases macro-micro treatments led to nominal increases in canopy size and marginally less fruit drop.

#12

Optimizing foliar nutrient sprays

L. Waldo and A.W. Schumann, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL

With increasing numbers of growers utilizing nutrient sprays as part of their nutrition regimes it is important to maximize the efficacy of these foliar sprays. Two separate experiments were conducted at the Citrus Research and Education Center in Lake Alfred to explore nutrient uptake efficiency, specifically using strontium (Sr), as a tracer cation for calcium and boron (B) as borate to represent nutrient oxyanions. The first experiment was a field trial looking at the uptake of Sr from foliar sprays applied at 100% and 50% standard concentrations along with the use of two different adjuvants. The use of both adjuvants increased the uptake of Sr in leaf tissue, with the 50% Sr rate plus adjuvant being the most effective. The second experiment was done in a greenhouse using potted Carrizo rootstock trees to explore the uptake of Sr and B in a factorial study. Results showed a significant increase in the uptake of Sr on the abaxial surface of the leaf as well as a significant increase in Sr uptake as a result of applying an electrostatic charge, suggesting that improved physical spraying conditions could save up to 50% of the sprayed fertilizer products. The uptake of Sr was significantly higher in the one week and two week samples compared to the tissue collected three days after spray. Boron uptake was also increased by the use of spray droplet charging, and was higher at pH 7 than 5.

#13

A prototype robotic sprayer for high density plantings of horticultural crops

A.W. Schumann, H.K. Hostler, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL and B.R. Gruber Indian River Research and Education Center, University of Florida IFAS, Ft. Pierce, FL

Endemic Huanglongbing disease (HLB, “greening”) in Florida makes it virtually impossible to profitably grow citrus. Some fresh citrus fruit growers are turning to screen house protected agriculture in order to physically exclude the psyllid insect and thus ensure disease-free citrus trees. The resulting large greenhouses / screen houses with citrus planted at high densities are well suited for automation, including the deployment of narrow precision-guided agricultural machinery to safely traverse kilometers of narrow alleys. The protected screen house environment is less well ventilated than outdoors, which creates human safety problems during pesticide spray applications, and a fully autonomous driverless vehicle platform would be most appropriate. Using automated equipment is also likely important to reducing accidental contamination by human workers. In the research described, a standard 36-volt electric golf car was modified for fully autonomous RTK-GPS navigation in a 0.54-ha screen house planted with high density hydroponically grown citrus for the fresh fruit market. Initial testing of the vehicle with a 378-L sprayer trailer demonstrated that spraying the screen house at a speed of 3.2 km/h used 1.5 kWh of electrical power from the 120VAC utility, costing less than \$0.30. Without any modifications to the standard power source, the projected capacity of the vehicle is approximately 1.5 ha. Gas-electric hybrid modifications could greatly extend the range of the vehicle, and the concept could also be transferred to small diesel-powered farm vehicles with greater range.

#14

Using Real-Time Onsite Weather Data in Support of Freeze Protection of Florida Crops: A My Florida Farm Weather Update

R. Lusher, Florida Automated Weather Network, University of Florida IFAS, Gainesville, FL and K. Morgan, Southwest Florida Research and Education Center, University of Florida IFAS, Immokalee, FL

Weather-related information is essential to Florida’s agricultural producers for making important decisions regarding the use water for irrigation scheduling and cold protection. Since the mid 1990’s, The Florida Automated Weather Network (FAWN), a program of the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS), has developed a variety of weather-related tools that can aid them in making irrigation and cold protection decisions. FAWN worked with the Florida Department of Agriculture and Consumer Services (FDACS) Office of Agricultural Water Policy (OAWP) in 2013 to establish *My Florida Farm Weather* (MFFW), a high-resolution farm based basic weather station network that can be used to maximize water used for irrigation and cold protection. Each MFFW weather station measures air and dew point temperatures, wind speed and direction, relative humidity, and rainfall amount. Data are collected every 15 minutes, and disseminated via a dedicated webpage and smartphone app. FAWN recently integrated data from

the approximately 160 stations into its suite of cold protection tools. Now growers can view a 4-day forecast which includes the following: estimated overnight minimum temperature, a graph that compares actual vs forecasted temperatures, evaporative cooling potential, and a safe shutoff temperature for a running irrigation system, all at a MFFW station location. The MFFW webpage can be accessed at <http://fawn.ifas.ufl.edu/mffw>.

#15

Screen House Production Systems for Fresh Citrus Cultivation, Part I: Effects on Meteorology, Pest Damage, and Huanglongbing Disease (HLB) Development in Young Grapefruit Trees

B.R. Gruber, B.J. Boman, Indian River Research and Education Center, University of Florida IFAS, Ft. Pierce, FL, A.W. Schumann, F.G. Gmitter, and J.W. Grosser, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL.

This project evaluated the ability of screen house enclosures to prevent Huanglongbing disease (HLB) development by preventing physical contact between the Asian citrus psyllid (ACP) and young citrus trees. ‘Ray Ruby’ grapefruit trees were planted outside in the field or within anti-insect mesh screen houses. Abundance of adult ACP was monitored monthly using sticky trap cards outside and inside the houses. After 10 months of observations, adult ACPs were observed throughout the spring and summer months (of 2014) in the outdoor plots. However, no adult ACPs were observed within the screen house enclosures during the same time period. Eleven months after establishment, 20%-25% of trees surveyed in the outside plots tested positive for the bacterial pathogen (*Candidatus Liberibacter asiaticus*, CLAs) associated with HLB. None of the trees inside the screened enclosures surveyed tested positive for CLAs during the same time period. Additionally, 13 months after establishment, approximately 20% of leaves of monitored trees planted outside displayed visible feeding damage from the citrus leafminer (CLM), while no CLM-associated damage was observed inside the enclosures during the same period of time. Meteorological measurements were also made outside and inside screen houses. Solar radiation, reference evapotranspiration, and wind gust values were less inside enclosures. Maximum and minimum air temperatures were elevated inside the houses, compared to outside, while rainfall did not differ between the two environments.

#16

Short-time Heat Treatment for Prolonging the Life of HLB Infected Trees

R. Ehsani, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL.

#17

Screen House Production Systems for Fresh Citrus Cultivation, Part II: Effects on Young Grapefruit Tree Growth, Leaf Photosynthesis, and Nutrient Status.

B.R. Gruber, B.J. Boman, Indian River Research and Education Center, University of Florida IFAS, Ft. Pierce, FL, A.W. Schumann, F.G. Gmitter, and J.W. Grosser, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL.

'Ray Ruby' grapefruit trees on US-897 rootstocks were planted outside in the field or within mesh screen house enclosures meant to prevent Huanglongbing disease (HLB). In addition, half of the study trees were planted in ground and half were potted in 37.9 L plastic air-pruning containers. Tree canopy volume was measured monthly from January to December, 2014, and trees grown inside the completely enclosed screen houses developed nearly twice the volume as plants grown outside during this period. Leaf area index (LAI) of trees in the study plots varied throughout the study period, with trees planted in ground and inside the houses having the largest LAI values, compared to the other treatments. Canopy transmission of solar radiation was less in trees planted in ground and inside compared to trees established outside, but was equal to potted trees inside the houses, when averaged over the entire study period. Leaf photosynthetic net CO₂ assimilation did not vary among treatments for any month of observation. However, values of leaf area growth increment efficiency (LAI divided by mean daily reference evapotranspiration) were greatest for in ground planted trees inside the enclosures for the months of November and December, 2014, compared to the other treatments. Leaf N concentrations were largest in containerized trees outside and smallest for in ground planted trees inside, throughout the study period. Leaf Mn concentrations were larger in trees outside, compared to inside in June and July, 2014, but no differences were observed later in the year.

#18

Fate of Indicator Organism Populations on Citrus Trees Following Foliar Application of Agricultural Water Containing Copper Hydroxide

T.K. Chapin, Citrus Research and Education Center, University of Florida, Lake Alfred, FL; G.K. Mootian, Rutgers, The State University of New Jersey, New Brunswick, NJ; L.M. Friedrich, Citrus Research and Education Center, University of Florida, Lake Alfred, FL; T.M. Spann, California Avocado Commission, Irvine, CA; D.W. Schaffner, Rutgers, The State University of New Jersey, New Brunswick, NJ; and M.D. Danyluk, Citrus Research and Education Center, University of Florida, Lake Alfred, FL.

Agricultural sprays for citrus groves may be prepared with surface water, which could contain indicator organisms (i.e., generic *Escherichia coli*) at levels above proposed regulatory limits

under the Produce Safety Rule of the Food Safety Modernization Act. Agricultural sprays for citrus often contain copper hydroxide as a fungicide and bactericide for disease control (e.g., citrus canker, black spot). The objective of this study was to determine the fate of generic *E. coli* and coliforms on citrus trees following the foliar application of low microbial-quality water containing 0.1% copper hydroxide (n=9). Field trials were conducted monthly from January 2014 to May 2014 and from October 2014 to March 2015. Orange trees ('Hamlin' and 'Valencia') were sprayed with either low microbial-quality water (ca. 250 gpa; ca. 4 log CFU/ml generic *E. coli*) or with low microbial-quality water containing 0.1% copper hydroxide. Populations of generic *E. coli* and coliforms were determined at 0, 2, and 6 hours and continued at regular intervals until *E. coli* was no longer detected. Weather data, including solar radiation; temperature; relative humidity; and rainfall were obtained. Results indicate that the addition of copper hydroxide to the low microbial-quality water prevented a sharp increase in *E. coli* populations immediately following the foliar spray, which was observed in the trees sprayed with water not containing copper hydroxide. Copper hydroxide may also provide some protection against population rebounds of *E. coli* following rain events. The effect of copper hydroxide on long-term persistence of *E. coli* populations is less pronounced.

#19

Pre-Harvest Fruit Drop and Fruit Quality of "Huanglongbing" Infected Sweet Oranges

T Vashisth, M. Danyluk, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL. and W.C. Oswalt Polk County Extension, University of Florida IFAS Extension, Bartow, FL

The future of Florida citrus industry is highly jeopardized by the epidemic of a disease called Citrus Huanglongbing (HLB). Fruit produced by HLB-infected trees are smaller, lopsided, poorly colored, with aborted seeds and abscise/drop prematurely. Moreover, juice from symptomatic fruit has higher acidity, lower sugars, lower Brix/acid ratio, and the chemical composition resembles to juice from less mature fruit. Since 2012, high number of fruit drop incidences have been reported. Juice blend with high ratio of HLB symptomatic fruits to healthy fruits can result in off flavors and unacceptable juice product which is a big concern for citrus processors. Therefore the objective of this study was to study pre-harvest fruit drop and fruit quality of sweet oranges grown under different management programs. Four different commercial management programs were included in this study. In 'Hamlin' oranges as high as 34% fruit drop was observed. The quality of the fruit on the ground was low and the fruits were less than 2.3 inch in size, total soluble solids were less than 9 and were symptomatic. In harvested fruits the majority of the fruits were less than 2.45 inches which is lower than the average fruit size from 2010-2011. Management program D resulted in the biggest fruit size and high brix to acid ratios. Our data suggests that pre-harvest fruit drop is a big concern and can result in as high as one-third crop loss. Pickers should be strictly advised not to pick fruit from the ground as they are of lower quality.

#20

Evaluation of Impacts of Mechanically Harvesting High-Density Semi-Dwarf Citrus on Tree Health and Yield.

T. Burks, Department of Agricultural and Biological Engineering, University of Florida IFAS, Gainesville, FL. K. Morgan, and F. Roka, Southwest Florida Research and Education Center, University of Florida IFAS, Immokalee, FL

In the 1990s, Florida had 845,000 acres of citrus and was competitive with Brazil. That number has since reduced to approximately 531,500 acres due to hurricanes, canker eradication program, urban development, economic downturn, and finally the discovery and spread of Huanglongbing, which causes tree decline and death. The national threat of HLB has set the stage for developing new approaches for citrus production and harvesting. One approach being considered is Advanced Citrus Production and Harvesting Systems (ACPHS) that use high density semi-dwarfed trees, and open hydroponics with optimized nutrient and water availability, which accelerates plant growth and can increase yield production per acre, while simultaneously shortening the time to return on investment. Since ACPHS has smaller trees planted at high density with limited operational area, existing machines are not suitable. One reoccurring challenge to the adoption of mechanical harvesting technology is grower concerns about the impact of mechanical harvesting on tree health, next year's crop, and fruit damage. This concern has been amplified due to the presence of HLB, which weakens the tree and could have potential negative interaction with tree longevity when trees are vigorously shaken by the harvesting machine. In this paper, the authors introduce a new Over the Top Citrus Harvester (OTPCH) specifically designed for ACPHS and an experimental trial conducted to evaluate the impact of harvesting on tree health. The first of a two year study is presented, where tree health indicators are measured in the field before and after harvesting to evaluate tree response.

#21

Estimation of Water Use by Young, Containerized Grapefruit Trees in Citrus Screen House Production Systems.

B.R. Gruber, B.J. Boman, J. Lu, J. Wu, and G. Shao, Indian River Research and Education Center, University of Florida IFAS, Ft. Pierce, FL.

Evapotranspiration (ET) and tree growth for young 'Ray Ruby' grapefruit on sour orange rootstock trees grown in nursery pots were measured for months 5-15 after transplanting. Nursery trees were transplanted into 37.9 L air-pruning pots in November 2013 and set out into field trials. Half the trees were located inside psyllid-proof screen enclosures (passively ventilated) and the other half outside. Three trees of each treatment were placed on weigh cradles, each supported with two 22 kg load cells. Irrigation was supplied by a drip irrigation system, with two 7.6 L/hr drippers serving each pot. Irrigation and rainfall were measured with a tipping bucket rain gauge and recorded with a data logger along with pot weight at 3-minute intervals. An automated control system utilizing weather station inputs was used to schedule the duration and interval for irrigation events. Typical applications were for 3-5 minutes, with up to 5 applications per day. Weather stations inside and outside the enclosures were used to calculate

Penman reference ET (ETo), which was used to calculate water use efficiency for the trees monitored. During the study period, ETo inside the enclosures was about 20% less than outside, while tree water use was about 15% greater. Tree canopy volume was about 40% greater for trees inside the enclosures.

#22

Chemical Composition of Xylem Sap from *Citrus sinensis* L. Osbeck (Sweet Orange).

N. Killiny, and F. Hijaz. Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL.

Currently, Huanglongbing is the major disease in Florida citrus. The disease is caused by the phloem-restricted, uncultivable bacterium, *Candidatus Liberibacter asiaticus* and transmitted by the Asian citrus psyllid (ACP), *Diaphorina citri*. It has been shown that the phloem sap feeder, ACP also spend time on xylem activities and a proportion of psyllids feeds from xylem indicating that xylem sap contains all the essential nutrients needed for psyllid. We studied the chemical composition of citrus xylem sap and carried out a comparison with citrus phloem sap. Xylem sap was collected by centrifugation. The collected sap was derivatized with trimethylsilyl (TMS) and analyzed with GC-MS. We found that xylem sap is relatively rich in many compounds including sugars and organic acids but poor in amino acids in comparison with phloem sap. Malic acid, inositol, sucrose and glucose were the abundant compounds. Also a relatively low amount of proline was found in xylem sap. This result indicates that ACP may depend on its endosymbiotic bacteria as a source of amino acids. This information expands our knowledge about the nutrition requirement for citrus phloem-sap feeder, ACP and can help define suitable artificial diet. The diet will greatly help in lab studies such as test the efficiency of RNAi and antimicrobial peptide.

#23

Strigolactones (SL) Induced Vegetative and Reproductive Growth in Citrus.

N. Kumar and E. Etxeberria, Citrus Research and Education Center, University of Florida IFAS, Lake Alfred, FL.

Strigolactones (SL) are carotenoids derived novel plant hormone with multiple physiological and anatomical functions. Two year old greenhouse-grown HLB-infected and healthy control Sweet orange 'Valencia' (*Citrus sinensis* L. Osbeck) trees were used for this study. Trees were sprayed at an interval of three months with 10 μ M SL. Trees were grouped in four categories based on SL treatment; SL treated HLB-infected trees, HLB-infected trees, SL treated healthy trees, and healthy control trees. Similar field experiments were also conducted at CREC with 10 trees each for above mentioned four treatments. Healthy control trees were sprayed in a commercial grove at Marion County, FL. SL spray applications in greenhouse conditions resulted in early induction of spring and summer flush and early flowering in HLB-infected trees in comparison to control and HLB-infected non-sprayed trees. The number of new vegetative branches were higher in SL treated HLB trees in comparison to other treatments. Fruit peduncle diameter and fruit diameter

was greater in SL treatments. Flower retention, fruit drop, and various anatomical parameters were also evaluated.

#24

The History and Current Status of Citrus in Putnam County

E.V. Fletcher, Putnam County Extension, University of Florida IFAS Extension, East Palatka, FL and J. Sowards, Volusia County Extension, University of Florida IFAS Extension, Deland, FL

Putnam County was originally one of the top citrus producing counties in the late 1800s. However, after the awareness of freezing temperatures, an increasing demand for ferns and the purchase of agricultural land in central and south Florida, the dooryard citrus is what remains. The world of citrus has changed in northeast Florida, but that has not stopped small groves and homeowners from growing this iconic fruit.

#25

Invited Speaker on Panhandle Citrus

Natural Resources Section

NR-1

Reducing Coyote Encounters through Community Awareness Programs

Lisa Hickey, Manatee County Extension, UF

Prior to the turn of the twentieth century, wolves were nuisance wildlife to farmers and residential owners. After eradication of wolves, coyote population increased due to lack of predation by wolves. Coyotes expanded their territory into Florida. Their adaptability and behavior easily allows them to adjust in the urban environment (Coates, Main, and et.al. 2011). During Manatee County's urban corridor increase, coyote activity in the residential landscapes increased. During the years 2012 - 2014, telephone calls tripled (n=146), expressing concern over the increased activity of coyotes. The Manatee County Commissioners were called on many occasions to "hunt and kill the coyotes". The County Commissioners requested Manatee County Extension Service to provide educational programming on coyote awareness. In the spring of 2014, a residential program complemented with several videos was offered to residents. Attendance (n=465) has been rewarding, awareness/knowledge gained has been recorded through pre/posttests (56% increase n=156 survey responses), and behavior changes are documented through follow-up phone and email surveys. To date, two homeowner associations have adopted changes in their community to reduce coyote encounters. A few adoptions included: an increase in awareness programs at the annual and monthly meetings, a delay in trash disposal by the curbside until morning (some owners built tighter trash receptacles deterring

coyotes from foraging), a reduction of dogs on long, retractable leashes, and a reduction of outdoor pets and pet dishes unattended in the backyard settings in evening hours.

NR-2

Sneaking it In: Linking Integrated Pest Management (IPM) and Water Quality to Homeowner Horticulture Workshops

Nicole D Pinson, Manatee County Extension, UF

Extension agents and Master Gardener volunteers provide information to clientele on many subjects such as vegetable gardening, butterfly gardening, and pruning. Water quality and water quantity are important overarching concerns for most citizens, and integrated pest management principles are a central component of Extension teaching. Residents may not necessarily attend your programs to learn more about water or pests. To link integrated pest management and water quality to horticulture programs, sneak it in! In Hillsborough County, a partnership with Hillsborough County Government and fifteen local library branches affords opportunities to provide horticulture workshops on a monthly basis. Several workshops such as lawns, butterfly gardening, vegetable gardening, and landscape design were adapted so agents and volunteers can teach clientele gardening basics while emphasizing water quality and integrated pest management.

NR-3

St. Augustine Response to Reduce Annual Nitrogen Application

Tracey K. Wasyluk, Kimberly Moore, Tim Broschat, Fort Lauderdale Research and Education Center, UF and Samira Daroub, Everglades Research and Education Center, UF

Because of no-fertilizer summer black-out periods in parts of FL, polymer coated urea (PCU) fertilizers that release nitrogen (N) over 16 to 24 weeks may provide better quality turfgrass than PCU products that release N over 8 to 12 weeks. The purpose of this study was to compare four PCU fertilizer products with varying N release rates to an untreated control on the quality of a mature stand of 'Floritam' St. Augustinegrass (*Stenotaphrum secundatum* [Walt.] Kuntze). The University of Florida Institute of Food and Agricultural Science suggested applications of 196 kg N/ha (4.0 lb. N/1000 ft²) to 294 kg N/ha (6 lbs./1000 ft²) for St. Augustinegrass in South Florida. In trial 1, the 4 PCU products (PCU 44.5, PCU 43, PCU 42, and PCU 41) were applied at a rate of were 49 kg N/ha (1.0 lb. N/1000 ft²) applied 3 times per year for a total of 147 kg N/ha (3.0 lb. N/1000ft²) per year. In trial 2, the same products were applied as a single application of 98 kg N/ha (2.0lb N/1000 ft²) prior the summer blackout period and a second application of 49 kg N/ha in the fall for a total of 196 kg/ha (4.0 lb. N/1000 ft²). Both trials looked at N longevity through the blackout period. In both, PCU 41 (16-24 week release) had higher quality ratings in July and August than PCU 44.5 (8-12 week release) or the untreated control.

NR-4

Does Divot Fill Composition Affect Bermudagrass Recovery From Damage?

George H. Snyder, Everglades Research and Education Center, UF.

Turfgrass on athletic fields is routinely damaged by play and related activities, resulting in “divots” devoid of turf and root zone material. Divots often are filled with silica sand to level the surface and provide a media into which the grass can grow from the surrounding area. Sometimes the sand is amended with an organic constituent, such as peat, in an attempt to improve recovery from the damage. Various root zone amendments were evaluated on athletic fields and at the UF Ft. Lauderdale Research and Education Center for recovery of cv. Celebration bermudagrass (*Cynodon dactylon* L Pers.) in constructed divots. Holes ~ 18 x 18 x 8 cm deep (divots) cut into mature bermudagrass were filled with various root zone mixes. Visual ratings were made over time of the regrowth (coverage) of the grass in the divots. Various combinations of quartz sand, peat (EarthMax), humate, polymer-coated sand (Maxand), biosolids (Milorganite), compost, IBDU-N and other plant nutrients, and a plant hormone (brassinolide) were examined. The study area was irrigated and fertilized for turfgrass maintenance. The amended root zones provided faster rates of coverage relative to the quartz sand alone. The superior blends contained peat, polymer-coated sand, and biosolids.

NR-5

Evaluation of a Surfactant Coating on Soluble and Slow-Release Fertilizers in Bermudagrass [NR-5]

Mica F. McMillan, Aquatrols Corp. Paulsboro, NJ, J.L. Cisar, Cisar Turfgrass Services, and K.E. Williams, Fort Lauderdale Research and Education Center, UF

Surfactants are typically used to alleviate soil water repellency and improve water use efficiency in turfgrass systems. In previous research, surfactants increased nitrogen (N) uptake and reduced N leaching by improving moisture distribution throughout the soil profile. In 2014, a research trial was conducted at Fort Lauderdale Research and Education Center in Fort Lauderdale, Florida on “Tifway 419” bermudagrass (*Cynodon dactylon*) in the latter stages of the dry season. The objective of the trial was to determine if coating a granular soluble urea (46-0-0) and a slow-release sulfur coated urea (39-0-0) with 0.5% of a surfactant would improve N uptake and enhance turfgrass quality for an extended period of time. Treatments included a one-time application of fertilizer applied at a rate of 5 g/m². Turfgrass quality, color, clippings, N content and N uptake were evaluated. Results indicate the typical comparisons for controlled-release N vs soluble N and controls over the time period with significant differences generally reflecting differences between treatments and the control. However, late in the season, there was a statistically significant quality treatment effect with surfactant treated urea having better turf quality ratings than the untreated urea suggesting prolonged response to the treated urea.

NR-6

Air Potato Biological Control Extension Needs Assessment

Kenneth Gioeli, St. Lucie County Extension Service, UF, William Overholt, Indian River Research and Education Center, UF, Min Rayamajhi, USDA-ARS, Invasive Plant Research Laboratory, Fort Lauderdale FL, Eric Rohrig and Kenneth Hibbard, FDACS Division of Plant Industry, Gainesville FL

A new initiative is helping connect land managers struggling with invasive air potato (*Dioscorea bulbifera*) with a new weapon in our arsenal: the air potato leaf beetle (*Lilioceris cheni*). Host specificity testing for the air potato leaf beetle was undertaken by scientists at the USDA ARS Invasive Plant Research Laboratory in Fort Lauderdale. Larvae and adults feed predominantly on air potato leaves and occasionally on bulbils and do considerable damage to the plant. Program partners include UF/IFAS Extension, USDA ARS, USDA APHIS and the Florida Department of Agriculture and Consumer Services. The Air Potato Biological Control Extension Needs Assessment was conducted to help better target outreach efforts for this initiative. This Extension Needs Assessment (a) analyzed end users' perceived knowledge of air potato and the role of IPM and biological control in the plant's management; (b) analyzed end users' preferred methods of obtaining information on air potato IPM strategies; (c) determined the characteristics, needs and priorities of the target audience; and (d) determined types and numbers of educational resources currently being used by end users to manage air potato. Project website address: <http://bcrc.ifas.ufl.edu/airpotatobiologicalcontrol.shtml>.

NR-7

Make a Beeline with Native Plants

Gabrielle C. Milch, Seminole County Extension Service, UF

Many urban and commercial landscapes are deserts for pollinating insects. Bees, whether native or European are extremely important for our agricultural community and home vegetable gardens. Many people fear attracting bees due to safety and liability concerns. Creating a pollinator friendly landscape with native or ornamental plants can be attractive and helpful to native bee and honey bee (*Aphis mellifera*) populations. Prior planning and plant selection is important for decreasing, degradation and fragmentation of pollinator's habitats. Locating and creating a pollinator habitat has a few necessary requirements such as a flower-rich foraging area, suitable host plants or nests where pollinators can lay their eggs and provide shelter from pesticide drift. Florida has more than 2000 species of native pollinator insects which includes more than 200 species of native bees. Each pollinator has a special plant relationship. A multifunctional landscape is important and the use of species with extrafloral nectaries helps greatly. Nectary size, shapes and secretions vary by plant species. The timing of flowering and the shapes and sizes of the flowering plants all need to be considered. The life cycles of the native bee desired and plant selection should correspond to ensure a successful habitat. In a state where pollination whether by native or honey bees is so important more care must be taken to protect bee and our agriculture. Proper use of pesticides with consideration of when to spray is almost as critical as providing flowering habitats for food sources for bees.

NR-8

Showing the Value of Extension to Local Government Using SmartIrrigation Apps

Michelle Atkinson, Manatee County Extension Service, UF, M. Dukes and K. Migliaccio, Agricultural and Biological Engineering, UF

Extension needs to show that they have value to local county government who funds much of local extension services. One way that the UF/IFAS Manatee County Extension Service is showing its value is by helping Manatee County save irrigation water on county owned properties. Using the Urban Lawn SmartIrrigation App, property site managers with the help of Extension are setting up the SmartIrrigation App on smart phones and tablets. By programming the soil type and unique zone characteristics like sprinkler type and number of sprinklers in the zone, an irrigation schedule is generated. Extension provides detailed zone information to the site managers for app set up as well as completing a full irrigation evaluation on the site to correct inefficiencies in the system. The app then provides site managers with an estimate of irrigation run times needed to meet current turf water demand using a simplified approach for automated irrigation systems. Temperatures will also be monitored by the model to determine if they are above the minimum temperature required for growth to occur. App users receive notifications if more than 0.4 inches of rain occurs 24 hours prior to irrigation, rain is expected, or temperatures are too low for growth. Using the app instead of a set time-based schedule for irrigation, county site managers can provide irrigation amounts to turf that more closely match water needs.

NR-9

Growth of Native Wetland Plants after Irrigation with Wastewater or Dilute Seawater

Lyn A Gettys, Carl J Della Torre III and Kimberly K Moore, Fort Lauderdale Research and Education Center, UF

As water resources in Florida are becoming more scarce and valuable, identifying alternative sources of irrigation water such as reclaimed water are becoming more important. In addition, climate change and the threat of rising sea levels and saltwater encroachment into freshwater systems is a growing concern. In these experiments we evaluated the effects of reclaimed water and saltwater intrusion on growth of the native wetland plants arrow arum (*Peltandra virginica*) and cardinalflower (*Lobelia cardinalis*). Both species were grown in 4" nursery pots filled with a commercially available potting mix and were maintained in a covered greenhouse at the UF/IFAS FLREC in Davie, FL. Plants were irrigated three times per week with either tap water, reclaimed wastewater sourced from a water treatment plant in Broward County FL, or dilute (1 ppt) saltwater solution. Plants were cultured under these conditions for eight weeks, then visual quality ratings were assigned and all plants were destructively harvested. All treatments were replicated and these experiments were repeated in time. We will outline the results of these experiments and discuss the potential effects of wastewater and saltwater intrusion on growth of wetland plants.

NR-10

Effect of Substrate Carbon on Topramezone Phytotoxicity to St. Augustinegrass

Carl J Della Torre III, William T Haller and Lyn A Gettys, Center for Aquatic and Invasive Plants, UF

Topramezone is a newly labelled aquatic herbicide with a maximum label rate of 50 ppb. Previous greenhouse studies evaluating the effect of this herbicide in irrigation water revealed that the EC₁₀ (the concentration of herbicide that reduces growth by 10% compared to untreated controls) of topramezone was 3.5 ppb on St. Augustinegrass grown in 100% sand. However, these results differed from field observations; most field soils where turfgrasses are grown contain carbon, which can bind with topramezone. The goal of these experiments was to determine the effects of irrigation with topramezone-treated water on St. Augustinegrass grown in substrates with different carbon contents. Topramezone was applied at concentrations ranging from 0 to 120 ppb to mature St. Augustinegrass grown in 19 cm diameter 2L pots. Pots were filled with coarse sand amended with one of five carbon contents: 0, 0.35, 0.65, 1.4, and 3.8%. Plants were irrigated with a ½” of topramezone-containing water twice per week for 4 weeks and grown out for 12 weeks after the final topramezone treatment. Plant material was clipped as needed for a total of 8 harvests, then dried and weighed. EC₁₀ values for St. Augustinegrass grown in substrates with 0, 0.35, 0.65, 1.4, and 3.8% carbon were 3.74, 7.32, 10.13, 28.10, and 25.70 ppb, respectively. These experiments revealed that substrate carbon content plays an important role in the susceptibility of St. Augustinegrass to topramezone in irrigation water and that carbon contents of 1.4% or greater significantly reduce damage to this warm-season turfgrass.

NR-11

Response of Sugarcane to Carbon Dioxide Enrichment and Elevated Temperature

Leon Hartwell Allen Jr., Joseph C. V. Vu, Chemistry Research Unit, Center for Medical, Agricultural, and Veterinary Entomology, USDA-ARS, Gainesville, FL and Jeffrey D. Ray, Crop Genetics Research Unit, Jamie Whitten Delta States Research Center, USDA-ARS, Stoneville, MS.

Four sugarcane cultivars (CP72-2086, CP73-1547, CP88-1508, and CP80-1827) were grown in elongated temperature-gradient greenhouses (TGG) at ambient or elevated carbon dioxide (CO₂) of 360 or 720 μmol CO₂ mol⁻¹ air, respectively. Each TGG maintained temperatures in four zones at Base temperature with respect to Gainesville ambient (Zone 1), Base + 1.5 °C (Zone 2), Base + 3.0 °C (Zone 3), and Base + 4.5 °C (Zone 4) via computer-controlled ventilation fans and electric heaters. Elevated CO₂ was maintained by injection and feedback control. Germinated sugarcane seed pieces of each cultivar were planted in early March 1997 in 8 tubs in each zone of each TGG. Four tubs contained mineral soil and four contained organic soil. Two tubs of each soil had a high water table (20 cm) and two had a low water table (~50 cm). Biomass harvests were conducted each June and December of 1997 through 2000. Extracted juice volume and Brix were measured from a subset of plants in Zone 1 and Zone 4, and sucrose yield (g per plant) calculated. Over the first six harvests, sucrose was 24% greater in doubled CO₂, 23% greater at + 4.5 °C, 36% greater at the higher water table, and 63% greater in mineral than organic soil. Fresh

weight harvests were 12% greater in doubled CO₂, 4% greater at + 4.5 °C, 10% greater at the higher water table, and 32% greater in mineral than organic soil. Sucrose was promoted more than fresh weight by doubled CO₂ and favorable environments.

NR-12

Using a Science Café Format to Educate Homeowners on Stormwater Ponds

Michelle Atkinson, Manatee County Extension Service, UF, P. Monaghan and E. Ott, Agricultural Education and Communication, UF

Lakewood Ranch Protect Our Ponds is a group of residents, governance, and University of Florida researchers along with UF/IFAS Manatee County Extension. This advisory board provides guidance for community education to the residents on their 320 stormwater ponds. Outreach topics include stormwater pond functions, pond maintenance, landscape maintenance effects on stormwater ponds, pollution runoff, and the best management practices in the landscape. A variety of outreach efforts have been tried to attract the attention of the community. One very successful attempt was a Science Café. This outreach event featured presentations about stormwater ponds, stormwater runoff, and how residents can protect local waterways. Local and University experts also had information tables with displays and there was a time to ask an expert. Light refreshments were provided to attendees and had a pond theme; algae wraps, pond punch, and aquatic vegetables. As this educational outreach was advertised we found an interesting attraction to the event from this community. We only allowed 50 attendees to register and advertised it as “limited”. This small detail had community members signing up quickly and resulted in a waiting list.

NR-13

Water Schools for Decision Makers – A Statewide Cooperative Extension Initiative

BJ Jarvis, UF, Lynn Barber, UF, Chris Martinez, UF, Tatiana Borisova, UF, Shannon Carnevale, UF, Linda Seals, UF

Water conservation, quality and availability are top priorities in Florida. UF/IFAS, at the request of Governor Scott, and after consultations with stakeholders statewide, created a UF/IFAS Extension initiative to address our water challenges. Within this initiative, raising awareness of water issues was identified as a key priority at the statewide Extension Water Summit. Throughout the state, agents are addressing numerous issues for long term sustainable and diverse use of water resources. Decision-makers have pivotal influence on how water resources will be managed on a county and regional levels. To reach this critical audience, a statewide team of experienced agents designed materials for the *Water Schools for Public Officials* Extension program. A Water School is an educational program targeting elected leaders, public officials, and community leaders on water resource issues in their region. Water Schools promote awareness of local, regional and state-wide water issues and potential solutions to local water challenges. Post-program evaluation results from the statewide ISTs found that prior to the IST, attendees felt the least confident about the strategies to recruit the Water School target audience. After the IST, respondents self-assessed their skills as “*very good*” or “*good*” for all key Water

School design and delivery tasks. There was an increased interest in holding a Water School within the next two years. Based on these results, future Water School ISTs may be held and the Water School team will provide assistance to counties that will be presenting Water Schools in the future.

NR-14

Growth of Naiad and Hydrilla using Controlled-Release Fertilizer

Heather Hasandras, Kimberly Moore, Lyn A Gettys, Fort Lauderdale Research and Education Center, UF and Wagner Vendrame, Tropical Research and Education Center, UF

The native aquatic plant naiad (*Najas guadalupensis*) is often confused for the invasive weed hydrilla (*Hydrilla verticillata*). We were interested to investigate if these plants had similar nutrient and growth requirements. A lot of information has been published on the growth of hydrilla but few studies have investigated the growth of naiad. We compared the growth of naiad and hydrilla in mesocosms that contained submerged containers filled with sand. Each mesocosm had containers of naiad and hydrilla growing side by side. Plants were fertilized with 2.6, 5.2, or 10.4 grams of Osmocote 15N-9 P2O5-12K2O incorporated into the sand prior to planting. We had three mesocosms per fertilizer rate with 3 containers of naiad and 3 containers of hydrilla in each mesocosm. Mesocosms were randomly placed in a greenhouse. The experiment ran for eight weeks in spring 2014 and was repeated in summer 2014. Naiad shoot and root dry weight were greatest in containers fertilized with 5.2 g of fertilizer while hydrilla shoot and root dry weight were greatest in containers fertilized with 10.4 grams of fertilizer. Although these plants may look similar, it is clear from this study that their nutritional requirements are different.

NR-15

Alabama and Florida Extension Agents Partner to Offer the Beaches to Woodlands Pre-tour at the Mobile A.M.P.I.C. [NR-15]

Libbie Johnson, UF/IFAS Extension Escambia County, Cantonment, FL, Sheila Dunning, UF/IFAS Extension Okaloosa County, Crestview, FL, C. Stevenson, UF/IFAS Extension Escambia County, Cantonment, FL, C. Verlinde, UF/IFAS Extension Santa Rosa County, Milton, FL, R. O'Conner, UF/IFAS Extension Escambia County, Cantonment, FL, A. Baril, Alabama Regional Natural Resource Extension Agent, Jasper, AL, R. Hendrix, Escambia County Alabama Forester, H. Matthews, Baldwin/Escambia County Alabama Forest Landowner, Captain M. Dorrie, Five Rivers Delta Safari, Mobile, AL.

UF/IFAS Extension and Alabama Cooperative Extension agents worked to design, teach, and evaluate a program to highlight the unique ecosystems found in lower Alabama. **OBJECTIVES:** Introduce unique ecosystems and natural and cultural history of the Northern Gulf Coast region to 10 Extension agents field experiential learning and enable 10 agents to gather and synthesize information, including the Florida Master Naturalist techniques and curricula, which can be incorporated into Extension programming across multiple disciplines nationwide. **METHODS:**

The 1 ½ day event was an experiential-learning style, group excursion in which attendees received instruction on the natural and cultural history of the region; led by a combination of Extension agents, private landowners, forest managers, and professional eco-tour guides. Emphasis was placed on explaining public and privately-owned natural resource management and the economic impact associated with proper planning. Participants visited a coastal barrier island, upland seepage bog, privately owned longleaf plantation, Mobile Tensaw River delta, and Bottle Creek Indian Mound. **RESULTS:** Fourteen (14) participants from 6 states attended. Seven (of 14) responded to an emailed post-tour survey. 100% of the responding attendees (7/7) indicated they increased their knowledge of pitcher plants, the Mobile River Delta and watershed, Longleaf pine and fire ecology, local Indian history, gopher tortoises, sea life, and cogongrass. **CONCLUSIONS:** Participants indicated that they have shared information with clientele and colleagues and integrated interpretive skills into programming for various disciplines (e.g. the 4-H Wildlife Habitat program). Multi-state programming raises awareness and cooperation on issues such as water quality and invasive species management.