138th Annual Meeting of the Florida State Horticultural Society 2025

Book of Abstracts

Horticultural Commodities in the Southwest of Florida. *Photo Credits: Ute Albrecht, Jessica Chitwood-Brown, Pam Roberts, UF/IFAS Photo Stock, Pavlos Tsouvaltzis*

Book of Abstracts

Prepared by Germán Sandoya Miranda and Mary Lamberts

Edited by Mary Lamberts

Florida State Horticultural Society since 1888

Posters

Presiding: **Anna Mészáros**

[P-1 (AGR-5)] Florida Horticulture Sweetens the Deal for Residents of The Villages

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Sumter County is experiencing rapid urban development, with residential areas expanding into historically agricultural lands. As the population grows, fostering public awareness and support for local agriculture is increasingly important. To address this, Sumter County stakeholders collaborate annually to host the Farm City Week Tour, an educational event designed to connect non-agricultural residents with local farming operations. This year's tour highlighted a visit to a local stevia farm, offering interactive presentations on topics such as stevia production, integrated pest management, Florida's natural history, cattle production and ecosystem services, and the use of drones in agriculture. Each 15-20-minute session featured visual aids like brochures, plant specimens, live demonstrations, and displays to enhance learning. Following the presentations, participants toured the farm's extraction facility and propagation nursery, observing breeding trials aimed at developing stevia varieties suited to Florida's climate. The event attracted 55 participants, with 42 completing post-event surveys. Results showed that 100% of respondents gained a better understanding of Sumter County's agricultural practices and natural resources. Many participants, including longtime residents, were surprised by the diversity of local agriculture and discovered new aspects of their community's farming industry. Additionally, because stevia is a new crop for the state, participants were interested in learning about something new and crop diversity throughout the state. The Farm City Week Tour promotes agricultural awareness through hands-on education, strengthening connections between urban and rural communities. This model can be adapted to other regions looking to increase public understanding of agriculture's role in their local economies and ecosystems.

[P-2 (AGR-6)] Inaugural Florida Mango Fest: Extension Education, Community and Florida's Growers.

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South Florida is a major agricultural hub, with Palm Beach County leading in crop production and economic impact. Mangoes (*Mangifera indica*), introduced in 1889, hold both economic and cultural significance in the region, yet many home growers lack access to science-based guidance. To bridge this knowledge gap, UF/IFAS Extension Palm Beach collaborated with FAMU and local growers to launch the Florida Mango Festival in summer 2024. The festival combined education with community engagement, offering expert-led seminars on mango history, best management practices (BMPs), grafting techniques, and variety selection. A 180-variety mango display highlighted fruiting timing

as well as breeding origin. Attendees participated in grower panel discussions, guided mango tastings, while a vendor marketplace featured fresh fruit, trees, and other tropical fruit products. The event also included mango-inspired cuisine from local food vendors. The festival attracted over 700 attendees, demonstrating strong public interest in mango cultivation. Post-event surveys revealed that 90% of seminar participants gained new knowledge in key areas such as pest management, variety selection, and sustainable growing practices. The event successfully increased awareness of Florida-grown mango varieties and highlighted UF/IFAS and FAMU Extension as valuable resources for both advanced and beginner growers and general mango enthusiast. Given its success, planning is underway for an expanded 2025 Florida Mango Festival to further support local agriculture and deepen community engagement.

[P-3 (ANR-18)] Melittin: A Natural Bee Venom Peptide for Cardiovascular Therapy and Disease Modulation

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Melittin, the principal component of bee venom, has emerged as a promising bioactive peptide with significant therapeutic potential in the management of cardiovascular diseases (CVDs). Its amphipathic and anti-inflammatory properties contribute to the modulation of several key mechanisms involved in CVD pathology, including endothelial dysfunction, atherosclerosis, thrombosis, and myocardial ischemia. Melittin has been shown to suppress pro-inflammatory cytokines such as TNF-α and IL-6, inhibit NF-κB signaling, reduce oxidative stress, and promote vasodilation through nitric oxide modulation. Additionally, it demonstrates anti-thrombotic and lipid-lowering effects by inhibiting platelet aggregation and modulating lipid metabolism enzymes. While its cytolytic nature poses challenges for direct systemic administration, recent advancements in nanoparticle delivery systems and synthetic analogs have enhanced its therapeutic index and reduced toxicity. This study explores the biomedical mechanisms through which melittin contributes to cardiovascular protection, offering insights into its potential development as a novel therapeutic agent for high-risk patients with CVDs.

[P-4 (ANR-19)] Utilizing Salt Water to Manage Terrestrial Weeds in Southwest Florida

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Using fertilizers and herbicides to maintain lawns is commonplace throughout Florida. Chemical excess from these practices often gets carried into waterways through runoff, promoting large algae blooms and other environmental disturbances. This study explores the possibility of using native halophytes as turfgrasses whose weeds can be eliminated with salt water rather than artificial chemicals. The grasses *Paspalum vaginatum* and *Sporobolus virginicus* were selected for this experiment due to being low-growing, drought-tolerate, and previously used in similar research. Monocultures of *P. vaginatum* and *S. virginicus* were grown in 10”x20” plastic trays in an outdoor facility where vegetation other than the two cultured grasses were allowed to naturally establish in the trays (weeds). After several months of growing, four trays of each grass species were randomly assigned into three different salt water treatment groups and a fresh water control group. The experimental groups will undergo being watered with a salt concentration of 10ppt, 15ppt, or 20ppt. Prior to treatment, all weeds in every tray were identified and counted so that their individual responses to each salt level could be accurately tracked. The goal of this study is to identify the lowest effective salt concentration that will be able to control most, if not all, common inland weeds species in Southwest Florida.

[P-5 (ANR-20)] AI-BMP Taskforce for North Florida: First Steps to Using AI to Advance BMPs

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Artificial Intelligence (AI) in agriculture is a rapidly growing field aimed at increasing production efficiency. In Florida many producers, industry representatives, agencies and universities are working to increase production efficiency in the hopes of conserving water quality and quantity. To this group AI can and will be a helpful tool to accomplish our water conservation goals through improved production efficiency. We developed an AI-BMP Taskforce made up of farmers, agriculture industry representatives, and university extension and researcher faculty to hopefully bridge the gap from AI theory to practical on-farm tools. This taskforce began by hosting a workshop to better understand the role of AI for BMPs in agriculture. The initial efforts of the taskforce have highlighted the following primary challenges and opportunities for increasing AI adoption in farming. Farmers are most concerned with economic viability, administrative burdens, weather unpredictability, and labor shortages, while AI adoption is hindered by issues of reliability, cost, trust, and data accessibility. However, the strong interest in AI expos, hands-on demos, and centralized resources indicates a need for practical, user-friendly AI solutions tailored to real-world agricultural challenges. To drive AI adoption, stakeholders must focus on improving AI reliability, demonstrating clear financial benefits, and building trust through transparent data practices. Additionally, providing accessible training, beginner-friendly guides, and tools specifically designed to address farming challenges will help bridge the gap between technology and agricultural operations. By fostering collaboration among farmers, industry leaders, and researchers, and ensuring AI solutions align with real-world needs, we can accelerate AI adoption and enhance efficiency, sustainability, and profitability in agriculture.

[P-6 (C-33)] Use of Machine Learning for the Early Detection of Cotonet in Citrus Crops

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The citrus industry of Spain it is affected of a *Delotococcus aberiae*, pest is a species of pseudococcus commonly known as cotonet, a mealybug that causes important economic losses and represents a significant threat to the citrus industry. To meet the challenges of sustainability and production, pest monitoring and control strategies are important to achieve IPM (Integrated Pest Management) strategies. In this context, remote sensing and the use of data analysis and generation of algorithms through Machine Learning, proves to be a digital tool that has allowed to study the presence of pests and diseases in citrus and other crops. The study demonstrates that an application of Machine Learning (ML) techniques and remote sensing data are useful for the early detection of *Delottococcus aberiae L*. It causes fruit deformation that significantly reduces commercial yield, and tree weakening that reduces plant vigor. The proposed model allows early identification of affected areas, reducing dependence on pesticides and promoting a more environmentally friendly crop management. The experiment was conducted on citrus plots from the year 2021 to 2024 to assess the impact of Cotonet and to detect affected plots using Sentinel-2 satellite data. Images of spectral bands mainly B4 and B8, together with vegetation indices such as NDVI [(B8 - B4)/(B8 + B4)] and RVI (B8/B4), were analyzed to monitor pest incidence. Data are collected during critical months for early pest detection, establishing different scenarios based on statistical analysis in different time series. KNN (K-nearest neighbors) analysis was applied to classify plots into two levels (Affected and Unaffected), reaching an accuracy in the lowest case of 85%. The developed algorithm allows the users to enter the geographical reference and to generate a 10x10 m pixel map showing the classification levels, facilitating decision making in the field. The integration of agronomic and remote sensing data with ML techniques improves Precision Agriculture, providing a data-driven strategy for sustainable citrus production with less environmental impact.

[P-7 (C-34)] Assessing the Influence of Fabric Mulch Ground Cover on Grapefruit Tree Growth and Soil Characteristics in the Indian River District

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Citrus production in Florida has drastically decreased over the past twenty years, as acreage management has become more challenging and resource demanding primarily due to citrus greening disease (huanglongbing, HLB). Due to these challenges, new management practices are being implemented to increase soil health and restore tree and root health to mitigate production losses. One practice that has increased in use in the Indian River region is fabric mulch ground covers (FMGC), which have multiple theoretical advantages, including improved weed and pest control, reduced soil erosion and temperature extremes, increased soil moisture and nutrient retention, and enhanced microbiome composition of the soil. Although this practice has been in use for almost ten years, little scientific data has been collected from established groves. Therefore, the goal of this trial is to evaluate the effects of FMGC on grapefruit tree growth and soil characteristics in the Indian River region. Five-year-old 'Star Ruby' grapefruit (*Citrus* × *paradisi*) trees grafted on 'US-942' (*Citrus reticulata* × *Poncirus trifoliata*) rootstock grown with or without FMGC were uniformly chosen for a two-year trial. Twenty trees were assigned to two treatments (FMGC vs. conventional), for a total of 40 trees. Leaf and soil nutrients, trunk diameter, height, canopy volume, nematode abundance, and soil microbiome composition were collected in the winter and summer of 2024 and the winter 2025. Initially, differences in canopy volume, trunk diameter, and soil moisture were detected between the two treatments. The trial will continue for an additional summer, resulting in two years of collecting data and a greater understanding of the potential impact of this recently implemented management practice and benefits to Florida citrus growers.

[P-8 (C-35)] Effects of Cover Crops and Herbicide Strategy in Mature 'Valencia' Sweet Orange Trees

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Huanglongbing (HLB), associated with the bacterium *Candidatus Liberibacter asiaticus*, is one of the most destructive citrus diseases and has caused significant losses in Florida's citrus industry. One of the main challenges is the decline of fibrous roots, which compromises water and nutrient absorption and reduces plant vigor. Additionally, weed competition can increase the stress on HLB-affected trees by competing for moisture, nutrients, and light. Cover crops have been suggested as a potential strategy to improve soil quality, suppress weeds, and mitigate some negative impacts of HLB. This study evaluated the integration of cover crops and two different types of herbicides in HLB-affected citrus orchard. The experiment was conducted in a commercial grove in Fort Meade, Central Florida, using a split-plot design and six replications each consisting of 80 trees. The trees were 'Valencia' orange (*Citrus sinensis*) grafted on US-942 rootstock (*C. reticulata* × *Poncirus trifoliata*), planted in 2016. Since 2022, a mixture of leguminous and non-leguminous cover crops was sown in row middles during the summer and fall, while control plots remained without cover crop. Weed management under the tree canopy was performed using either glyphosate or glufosinate-ammonium. During the study, cover crops reduced weed infestation but did not significantly impact soil physicochemical properties or overall tree health. In year 3 (2025), trees with cover crops had a lower yield than trees without cover crops, indicating that cover crops might have increased resource competition, negatively affecting tree productivity. Herbicide treatments did not significantly influence any of the variables measured.

[P-9 (C-36)] Investigating Zinc for Resilience in Healthy and HLB-Affected Young Citrus.

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Zinc (Zn) is an essential micronutrient critical for enzyme activation, protein synthesis, and chlorophyll formation, directly influencing photosynthesis and plant vigor. In citrus, Zn deficiency leads to chlorosis, small leaves, and stunted growth, symptoms often worsen in trees affected by Huanglongbing (HLB) disease. Since HLB impacts root health and nutrient uptake, it is hypothesized that HLB-affected trees may require a higher Zn application rate than healthy trees to correct deficiencies. A one-year greenhouse study (2023-24) was conducted at the Citrus Research and Education Center in Florida to evaluate the impact of Zn application rates 0, 5.6, 16.8, and 33.6 kg/ha on the growth of 3-year-old HLB-affected and Healthy citrus trees. Preliminary results revealed significant effects of Zn treatments on trunk diameter ($p = 0.002$) and tree height ($p < 0.001$), with HLB status also significantly affecting tree height ($p < 0.001$) and SPAD chlorophyll (p = 0.03). Above-ground and below-ground dry matter were significantly influenced by Zn rates ($p < 0.001$), with the highest Zn rate (33.6 kg/ha) reducing root biomass and fibrous root density in young trees. Leaf Zn concentrations increased markedly, from 28.4–33 mg/kg in Fall 2023 to 124–147 mg/kg in summer 2024, indicating up to 355% increase. However, no significant interaction between Zn rate and HLB status was found for most parameters, suggesting that young HLB-affected trees did not require higher Zn levels than healthy trees. Moreover, higher Zn rates (16.8 and 33.6 kg/ha) led to reduced root biomass and stunted growth, indicating potential Zn toxicity at elevated rates. These findings highlight the importance of balanced Zn fertilization to avoid adverse effects while supporting tree growth.

[P-10 (C-37)] Incorporating and Improving the TREEGRO Model in DSSAT-CSM to Simulate Sweet Orange Crops

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Sweet orange is of great importance to many regions worldwide. Therefore, a sophisticated process-based perennial fruit tree model could provide invaluable support for decision-making. Among dynamic crop simulation models, the Decision Support System for Agrotechnology Transfer (DSSAT) is a widely recognized and utilized tool for crop modeling. However, the system currently lacks a model for simulating perennial fruit tree crops, despite previous efforts that adapted the CSM-CROPGRO model to simulate fruit tree crops (TREEGRO). The goal was to improve an earlier version of the TREEGRO model for simulating sweet orange, focusing on enhancing its representation as a tree fruit model within DSSAT-CSM for Florida and Brazilian conditions. TREEGRO has been incorporated into the most recent Version 4.8.5 of DSSAT-CSM and has shown promising results after improvements in phenology and perennial representation. TREEGRO was able to successfully represent key aspects of sweet orange tree development, accommodating different cultivars with varying maturation, and functioning effectively across different climates. The model accurately simulated flowering and maturity dates, for different cultivars and in different sites in both hemispheres. A dry matter sub-model was added, so it could estimate the fruit fresh weight along with its development. Finally, the sweet orange's species parameters are being parameterized with experimental data to better represent the crop physiological characteristics. The model will be further evaluated with independent data, and finally, applied to different scenarios. It is expected that this project will deliver a robust, ready-to-use tool for simulating sweet orange development, growth, and yield within the open-source DSSAT framework.

[P-11 (C-38)] Effects of Iron in Lignosulfonate Form on Young Citrus Plant Growth

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Iron is an essential element for plants, playing a crucial role in the formation of key enzymes involved in fundamental processes such as respiration and photosynthesis. It also participates in other important processes, including nitrogen metabolism, chlorophyll biosynthesis, and ethylene production. Citrus trees in the Mediterranean region often suffer from iron (Fe) deficiencies due to the high pH levels of the soils. Under alkaline conditions, insoluble ferric hydroxides and intermediate forms of [Fe(OH) ^(2+) or [Fe(OH)] _2^+ are typically produced. Additionally, iron is a non-mobile element in plants, as it has low translocation from older to younger leaves. Because of these factors, applications of iron chelate or lignosulfonates, whether in the soil or as foliar treatments, are necessary to correct Fe deficiencies in citrus cultivation in Valencia. This experiment aimed to evaluate iron deficiency in young citrus plants and their response to various preventive and corrective treatments formulated with iron in the form of lignosulfonates (BIOQEL FERRUM). The experiment was conducted in the Venlo-type glass greenhouses at the Polytechnic University of Valencia (UPV), which are equipped with zenithal ventilation systems regulated by climate control automatons. On December 9, 2024, commercial seedlings of the citrus variety 'Clemenules,' grafted onto the 'Carrizo' rootstock, were transplanted into 5-liter containers using coconut fiber as the substrate (pH = 8.0, EC = 0.20). A total of 80 plants were distributed among four experimental treatments (T1, T2, T3, and T4) with the same irrigation dosage but different nutrient solutions.
The nutrient solutions studied were as follows:
- T1: Hoagland nutrient solution (without Fe contribution).
- T2: Hoagland nutrient solution, providing Fe as EDDHA chelate at each irrigation.
- T3: Hoagland nutrient solution, providing Fe as lignosulfonate (BIOQEL FERRUM) at each irrigation.
- T4: Hoagland nutrient solution, providing Fe as lignosulfonate (BIOQEL FERRUM) every four irrigations.
The plants were arranged according to a randomized block design, with four replicates for each treatment, consisting of five plants each. Subsequently, two plants from each replicate were sampled to determine evaluation parameters 90 days after transplanting (DDT). The agronomic performance of the plants was characterized by measuring morphological and physiological parameters, including plant height (cm), number of leaves, leaf dry weight (g per plant), Hunter parameters of leaf color (a, b, L), and SPAD index. The treatments with different sources of Fe did not significantly influence plant height, the number of leaves, or morphological parameters related to plant dry matter. However, leaf color was affected by the treatment source of Fe, with the therapy lacking Fe showing different Hunter coordinates (a and b values) compared to treatments with Fe. The lowest values for the leaf color parameter b (indicating less yellow) corresponded to the highest SPAD values, demonstrating that the Fe treatments did not exhibit chlorosis problems. In conclusion, treatment T4 was identified as the most balanced, exhibiting the fewest difficulties in leaf coloration and, therefore, the least occurrence of chlorosis.

[P-12 (C-39)] Optimizing Zinc and Potassium Applications to Enhance Sweet Orange Yield

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Huanglongbing (HLB), associated with the bacteria Candidatus Liberibacter asiaticus (CLas) and spread by the Asian citrus psyllid in Florida, disrupts hormonal pathways, leading to premature abscission, exacerbated preharvest fruit drop, and decreased yield in citrus. Zinc (Zn) and potassium (K) are essential for plant growth and auxin homeostasis, which is key for fruit retention. This study aimed to determine the optimal timing for Zn and K applications to maximize fruit retention in HLB-affected citrus trees. Field studies were conducted in Collier and Hendry Counties, Florida, starting in the fall of 2023, using Valencia and Hamlin sweet oranges (*Citrus sinensis*). The experimental design was a randomized complete block design (RCBD) with foliar sprays at three different months and treatments: water control, Zn sulfate, and a combination of Zn and K. Data were collected on growth, fruit/juice quality, yield, fruit detachment force, fruit drop and Indole-3-acetic acid (IAA) content in fruit flavedo. Both Hamlin and Valencia trees showed similar responses to all treatments, and the response was dependent on the time of application, suggesting that the fruit developmental or maturation stage determines the response to the treatment. Initial results suggest that

the nutrient sprays performed after the onset of peel color development positively induced IAA content thus reducing fruit drop by the end of maturation. The physiological implications of this observation will be discussed.

[P-13 (KM-26)] Exploring the Effects of GA_3, Hydrogel, and Nitrogen on Boosting Pomegranate (*Punica granatum* 'Salavatski') Yields in Florida.

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Pomegranate (*Punica granatum* 'Salavatski') is a resilient fruit crop with potential for high productivity in subtropical climates. However, flowering and fruit set can be influenced by environmental conditions and nutrient availability. Gibberellic acid (GA_3), a plant growth regulator, has been shown to enhance flowering, fruit development, and overall plant vigor. This study evaluates the effectiveness of low (150 ppm) and high (300 ppm) doses of GA_3 in promoting flowering and growth in pomegranate, comparing their impact with conventional fertilization and hydrogel polymer applications. Additionally, the study assesses the influence of treatments on fruit yield and quality. The experiment was conducted on 1 year old pomegranate seedlings. The study included four treatments: (1) NPK Fertilizer as Control, (2) NPK+Hydrogel, (3) NPK+150ppm GA_3, (4) NPK+300 ppm GA_3, with 5 replications per treatment. Tree growth parameters, flowering intensity, fruit set, and yield were monitored. Statistical analysis performed using one-way ANOVA in R Studio, with Tukey's HSD Test ($P<0.05$) applied for multiple comparisons. Preliminary expectations suggest that GA_3 treatments, particularly at a higher dose, promote flowering and increased fruit set. Hydrogel-amended treatments with improved soil moisture retention, reducing stress and enhancing growth. NPK treatments influence vegetative growth with varying effects. Each treatment demonstrated distinct effects on pomegranate development, emphasizing the importance of targeted management strategies. These findings highlight the potential of Gibberellic Acid, Hydrogel, and NPK fertilization adjustments as independent interventions to optimize pomegranate production in Florida's challenging growth conditions.

[P-14 (KM-27)] Effect of Biochar Amendment on Morphology and Physiology of Potted Banana

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Biochar has been studied as a soil amendment for enhancing plant growth and soil health. This study evaluated the effects of biochar on banana (*Musa spp.*) growth using four treatments: 0% biochar (control), 25% biochar, 50% biochar, and fertilizer. The major goal of this study was the assessment of the effect of biochar amendment on the physiology and development of banana plants at pot conditions. Growth parameters, including growth rate and leaf number, leaf area was measured. Results showed that 50% biochar application resulted in the highest growth rate and leaf number, followed by 25% biochar treatment. It stimulated plant growth and led to a greater leaf area, larger plant stems and wider leaves than those cultivated on the un-amended soil. There was no significant difference in plant performance between the control and fertilizer treatments. These findings suggest that biochar, particularly at 50% application, may be a beneficial amendment for improving banana growth. Further research is needed to assess long-term impacts on soil properties and yield.

[P-15 (KM-28)] Introducing a New Research Program: Advancing Sustainability and Quality in Grapes and Other Tree Crops for Texas and Beyond

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This research program at Texas A&M University aims to enhance the sustainability and productivity of Texas horticulture by applying plant physiology to address key production challenges. With a focus on high-value crops like grapes, citrus, and other fruit trees, the research program explores how environmental stressors - such as drought, heat, cold, and varying soil conditions – affect plant growth, fruit quality, and overall yield. By studying the physiological responses of plants to these stresses, the program seeks to develop strategies that optimize water and nutrient use, improve soil management, and enhance rootstock and cultivar selection. Field and laboratory studies will investigate how to increase crop resilience through better understanding of the interactions between roots, shoots, and fruits, as well as how to mitigate stress impacts on production. The research program's output will directly benefit Texas growers by providing practical recommendations for improving crop quality and sustainability in diverse climates and soils. Collaborative efforts with colleagues at Texas A&M, Texas Tech, and institutions nationwide will enhance the program's ability to deliver practical, science-based solutions to Texas growers, improving crop quality and sustainability across the state's varied climates and soils. Additionally, the laboratory provides hands-on research opportunities for undergraduate and graduate students, fostering the next generation of horticultural scientists. Through industry collaborations, the program will support the long-term success of Texas and American agriculture, helping to ensure a sustainable future for horticultural production.

[P-16 (OGL-19)] Effects of Nitrogen Fixing Bacteria on Zoysiagrass Lawns

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Zoysiagrass is widely used on lawns across Florida; however, it requires supplemental fertilizer and irrigation. The integration of nitrogen fixing bacteria, such as *Azospirillum brasilense* (Azb), may enhance nutrient uptake and rooting, which could allow a reduction in fertilizer and irrigation. This study aimed to assess the effects of *Azospirillum brasilense* on Zoysiagrass under different nitrogen (N) and irrigation rates on turfgrass performance. The experiment is taking place from summer 2024 to fall 2026 at the University of Florida, involves 'CitraZoy' Zoysiagrass treated with different Azb products, N and irrigation rates. Treatments included three Azb products (Tazo-B, AzoPro Turf, Azo Root) and a non-inoculated control, applied monthly at three N levels (100%, 50%, 0% N rate) and two irrigation levels. The experimental design used a randomized complete block with four replicates per treatment combination. Data collected weekly on normalized difference vegetation index (NDVI), visual quality, soil moisture, digital image analysis. Statistical analysis was conducted using Analysis of variance (ANOVA), with mean comparisons determined by Fisher's Protected Least Significant Difference (LSD) at a $p \leq 0.05$ level. This is year one results and a second year will be conducted in the same place to confirm results that suggest that *Azospirillum brasiliense* may enhance Zoysiagrass performance and potentially reduce nitrogen fertilization and irrigation needs.

[P-17 (OGL-20)] Native Grass: An Alternative to Bahiagrass Sod in Southwest Florida

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Bahiagrass (*Paspalum notatum*) is widely used in Southwest Florida (SWFL) due to its availability and resilience, but its high mowing requirements impose significant costs (~$1 million annually) and contribute to aquatic eutrophication through grass clippings. This study evaluates three native SWFL grass species as lower-maintenance alternatives that may provide soil stabilization and aesthetic benefits. A randomized split-block experiment was conducted at Freedom Park in Naples, FL, with eight plots per block: three single-species plots (*Distichlis spicata, Paspalum vaginatum, Sporobolus virginicus*), three mixed-species plots, one all-native species plot, and a *P. notatum* control. Percent cover, mean maximum height, and belowground biomass was measured quarterly. Performance was assessed by target species cover ≥ control, mean maximum height ≤ 30 cm, and root biomass comparable to *P. notatum*. Results showed that *D. spicata* and *S. virginicus* maintained heights below 30 cm. *S. virginicus* and the all-native mix had significantly higher target species cover than the control ($p < 0.0032$). No significant differences in belowground biomass were

observed (p = 0.89). Findings suggest SWFL native grasses can establish effective ground cover while reducing mowing needs and eutrophication risks. *D. spicata* and *S. virginicus* exhibited optimal growth characteristics, making them promising alternatives to *P. notatum* for landscaping and soil stabilization.

[P-18 (OGL-21)] 'Chico', a New and Improved UF/IFAS Cultivar of Ornamental Rhizome Perennial Peanut (*Arachis glabrata*) for the Landscape.

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Perennial peanut is an umbrella term used to describe a group of *Arachis* species (*A. glabrata* and *A. pintoi*) adapted to tropical and subtropical climates. With a high protein content, drought tolerance, low disease and insect incidence, perennial peanut species have been traditionally used to produce high-quality hay. In a small capacity, perennial peanut has also been used as an ornamental ground cover due to its attractive leaf color, low maintenance needs, orange flowers, and low mowing requirements. *A. glabrata* is a stoloniferous perennial peanut type that fixes nitrogen into the soil, have low disease and insect incidences, and is drought resistant. *A. glabrata* 'EcoTurf' is a dual-purpose rhizome perennial peanut (RPP) cultivar that can be use for hay and as ornamental due to its low height (15 -20 cm). 'Ecoturf' is the most popular ornamental RPP cultivar. The University of Florida IFAS Ornamental Perennial Peanut Breeding Program is releasing a new and improved Ornamental RPP variety: *A. glabrata* 'Chico'. 'Chico' was discovered in a field of the unpatented *A. glabrata* selection 'Chiquita' at the UF/IFAS North Florida Research and Education Center (NFREC) Live Oak, FL. 'Chico' was purified from single rhizome descent and tested for propagation and stability for the last nine years. 'Chico' is phenotypically stable and has dark green leaves, a compact and dense foliage growth habit, glaucous leaves, and an elliptical leaf shape. In field teste, 'Chico' has significantly smaller height, and leaflet height and width, than the industry standard 'EcoTurf'. Foundation and Breeder's plant materials are available and maintained at the NFREC Quincy, FL.

[P-19 (OGL-22)] Measuring Nitrate and Phosphate in Leachate During Greenhouse Production of *Philodendron* 'Moonlight'- Comparing Analysis Methods and Evaluating Results

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Fertilizers play a crucial role in plant growth and sustainability, particularly in controlled greenhouse environments. Understanding how nutrients, particularly nitrate and phosphate, fluctuate over time can improve fertilizer management. This study indirectly evaluated nutrient availability to *Philodendron* 'Moonlight' by monitoring leachate composition over time. The main objectives were to determine nitrate and phosphate availability to plants and to evaluate different methods for measuring nitrate ion and phosphate ion levels in leachate. Leachate samples were collected monthly from 72 plants produced with one of four different controlled-release (365-day formulation) fertilizer rates and grown under one of two different light levels to assess how the plants grow in relation to available nutrients from the fertilizers. Measurements of leachates included pH, electrical conductivity (EC), temperature, nitrate ion concentration and phosphate ion concentration. Phosphate ion concentrations were analyzed using both a Hanna Nutrient Analysis Photometer and a LaMotte colorimeter. Nitrate ion concentrations were analyzed using a Horiba LAQUAtwin Nitrate ion meter, a Hanna Nutrient Analysis Photometer, and the Mackerey-Nagel Quantofix nitrate test strip system. By tracking nitrate ion and phosphate ion fluctuations, this study provides insight into nutrient uptake efficiency and fertilizer retention in greenhouse production. Evaluating the levels of nitrate ions and phosphate

ions present in leachate allows for better fertilization practices, ensuring plants receive the necessary nutrients while minimizing waste. These findings contribute to improved fertilization practices for both commercial and domestic plant care, promoting sustainability in controlled system.

[P-20 (OGL-23)] Assessing Weed Invasion into an Experimental Native Saltmarsh Sod Planting in SWFL

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Turfgrasses cover over 16 million hectares in the U.S., with 10 million hectares as residential lawns. In Southwest Florida (SWFL), bahiagrass (*Paspalum notatum*), a non-native species, dominates turf management due to its cost-effectiveness and resilience but poses maintenance challenges in coastal residential and urban areas. Native grasses, adapted to local conditions, may offer a sustainable alternative. This study tested native saltmarsh sod strips for their resistance against weed colonization in SWFL. Native grasses *Paspalum vaginatum* and *Sporobolus virginicus* were cultivated at Lipman Family Farms with Naples Botanical Garden (March–August 2024) and later transplanted to Freedom Park-Everglades Wetland Research Park in Naples, Florida. Percent cover data was collected (September–November 2024) using a laser intercept technique. Contingency Chi^2 analyses assessed differences in cover classes over time and between species. Results showed minimal weed invasion (<1% cover, $p<0.0001$) in both native sod species. However, *P. vaginatum* exhibited significantly more bare ground than *S. virginicus* ($p<0.0001$), suggesting greater vulnerability to weed encroachment. Weed cover in *P. vaginatum* spiked in October before declining in November, likely influenced by drought followed by wetter conditions. *S. virginicus* maintained lower weed invasion throughout. Findings suggest native sod species, particularly *S. virginicus*, show promise as alternatives to non-native turfgrasses in SWFL and warrant further field trials in applied settings.

[P-21 (OGL-24)] Growing Together Towards Water-Efficient Landscapes

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In Florida, over 50% of residential water use is dedicated to irrigating home landscapes. Concurrently, Florida is one of the fastest-growing states in the country. Identifying strategies to reduce residential irrigation is crucial for meeting Florida's current and future water needs. This project aims to explore how the horticulture industry can address these demands by producing water-efficient landscape materials. Interviews with green industry stakeholders were conducted to identify challenges and opportunities. Based on the feedback from these interviews, key questions were formulated to engage nursery growers, landscape architects, irrigation professionals, builders, and developers in guided focus group discussions. These focus groups were designed to include various sectors of the green industry to foster collaboration, innovation, and shared responsibility in promoting water conservation while meeting consumer needs. The findings from this project will inform the development of educational materials and programs. These resources will help facilitate industry growth by exploring opportunities to expand the market for water-efficient landscapes. Additionally, educational programs will assist all stakeholders in identifying more aligned approaches to water conservation.

[P-22 (V-29)] Assessing Seed-Borne Pathogen Risks in Globally Sourced Okra

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Okra (*Abelmoschus esculentus*) is a versatile and nutritious vegetable; however, it is not produced in significant volumes in the U.S., with imports exceeding $71.2 million in 2024. While domestic demands must be met, imported okra can carry concerning diseases and should be screened to protect growers' fields. Seedborne pathogens are highly destructive to plant health, but also due to their wide host range and ability to survive long-term in seeds or soil. Some of these diseases can reduce germination rate by up to 50% and potentially spread to other economically important local crops. To address these risks, this project aims to identify seedborne pathogens in okra from various origins, supporting quarantining efforts to ensure the sustainability of local okra production. A total of 300 okra seed accessions from 22 countries across Africa, Asia, and Europe, were provided by the USDA/ARS, and evaluated using the blotter test. Bacterial and fungal pathogens were isolated, purified, and their pathogenicity was further confirmed through Koch's postulates. The resulting symptoms included root discoloration, reduced germination, and stunted seedling growth. Pathogens were identified by morphological and molecular characterization, with some showing regional frequency. These findings highlight the risk of seed-borne pathogens in okra, emphasizing the need for stringent testing and quarantine. Identifying regionally prevalent pathogens enables targeted screening, reducing disease spread and supporting pathogen-free seed development to enhance crop health and yields.

[P-23 (V-30)] Incorporating Phosphorus Fertilization Response for Tomato Growth and Yield in the CSM-CROPGRO Model

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Phosphorus (P) is an essential nutrient that plays a significant role in crop growth and yield. One way to assess the impact of P management on crops is through crop models, such as those embedded in the DSSAT Cropping System Model (DSSAT-CSM). These models enable the simulation and estimation of P response under different environment and management conditions. Therefore, they serve as important tools for researchers and growers, assisting in management decisions and improving agricultural production. However, the DSSAT-CSM is currently unable to simulate plant P dynamics for major vegetable crops in Florida, including tomato (*Solanum lycopersicum* L.). Thus, this study aimed to evaluate the model's ability to simulate P responses in tomato growth and yield under Florida conditions. The evaluation was conducted using field experimental data, considering six P fertilization rates (0, 29, 49, 78, 98, and 118 kg P ha^{-1}) applied to the tomato cultivar Ridgerunner at the University of Florida's Tropical Research and Education Center during the winter seasons of 2014 and 2015. The initial model assessment indicated that DSSAT-CSM responded to different P application rates, allowing for an evaluation of how varying P levels affect tomato yield. Therefore, these findings can contribute to improving the application of crop models for quantifying the effects of P management on tomato production in Florida.

[P-24 (V-31)] Differences in Postharvest Ripening Characteristics of Tomato Fruits from a Long Shelf-life Hybrid and an Heirloom Variety Stored under Light and Darkness

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The aim of this study was to determine differences in morphological, physicochemical and physiological characteristics during the postharvest ripening of tomato fruits from a long shelf-life hybrid and a heirloom variety with limited postharvest life. Fruits from a commercial greenhouse hybrid (cv. Formula F1) and an heirloom variety (MFS-106/07) were harvested at the mature green (MG) stage and kept in storage cabinets (68 °F and 85% RH) put in the dark and with light conditions. Fruit weight, color (a*, b* and L* values), and the production rate of CO_2 and C_2H_4 were monitored daily until the red-ripe (RR) stage, and in MG and RR fruits firmness (as resistance to

deformation), titratable acidity and the content in total soluble solids, total phenolics and lycopene were determined. Heirloom cultivar fruits ripened and developed fully red coloration 7 days faster, and contained more total soluble solids, total phenolics and lycopene (only when matured in darkness) at the RR stage in relation to the fruits from the long shelf-life hybrid. However, red coloration at the RR stage did not significantly differ between the cultivars and the hybrid fruits had higher skin lightness. Faster ripening of the heirloom fruits was concomitant with their substantially higher respiration and ethylene production rates as well as the earlier and more intense climacteric rise in respiration compared to the hybrid cultivar. Light during storage promoted the ripening of heirloom fruits faster than hybrid cultivar. However, it did not significantly affect most fruit physiological and physicochemical characteristics in both cultivars, except an increase of the lycopene content and a deceleration of softening only in hybrid RR fruits, and a decrease of the maximum ethylene production rate in both cultivars.

[P-25 V-32)] Evaluating Yield Performance in Commercial Cucumber Varieties Under Anthracnose Pressure

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Anthracnose, caused by the hemibiotrophic fungus *Colletotrichum orbiculare*, is a devastating fungal disease that significantly impacts crop yield. In Florida, cucumber generates a revenue of approximately $5,589 per acre, but anthracnose can cause 5–20% yield losses, reaching 46% in severe outbreaks, reducing profitability. In South Florida's tropical climate, it threatens farmers by infecting all above-ground plant parts, leading to dark leaf spots, sunken fruit lesions, and lower marketable yield. The pathogen's evolving races due to changing environmental conditions have reduced fungicide effectiveness, making existing resistant varieties vulnerable. Therefore, continual screening of commercial cultivars is essential to assess their resilience and ensure durable disease management strategies. To address this, our study focuses on evaluating the yield performance of eight commercial cultivars. Yield assessment showed significant variation in marketable and unmarketable fruit production, with genotypes H19 & MB consistently outperforming, while MK exhibited the poorest yield potential. ANOVA and post-hoc tests confirmed H19 producing the highest yield. However, AUDPC revealed significant variation, with H19 showing the lowest AUDPC score (6.93), indicating resistance. A strong negative correlation (r = -0.86) between marketable yield and disease severity highlighted the impact of disease pressure on productivity. Overall, H19 and MB emerged as promising candidates for commercial cultivation under anthracnose conditions, offering superior yield potential and enhanced disease resistance.

[P-26 (V-33)] On-Farm Application of Fluazaindolizine for Managing Nematodes in Okra Cultivation in South Florida

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Root-knot (*Meloidogyne* spp.), reniform (*Rotylenchulus reniformis)*, and spiral (*Helicotylenchus* spp.) nematodes are common nematode pests affecting vegetable crops in South Florida. This work evaluates the efficacy of recently registered non-fumigant nematicide, fluazaindolizine (Salibro® Reklemel™), for managing nematode populations in okra (*Abelmoschus esculentus* L.) in South Florida. A single application of fluazaindolizine (48 oz/acre) was applied using a tractor-mounted sprayer and mechanically incorporated into the soil on the same day before planting okra seeds, as per the manufacturer's instructions. Experimental plots were arranged in a randomized complete block design with six replicates, as well as the control (untreated). Soil and root samples were collected at four time points: 15 May (one day before nematicide application), 23 May, 17 June, and 8 August 2024. No significant differences in nematode populations were observed between chemically treated and untreated plots at any sampling time. Reniform and spiral nematodes were predominant, with populations below 200 per 100 cm^3 of soil, while Root-knot nematodes remained under 10. No root galling symptoms were observed, likely due to minimal root-knot pressure and fluazaindolizine's limited efficacy. Environmental conditions such as soil type and high temperature (88 F°) can influence nematicide

efficacy, potentially limiting its movement and bioavailability in the root zone. Another consideration is that if nematode populations were already low at the time of application, detecting significant differences in nematode reduction between treatments might be challenging due to natural population fluctuations and sampling variability. Further research is needed to evaluate the efficacy of fluazaindolizine under different environmental and nematode pressure scenarios.

[P-27 (V-34)] Monitoring the Growth of Commercial Edamame Varieties Throughout the Fall Season in Miami-Dade County

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Edamame, a vegetable soybean primarily cultivated in East Asia, has been introduced to U.S. regions like Arkansas and Virginia in recent decades to meet rising domestic demand. As consumer interest continues to grow, expanding domestic production is essential. While previous studies in Northern Floria demonstrated the potential of growing edamame, they mainly grew it in late spring and focused on Plant Introductions (PI) - experimental lines not yet commercially accessible to growers. Additionally, Florida's diverse climate presents challenges for crop adaptability, with significant differences between regions. Miami-Dade County's subtropical conditions support fall bean production, providing a unique opportunity to supply fresh edamame during winter when it is unavailable from other U.S. regions or northern Florida. This study evaluated the adaptability of 16 commercial edamame varieties in Miami-Dade County during fall 2024, from October to December. In addition to fresh pod yield, key productivity parameters, including plant biomass (both dry and fresh), height, leaf area, and SPAD readings were monitored biweekly throughout the growing period. Edamame pod dimensions (i.e., length, width, and thickness) and percentage of 1-seeded pods were also assessed to determine quality differences among varieties. The results showed emergence rates ranging from 12% to 84%, and fresh pod yield varying from 0.5 to 3.2 tons/ha. 'Chiba green' showed the highest yield, significantly outperforming 'Karikachi' and "Shirofumi', which had the lowest yields. Varieties also exhibited distinct growth patterns throughout the season, which correlated with yield potential. These findings enhance understanding of edamame growth under subtropical fall conditions, providing growers with opportunities to diversify crop production and address seasonal market gaps.

[P-28 (V-35)] Study on Biosolid Compost Integration on Basil Plant Production and Nutritional Composition

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Soil amendments are increasingly vital as agriculture faces rising demands and soil degradation from a growing global population. Sustainable practices are key to addressing these challenges. Biosolid compost, derived from treated wastewater and traditionally used for forage crops, is increasingly utilized to enhance soil properties by improving organic matter content, nutrient availability, and overall soil health. However, further research is necessary to understand its impact on crop production and nutritional composition. This study examines biosolid compost's effect on the growth, yield, and nutritional quality of basil (*Ocimum basilicum*). Two basil varieties (Prospera 1, Prospera 4) were transplanted into half-gallon pots filled with a mixture of various concentrations of biosolid compost (0%, 5%, 10%, 15%, and 30% v/v) and sandy soil. These plants were monitored across three consecutive planting trials. Soil properties, including pH and electrical conductivity, were evaluated before, during, and after each trial to assess changes over time. Plant growth and yield were measured, and post-harvest nutritional analyses included antioxidant capacity, nitrate content, phenolic properties, and dry matter content. Results revealed that moderate compost concentrations improved plant growth, leading to higher yields and enhanced nutritional quality, with Prospera 1 showing increased phenols, chlorophyll, and soluble solids at 15–30%, while Prospera 4 peaked at 10–15%. These quality improvements highlight biosolids' potential to boost flavor, vigor, and antioxidant content. This research

provides valuable insights into the biosolid compost's role in sustainable agriculture and transplant establishment for high-value crops like basil, particularly in nutrient-poor sandy soils such as Florida's.

[P-29 (V-36)] Comparison Between On-vine and Off-vine Tomato Fruit Ripening

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Tomato fruit can be detached from the plant and left to ripen upon harvest because it is a climacteric species. Ripening is associated with changes in color (from green to red) and loss of firmness (softening), but when performed too early, it is associated with reduced taste and, in turn, consumer appreciation. In our study, a group of tomato fruit were harvested in May 2024 from plants grown at SWFREC (cv. HM 1823) at four ripening stages, namely 'mature green', 'turning', 'pink', and 'red', as assessed visually and were transferred within 1 hour to a room at 22°C for 12 days, simulating shelf-life conditions. Simultaneously, another group of fruit at the same stages were selected and labeled on the plants, in order to monitor their on-vine ripening performance. Color and firmness measurements were taken every four days in pre-selected fruits. According to the results, significant differences in terms of color and firmness were observed between harvesting methods, with the exception of the red ripe harvested fruit. In particular, the hue angle levels of 'mature green', 'pink', and 'turning' fruit were always higher in fruit that were left on-vine, throughout the shelf life period, although their initial values were the same. Differences in firmness were observed only in the mature green fruit until the 8th day of storage, with higher values in fruit left on-vine. The above highlights the significance of proper scheduling of harvest practices in tomato production in order to combine optimum management and nutritional value.

Agritourism Section
Presiding: **Stephen Jennewein**

[AGR-1] Farm Tour Planning - Keeping the Event Safe, Fun and Educational

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Through experiential learning, students and the public can benefit from farm tours to increase their awareness of Florida agriculture, along with introducing them to their local farming neighbors. This practice gives students the opportunity to connect their knowledge gained in the classroom to the reality of farming practices, plus networking for their careers. It also provides an opportunity for the local community to discover where to locate locally produced fruits and vegetables as part of the "slow foods" movement. Depending on the target audience, farm tour planning will differ for students (graduate or undergraduates) versus the general public, while safety precautions are also reviewed to ensure that the non-farming participants are aware of what to expect on a commercial-scale farming operation. Participants are given a glimpse of navigating farm equipment, staying hydrated and protected from sun exposure, pesticide signage and more during their visit. Three farm tour experiences in Northeast Florida will be reviewed with their objectives, target audiences, along with the results of their survey feedback. These tours include one bus tour with the local public, the UF Sigma Alpha sorority, and the CALS Food and Resource Department's graduate students. Each experience included different modes of transportation and sites to explore, but they all were intended to be fun and safe, while being informative. The survey with the public resulted in a 100% knowledge gain of awareness of local farms in the area (n = 18 respondents) and 100% intended to increase the purchase of Florida-grown produce.

[AGR-2] Board Our Bus: Promoting an Appreciation for & Understanding of Local Agriculture

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Nearly 75% of land in Highlands County is zoned for agriculture. That is to say, agriculture is a big part of who we are and what we do. However, most farms in Highlands County are commercial operations without a public-facing element, so many residents and visitors lack opportunities to interact with their local agricultural community. Our annual "Ag Tours" give participants the chance to engage directly with producers. This January, I hosted an "Agriculture and Natural Resources Tour." The itinerary included five stops within Highlands County: a citrus grove, one of the country's largest horticultural nurseries, a biological station that conducts research on the Lake Wales Ridge (and also where we hosted the coveted steak lunch, expertly grilled by the local cattlemen's association), a fertilizer company, and a winery that sources some grapes from the vines outside the facility. At the citrus grove, visitors got an intimate look at productive HLB-infected trees and some innovative approaches producers use to navigate the disease's challenges. Surveys conducted after the tour showed promising results. 76% of participants reported knowledge gain about local agricultural operations and 81% reported knowledge gain about ecosystem services of agricultural lands. Additionally, 89% reported enhanced attitude about agriculture's importance to Highlands County and 86% reported enhanced attitude about agriculture's importance to food security. Our unique approach to these tours provides attendees with first-hand access to agricultural production and encourages continued connection between consumers and producers.

[AGR-3] Grove to Community: Mango Fest Successes and Lessons Learned

Kara Krueger[1]*, Emily Marois[1]*, Anna Meszaros[1], John W. Roberts[1], Yesenia A. Rodriguez[1], Tavia Gordon[2], Noelle Guay[1], Matthew Van Weelden[1], and Ronald Rice[1]

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There is always an annual influx of inquiries about Mango trees (*Mangifera indica*) to our UF/IFAS Palm Beach County Extension office from late winter through fruit production in the summer. Indicating a need amongst the community for more outreach and education on mango growing and horticultural techniques in their production, especially for home-growers. We partnered with local South Florida mango growers to develop the Florida Mango Fest. This event was designed to provide research-based education for the community while increasing agricultural awareness of the number of local growers. The festival featured concurrent educational lectures for beginner and advanced growers, delivered by experienced mango producers and UF faculty. A panel discussion among experts addressed cultivation techniques, challenges, and innovations. 180 Florida-grown mango varieties were on display, showcasing local mango diversity. The event also included grower-led tasting sessions of eight varieties, a mango identification booth, and 16 vendors/growers specializing in mangoes and tropical fruits. Providing an approachable event to bring agriculture awareness to the community really shows the value of UF/IFAS Extension to deliver meaningful education.

[AGR-4] Farm tours in Northeast Florida: the past, present, and future of the Tour de Farm

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Northeast Florida's Tour de Farm exemplifies an effective program for promoting agricultural awareness and appreciation through agritourism activities. The tours showcase a diverse range of local farms and bridge the gap between consumers and the food they eat. Participants are given the opportunity to directly engage with farmers to understand the origins of their food and learn about sustainable farming practices. These tours are planned and delivered by Tour de Farm subcommittee of Slow Food First Coast. Slow Food First Coast is an organization focused on strengthening the connection between growers and consumers to provide good, clean, fair food for all. Tour de Farm has changed over the years due to multiple challenges but remains a popular agritourism activity in Northeast Florida. From 2023-2025, roughly 300 attendees have experienced 3 Tour de Farms exhibiting 25 farms and 5 restaurants that use locally produced agricultural products. A follow-up survey was distributed to attendees to gauge the impact of the tours. Of those who responded to surveys, 96% learned about new local farms, with 44% being completely unaware of all locations exhibited. Further responses showed that 100% of survey respondents increased their appreciation of agriculture's importance in their region and 93% increased their understanding of how and where local food is produced.

Agroecology & Natural Resources Section

Presiding: **Jay Capasso**

[ANR-1] Evaluation of nitrogen rates and cultivar effects on growth and fiber biomass yield of industrial hemp (*Cannabis sativa* L.)

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Advanced interest on the agronomy of industrial hemp (*Cannabis sativa* L.) has risen due to the diversity of uses. The dynamic soils, weather patterns and increased regulations on crop fertilizations in Florida has necessitated the investigation of location-specific nutrient management practices, for optimal growth and yield of industrial hemp. This 3-year study assessed the effect of six nitrogen (N) rates (0, 56, 112, 168, 224, and 280 kg N ha^{-1}) and two cultivars (NWG-2730 and IH-Williams) on industrial hemp in the Florida Panhandle. The study was a 2 × 6 factorial in randomized complete block design with four replications. The emergence stand count (ESC), stand count at harvest (SCH), plant height (PH), stem diameter (SD), aboveground biomass (AGB) and stem biomass (SB) were evaluated. The study observed a 27.4% and 31.8% significant increase in AGB and SB, respectively, with increasing N rates (0 to 168 kg ha^{-1}). Cultivars effects on the evaluated growth (ESC, SCH, PH, SD) and yield (AGB and SB) parameters was also significant. The IH-Williams's cultivar gave a 22.2%, 38.3% and 40.9% higher ESC, AGB and SB. There was significant interaction between N rate x year (SD), and cultivar x year (SCH, PH, AGB and SB), indicating that the performance of N rates and cultivars on growth and biomass yield of industrial hemp in Florida was soil and weather dependent. Based on our predicted linear plateau model, we conclude that the optimal N rate for hemp biomass yield production in Florida is 147 kg ha^{-1}.

[ANR-2] Phosphorus Bioavailability in the Suwannee Valley Agricultural Area

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This study investigates phosphorus (P) bioavailability in soils collected from multiple locations in the Suwannee Valley Agricultural area of North Florida. Soil samples were obtained from a starter P fertilizer trial (both pot and field studies), a controlled-release fertilizer trial in carrots, on-farm corn trials, and residential properties. The study aims to assess the effectiveness of alternative P testing methods, including the Haney (H3A) and Iron Oxide (FeO) strip tests, in comparison to widely used Mehlich 3 (M3) and Mehlich 1 (M1) extractions. The FeO-P method is of particular interest as it is known as the gold standard of estimating bioavailable P. The study explores the potential of FeO strips as an in-situ, non-destructive tool for measuring bioavailable P in the field. By examining correlations between M3-P, M1-P, H3A-P, and FeO-P, this study seeks to better understand P bioavailability in these soils and identify conditions where traditional acidic extraction methods may not accurately estimate bioavailable P. Soil samples were analyzed for P concentrations using multiple extraction techniques, and bioavailable P indices were calculated to compare relative P availability across methods. Statistical analyses, including regression models and correlations, were conducted to evaluate the relationships between different P tests. Preliminary results suggest variability in P extraction efficiency across methods, with differences influenced by soil characteristics. The study also investigates the relationship between soil test P values and crop uptake.

[ANR-3] Somatic Embryogenesis and Micropropagation of Elite cultivars of Hazelnut (Corylus avellana) and the influence of Cultivar, and PGR selection on successful initiation

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Hazelnuts (*Corylus avellana*) are a perennial, high yielding, low input, food, and oil crop and a potential renewable biofuel. Kernel yield and disease resistance (to Eastern Filbert Blight) are heritable traits which can be influenced through cultivar selection. A method for propagation of hazelnut genotypes via somatic embryogenesis (SE) would aid in the rapid production of elite stock carrying the most desirable traits. Immature zygotic embryos of five cultivars of *Corylus avellana* were tested for somatic embryogenesis induction by culturing them on semisolid woody plant medium (WPM) supplemented with 1mg/L 6-BAP in combination with one of three auxin treatments (2 mg/L 2,4 D; 0.1 mg/L NAA; 0.5 mg/L NAA). Cultures were incubated in the dark at 22° C. All treatments were found to induce somatic embryogenesis. The highest rate of somatic embryogenesis was found in the cultivar Tonda Gentile delle Langhe, with an SE induction rate of 38%. Multiple treatments produced embryogenic cultures capable of repetitive embryogenesis; the highest frequency of repetitive embryogenic cultures were on WPM, with 2 mg/L 2,4-D and 1 mg/L 6-BAP. SEs were removed from repetitive embryo clusters and enlarged on semisolid WPM w/o PGRs in the dark. Embryos were germinated to produce plantlets following transfer to basal WPM in GA7 vessels. In the absence of PGRs, plantlets were subsequently grown on to rooted and hardened off plants, plantlet derived shoots could be transferred to WPM containing 4.4 mg/L BAP and maintained as repetitive shoot cultures.

[ANR-4] A Review and Meta Analysis of Plant Reference Lists for Miami-Dade County

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Plant reference lists are generated for a wide array of practical purposes, such as observations of rare plants in natural habitats, recommendations to cultivate native plants in landscapes, viable agricultural sections in community spaces, and commercial agricultural design considerations. Often these lists are prepared as comprehensive efforts by museums and collectors or by experts and practitioners responding to localized and use-inspirited requests. Our review and meta-analysis of reference lists aimed to establish a rigorous assessment for plant recommendations for Miami-Dade County. We analyzed publicly available plant reference lists to find which species are recommended routinely and reliably, which species may be recommended in error or lacking context, and which underappreciated or underutilized plants may warrant additional attention. Statewide reference databases (Plant Atlas, UF Herbarium, iNaturalist) were used as exhaustive lists when subset to observation made in Miami-Dade County and nearby counties. Each plant taxon (species, subspecies, varieties) in our assessment was confirmed to be documented growing in Florida by at least one reference. Databases were also included for information on plant status such as native/established/invasive, cultivated/uncultivated, dryland/wetland to characterize the differences in plants observed. Reference lists were also classified according to overall purpose and plant type. Lists were reviewed for accepted scientific names, their author attribution, and relevant synonyms. Our meta-analysis aimed to prepare a methodically generated reference list for natural, agricultural, and urban areas in Miami-Dade County by sorting, grouping, and arranging the composition of plants across lists. We also investigated individual species for their presence across lists to identify ubiquitous recommendations and alternates to consider, particularly emphasizing plants valid for installation in multiple areas. Practical insight follows related to plant selection and management in this globally unique region.

[ANR-5] Overview of best cultural practices and performance of Curry leaf tree (*Murraya koenigii*) for the mass rearing of *Tamarixia radiata* wasp.

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The 'Tamarixia Program' was established by the FDACS Division of Plant Industry for the purpose of mass rearing the *T. radiata* parasitoid wasp as part of the efforts to control the spread of citrus greening or Huanglongbing (HLB) disease and restore economic viability to the Citrus Industry in Florida. The vector of HLB, the Asian Citrus Psyllid (ACP), *Diaphorina citri*, has shown interest in a mixed diet. The Dundee Biological Control Laboratory experimentally produced Curry Leaf trees and starting November 2024, we have gathered enough data to fully transition from growing *Citrus spp.* plants, to growing *M. koenigii* and *M. paniculata* for mass rearing. This transition faced the challenges of exploring new planting and pruning techniques to induce increased flushing tips, along with the incorporation of biofungicides, mycorrhizae and other amendments that increase the soil drainage capacity, thus creating an ideal growing environment for the Curry leaf trees. The performance observations of *M. koenigii* in our production setting indicate that *D. citri* will lay eggs on the tips of the growing shoots and is able to complete its developmental cycle. ACP nymphs will only feed from the new flush tips, which has been a limiting factor due to the flush per plant ratio. As a result of the inclusion of *M. koenigii* plants in the presence of ACP, overall collection numbers of *T. radiata* have increased.

[ANR-6] Mass rearing of *Tamarixia radiata* parasitoid for release throughout Florida's citrus groves.

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The introduction of beneficial insects into agricultural settings can have a considerable positive effect in Florida's ecology and be an economically vial tool for suppression of pest's populations in the field. *Tamarixia radiata* is a known natural enemy of a very economically important pests of citrus, the Asian Citrus Psyllid, *Diaphorina citri*. This pest transmits a bacterium that diminishes the health of citrus trees throughout Florida, impacting the production of its most iconic crop. This parasitoid is mass reared by the Florida Department of Agriculture (FDACS) in two locations, Gainesville and Dundee, with the purpose of contributing to the release and establishments of healthy populations of *T. radiata* throughout the state to combat the spread of the Citrus Greening. Currently FDACS produces approximately 1.2 million *Tamarixia radiata* wasps per year and is working on increasing production in the near future.

[ANR-7] Plant Collections at the UF/IFAS Tropical Research and Education Center, Homestead

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The University of Florida, Institute of Food and Agricultural Sciences, Tropical Research and Education Center (TREC) of Miami-Dade County is the southernmost campus of the University of Florida serving agricultural and natural resource professionals in the region. TREC is a 0.64 km^2 parcel of subtropical upland with multiple collections of plants and habitats in open settings (i.e., not in a building, greenhouse, shadehouse or other covering structure). Over the last two decades, each plant species was identified using one or more methods: 1) Sending herbarium specimens for identification to the UF herbarium; 2) Using botanical keys followed by confirmation with online specimens; 3) A previous report from a trusted source; or 4) A visit from an expert who identified the plant. We have inventoried 852 species growing in the open and reflecting broadly sub-tropical plant diversity. We gathered detailed information on each species including plant use, general habitat, weediness, site location, and identification sources. Plants were first grouped by origin and purpose with 293 native, 516 non-native, and 43 unknowns. Small fragments of native pine rockland and rockdale hammocks remain preserved that host 31 endemic and imperiled plants. These plants require maintenance through controlled burn and protection from invasive species. Non-native groups associated with functional landscapes (i.e., agriculture and urban) were further classified as 297 established and 219

cultivated-only. These plants also require maintenance, in some cases to maintain control and aesthetic, in others fundamentally to grow and produce. The goal has been to develop a research-quality plant list and database, which can help answer practical questions about plant species identity, preservation, and management. Identifying plant species in an area with adjacent natural, agricultural, and urban habitats was key to establishing an agroecological context for the region. Practical insight follows related to plant selection and management in this globally unique agroecosystem.

[ANR-8] Application of silicon extracted from rice straw as a post-harvest effect in the cultivation of persimmon.

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The circular economy is an essential strategy for sustainability in agriculture, enabling the reuse of waste materials to produce efficient agricultural inputs. The use and application of these innovative products in agriculture should therefore have a positive impact on crop production, adding value and encouraging the development of new organic solutions. In this context, the foliar application of a silicon-based biofertilizer formulated from rice straw extracts combined with calcium was studied in persimmon cultivation to evaluate the post-harvest effects at the fruit. Although silicon (Si) is not considered an essential element, it is recognized as a beneficial element for plants due to its biostimulant effects, such as enhanced plant growth, strengthening of cell structure, increased resistance to pathogens and improved tolerance to abiotic and biotic stress, among others. The application of silicon (Si) plays a key role in improving fruit quality, as Si enhances Ca uptake, contributing to greater fruit firmness and extended shelf-life.
The experiment was carried out in a commercial persimmon orchard in Valencia (Spain). The treatment was applied to five trees, while five other trees served as a control group. The treated trees were sprayed with a solution containing 3.3% Si, resulting in a dose of X g/tree. Fruit quality parameters were analyzed at three different times: T1 (10/10/2025; day of treatment), T2 (18/11/2025; day of harvest) and T3 (17/12/2025; 30 days after harvest and cold storage). The quality parameters evaluated included fresh and dry matter, fruit color (internal and external Hunter Lab), firmness (measured with an 8 mm diameter penetrometer), nutrient concentrations (calcium and silicon), °Brix and sugar content (sucrose, glucose and fructose). The results showed no significant differences in fresh and dry fruit weight. However, treated fruit showed greater firmness, higher Ca levels and significant differences in color. Lightness followed a similar trend, with lower redness and higher yellowness in the treated fruit. Brix and sugar content showed no significant differences between treatment and control.
This study shows that silicon from natural sources (rice straw) can be a viable and sustainable alternative to conventional fertilizers, contributing to improved post-harvest fruit quality.

[ANR-9] Composting with Cowpea (*Vigna unguiculata*)

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Cowpea (*Vigna unguiculata*) grows rapidly throughout summer and is an abundant source of high protein plant biomass, fixing nitrogen and building reserves of nutrients for the farmer when plants are mixed with wood chips to produce compost. After growing plants, constructing piles, mixing, managing, and storage, compost is ready to be used in 2 years. Pine chips (2-3") were mixed with cowpea shoots to construct four piles (100 cu. ft.). Objectives were: 1) supply the farm with compost to reduce fertilizer input, and 2) create bulk potting medium to start seeds and reduce nursery costs. Cowpea seeds were broadcast on a 1,500 sq. ft. plot with lightly disked rows containing crop residue and organic material, producing about 2 tons fresh plant biomass with no added fertilizer. Plants were easily pulled from the field with a tractor claw, taking advantage of the inter-locking stems and ground was left weed-free. Plants were layered with chips in hardwire cages on pallets to improve air circulation. Constructed piles were left uncovered,

kept well-moist, and mixed with new cowpea shoots biweekly for 6 weeks, reaching 128 Fahrenheit. They were then consolidated and sieved for sampling and storage in plastic containers with space for air circulation, stirred biweekly, and monitored for consistency, odor, and quality. The sample contained an estimated available nitrogen of 71.2% or 6 lbs./ton and had a pH: 7.7. The objectives were achieved. The farmer has enough compost for 2 years and will use this product to lower costs and reduce fertilizer input.

[ANR-10] Variable Irrigation and Potassium Fertilization Rates for *Dendrocalamus asper* in Florida.

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Bamboo is a perennial crop cultivated for different purposes such as production of edible shoots, timber and energy, and an effective medium for carbon sequestration. Bamboo production in the United States has gained significant interest over the past two decades due to its many benefits. Despite this progress, there is still a knowledge gap regarding nutrient and irrigation management recommendations for bamboo production for the unique Florida agroecological conditions. Fertilizer and irrigation are important crop management strategies for supplying plants with adequate nutrients and water for plant growth and productivity. Understanding the nexus between plants, water-use efficiency, and nutrient uptake is critical for sustainable bamboo production. A 4 x 4 factorial completely randomized design consisting of four irrigation rates (50% evapotranspiration (ET), 75% ET, 100% ET, and 125% ET) and four potassium application rates (0, 100, 200 and 300 lbs K/acre), replicated 5 times was established under greenhouse conditions. The results showed that different K levels did not have any significant effect on culm height and stomatal conductance. The 125% ET showed the highest culm height in the first month but in the following month, the 75% ET and 100% ET resulted in the greatest heights suggesting that reasonable culm height can still be achieved while conserving water. The 100% ET and 75% ET resulted in higher stomatal conductance compared to 125% ET and 50% ET. This implies that excessive irrigation and low irrigation rates may limit stomatal regulations and overall water use.

[ANR-11] Evaluating Different Strategies to Enhance Phosphorus Availability in Organic Soils: A Comparative Assessment of Chemical, Biological, and Organic Amendments

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Phosphorus (P) is a crucial macronutrient in crop production, playing a critical role in plant growth, energy transfer, and yield. Therefore, phosphorous fertilizers are among the major input in crop production. However, the rising cost of P fertilizers and the very low use efficiency of P in soils (10-20%) is a concern in crop production leading to higher input cost with a substantial portion of applied P remaining unavailable to crops. This inefficiency is largely due to factors such as very high or low soil pH and interactions with minerals like calcium (Ca) and oxides of aluminum (Al) and iron (Fe), which form insoluble complexes with P, reducing its plant availability. Organic soils of Everglades Agricultural Area (EAA) exhibit similar challenges despite their high total P content. These soils may contain up to 1300 mg kg^{-1} of total P, yet only a small fraction approximately 10-25 mg kg^{-1} being available for plant uptake. This discrepancy highlights the urgent need to enhance P use efficiency in these soils to sustain crop production and reduce input costs. Addressing this challenge, our research focuses on developing and evaluating strategies to improve P availability. We are conducting a greenhouse experiment using a Complete Randomized Design (CRD) investigating chemical amendments, such as elemental sulfur, and citric acid, aim to alter soil pH and release bound P. Biological amendments such as P-solubilizing bacteria that facilitate P mineralization, while organic amendments like biochar, compost, and humic substances are being tested for their ability to improve soil structure and nutrient retention. In this presentation, we will share our preliminary findings on the effects of these strategies on sweet corn biomass, available

P in the soil, and P levels in leachate. Our research aims identify practical, effective solutions for improving P use efficiency in these challenging crop production systems.

[ANR-12] Evaluation of Phosphorus Fertilization on Florida Young Bamboo in a Controlled Environment

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Fertilizers are commonly applied to bamboo to enhance quality and productivity. Bamboo is widely used for consumption, construction, and fabrication. Bamboo production has expanded to 1,700 acres in Florida. However, there are no clear phosphorus (P) fertilization guidelines, despite P playing a crucial role in plant growth and production. This study evaluated the effects of varying P rates on *Dendrocalamus asper* under greenhouse conditions. Two trials were conducted on one-year-old bamboo plants at different P rates (0, 22.4, 44.8, and 89.6 kg P ha^{-1}) for five months in 2023 and 2024. Growth, physiological parameters, and biomass accumulation were assessed. Data were analyzed using one-way analysis of variance with a linear mixed model for repeated measures. Results showed that P fertilization significantly influenced bamboo growth, culm biomass accumulation, culm production, and chlorophyll content across both years. The highest biomass in culms, total biomass, number of culms, and clump height occurred at 22.4 and 44.8 kg P ha^{-1} in 2023 and 2024, respectively. Higher P rates (44.8 and 89.6 kg P ha^{-1}) increased below-ground biomass. The highest P rate (89.6 kg P ha^{-1}) increased soil P by 74% in 2023 and 84% in 2024 from the initial concentration. Soil P positively correlated with Ca in 2023 and K in 2024. Although no clear optimal P rate was established, moderate P application (22.4-44.8 kg P ha^{-1}) benefited young bamboo growth. These findings provide a foundation for developing P fertilization guidelines in Florida. Further field-scale studies are needed to determine the optimal application rate.

[ANR-13] Impact of Nitrogen Rates on Growth and Biomass Accumulation of Young Macadamia Trees

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Nitrogen (N) is a vital nutrient for plant growth, influencing physiological processes such as photosynthesis and biomass accumulation. This study evaluated the effects of different N rates on young *Macadamia tetraphylla* trees over five months, focusing on tree growth, biomass production, and chlorophyll fluorescence. The study was conducted in 2024 at the Citrus Research and Education Center, University of Florida, using a completely randomized factorial design of 4 treatment with five replications. The treatments comprised four nitrogen rates (1, 2, 3, and 4 g of N per tree). Plants were grown in 6 -pots filled with a peat moss-perlite-vermiculite mixture (6:3:1 v/v) with an initial soil pH of 4.6. Nitrogen rates significantly influenced leaf N concentration, which ranged from 13 g/kg to 18 g/kg. However, N rates did not impact biomass accumulation, root-to-shoot ratio, or nitrogen use efficiency (NUE). Chlorophyll fluorescence parameters, including the quantum yield of PSII (YII) and potential quantum efficiency of PSII (Variable fluorescence yield (F_v)/ Maximum fluorescence yield (F_m)), were not significantly affected by nitrogen rates. However, fluorescence under steady-state conditions (F') was significantly affected at the highest N rate (1,248 g/ha). Nitrogen (NH_4^+-N and NO_3^--N) positively correlated with phosphorus, potassium, and sulfur but had a significant negative correlation with soil pH ($p < 0.05$). None of the treatments reached the optimal NO_3^- range (25–30 mg/kg), indicating that nitrogen rates below 936 g/ha may be insufficient, while higher rates pose a risk of N leaching in Florida sandy soils. These findings suggest that N had a limited effect on plant biomass and chlorophyll fluorescence in young macadamia trees.

[ANR-15] Phosphorus Fixation Dynamics in Quartz Sands, Mixed Medium, and Agricultural Soils of Northeastern Florida

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Phosphorus (P) is a macronutrient essential for plant growth and overall development. Overtime, phosphorus management practices have presented significant challenges due to its tendency to become fixated or leached from soils. Availability of P in soils is often limited because of nutrient fixation processes, particularly in acidic environments where phosphorus binds with aluminum and iron, or in alkaline soils where it bonds with calcium and magnesium, forming insoluble compounds unavailable for plants. This study aimed to evaluate the availability of orthophosphate in leachate samples from three different growth mediums: (1) Quartz Sand, (2) 50% Quartz + 50% Soil, and (3) Soil. This experiment also assessed two phosphorus application treatments: (1) a single application of 120 lbs/acre and (2) a split application of 20 lbs/acre applied weekly over a period of six weeks. Leachate samples were collected and analyzed weekly to determine phosphorus availability trends. Results exhibited that Quartz retained the least phosphorus, leading to high orthophosphate concentrations in leachates. The mixed medium treatments (50% Quartz + 50% Soil) showed intermediate retention properties, while Soil treatments retained the most phosphorus, resulting in the lowest leachate orthophosphate levels. Additionally, the split application of 20 lbs/acre maintained more stable phosphorus concentrations over time compared to the single application, which presented an initial peak followed by a significant decline. These findings highlight the impact of soil composition and fertilization on phosphorus dynamics. Optimized nutrient management is needed. Minimizing contact time between P and Al is crucial. Split applications improve phosphorus efficiency and reduce environmental risks.

[ANR-15] Florida Agricultural Soil Moisture Sensor Network: Engaging Growers, Agents, and Technology Industry to Conserve and Protect Water Resources

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Florida's irrigated farmland increased from 1.49 to 1.51 million acres between 2012 and 2018, reflecting growing reliance on irrigation to sustain crop production. In a state with shallow water tables and abundance of water bodies, over-irrigation contributes to nutrient leaching and chemical runoff, threatening water quality. Adopting data-driven irrigation technologies is essential for efficient water management. Despite the availability of innovative tools like soil moisture sensors, many growers face barriers to adoption. To address this, the Florida Agricultural Soil Moisture Sensor Network was launched in 2018. The initiative aims to increase the adoption of soil moisture sensors as an irrigation management tool by helping extension agents and growers to explore this technology. The network follows a structured Technology Transfer Model to guide adoption: (1) Extension agents join the network; (2) Farmer recruitment by the agents; (3) Applied learning with the farmers; (4) Integrating knowledge by modifying irrigation management; and (5) Outcome assessment. The results from 2018 to 2023 showed that the network expanded to more than 300,000 acres and 22 different crops, including fruits vegetables and field crops. The network is bringing cultural and behavioral changes in technology implementation resulting in water conservation, nutrient, and energy savings. Water savings were reported ranging from 0.5 to 1.5 inches per growing season, depending on crop type and climatic conditions. Since 2020, the St. Johns River Water Management District approved 207 soil moisture probes for cost-share funding, further supporting adoption. This model demonstrates a scalable and collaborative approach to improving on-farm water conservation.

[ANR-16] Alternative Resources for Extension Clients who Oppose Using Glyphosate on Invasives and Hard to Kill Weeds

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Many Extension clientele know the risks associated with using herbicide products containing the active ingredient glyphosate, frequently referred to as “roundup”. Although there is a lot of misinformation circulating about chemical products used in home landscapes and gardens, there has also been a significant amount of press surrounding the health effects, specifically cancers, with thousands of lawsuits regarding post-use health effects from glyphosate. In 2015, the International Agency for Research on Cancer (IARC) classified glyphosate as "probably carcinogenic to humans." With this information easily available to the general public, regardless of its source or accuracy, some clients refuse to use certain chemicals and want “natural” alternatives to traditional herbicides. In this study, we trialed 3 small plots of cogon grass which is an extremely aggressive invasive species and spot-treated other “hard-to-kill weeds,” including paper mulberry and smilax vines, with a product called DONE (previously labeled Lonarch, Sodium lauryl sulfate). Other labeled herbicides, such as Fireworxx (Caprylic acid) and Natural Horticultural Vinegar (Acetic acid), do exist for “natural” or organic production they can be difficult for homeowners to find and purchase. In addition to being difficult to obtain, it is also often difficult to find instructions on how much to apply and correct application methods as many of these products do not have traditional pesticide labels. For this study, we were able to identify an appropriate rate of 10oz/ per gallon of DONE with 2oz/ gallon of the Cleargreen surfactant called Systemic that was available for clients locally and effective on Cogongrass and other difficult weeds. We had approximately 10-15% regrowth on cogongrass patches that were treated twice five months post-treatment regardless of the preparation or mowing that was done prior to treatment. Single cogongrass treatments had approximately 25% regrowth. The importance of having products that are easily obtainable, environmentally sound, and effective is very valuable to our local Extension clients.

[ANR-17] Indirect Educational Experiences from Native Plant Demonstration Gardens

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Extension agents’ use of native gardens helps to showcase unfamiliar plants and provides residents with information to assist in their plant selection decisions. These gardens provide hands-on learning experiences to deepen understanding of native plants and how to use them in a landscape. Between Jan. 2023 and Dec. 2024, UF/IFAS Extension Hillsborough County has helped to create or enhance native gardens with an educational spin. These gardens feature plant signs with a QR code linking to UF/IFAS publications as well as information from the Florida Native Plant Society, which help to support self-directed learning. The four garden sites include The Bay Friendly Landscaping site at the UF/IFAS Extension Hillsborough County office and native gardens at Lettuce Lake Park, Bell Creek Preserve and Carrollwood Village Park. Surveys were distributed to clients by email and in person on our workdays. Survey respondents reported (n=22), 91% indicated that they value native plants more after visiting the garden, 100% indicated they plan to plant native plants in their home landscape after visiting the garden, and 81% indicated that they have already planted native plants in their home landscape as a result of their visit to the native demonstration garden. Comments included “It was helpful to see the plants in a natural setting in different states of growth”. The native plant demonstration gardens have proven to be an effective educational tool for promoting native plant awareness and adoption. These findings highlight the value of demonstration gardens as impactful educational resources that inspire sustainable landscaping practices.

[ANR-18] Florida-Friendly Landscaping: Five Key Guidelines for Successfully Highlighting Native Plants in Demonstration Gardens

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Native plants play a crucial role in Florida-Friendly Landscaping™ (FFL), yet their adoption in managed landscapes often faces resistance due to misconceptions about aesthetics, maintenance, and functionality. Demonstration gardens serve as an essential bridge between ecological value and public perception, but their design must be intentional to maximize their educational impact. This lecture explores the process of identifying five key guidelines that ensure the successful integration of native plants into demonstration gardens. The development of these guidelines was informed by direct observation, community engagement, and programmatic feedback. By assessing both the barriers and motivations behind native plant adoption, key trends emerged, including concerns over maintenance, uncertainty about plant selection, seasonal appeal, and the need for clear guidance on sustainability benefits. To address these concerns, best practices were established to guide demonstration garden design. Selecting regionally appropriate species ensures long-term plant success while supporting local ecosystems. Considering plant size and maintenance needs showcases diverse forms and care requirements, making native plants more approachable for homeowners and landscape professionals. Planning for year-round interest highlights the visual appeal of native plants across seasons, countering the misconception that they lack aesthetic value. Providing educational signage offers clear, actionable insights into native plant benefits, reinforcing their role in sustainable landscapes. Designing for sustainability and resilience emphasizes water efficiency, habitat value, and minimal-input landscaping, making these gardens both functional and inspiring. By following a data-driven and experience-based approach, these guidelines create effective, persuasive demonstration gardens that encourage greater public and professional adoption of native plants within FFL landscapes.

[ANR-19] Florida-Friendly Landscaping: Ideas for Incorporating Native Plants in Demonstration Plots

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Florida-Friendly Landscaping™ (FFL) principles emphasize sustainable, low-maintenance landscapes that conserve water and support biodiversity. While many recommended plants align with these principles, native species remain underutilized in traditional landscapes. This project highlights effective methods for incorporating native plants into demonstration plots, bridging the gap between ecological function and aesthetic expectations in managed landscapes. By integrating native species alongside commonly promoted landscape plants, demonstration plots provide a tangible, visual example of how natives can enhance beauty, resilience, and sustainability in residential and public spaces. Carefully selected native plants not only complement existing FFL selections but also offer ecological benefits such as habitat support, reduced irrigation needs, and long-term adaptability to Florida's climate.

Observations from implemented plots indicate that placing native species within familiar design frameworks (such as mixed borders or foundation plantings) increases homeowner adoption. Native plants are more readily accepted when showcased in well-maintained, intentional arrangements rather than as wild, unstructured plantings. Additionally, pairing native species with widely accepted non-natives helps reinforce their aesthetic compatibility.

Encouraging native plant use in a concrete, visually engaging manner has proven to be an effective strategy in FFL outreach. These demonstration plots serve as a persuasive educational tool, helping property owners, landscape professionals, and decision-makers see the practical benefits of native species integration. This approach fosters greater acceptance and long-term sustainability in Florida's managed landscapes.

Citrus Section

Presiding: **Mohammad A. Shahid**

[C-1] Screening Novel Citrus Rootstock Hybrids for Salinity Tolerance Under Controlled Greenhouse Conditions

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Salinity stress poses a significant challenge to Florida citrus production, particularly in coastal areas affected by seawater intrusion. Selecting salt-tolerant citrus rootstocks is critical for mitigating the detrimental effects of salt stress on tree growth and productivity. This study evaluated nine novel rootstock cultivars for salinity tolerance under controlled greenhouse conditions. Rootstocks were grafted with 'Valencia' (*Citrus sinensis*) scion and subjected to three salinity treatments (0 mM, 50 mM, and 100 mM NaCl) over 12 weeks. Various morphological and physiological variables such as plant growth, canopy health, leaf and root nutrient content, and fibrous root respiration were assessed to identify the most suitable marker for large-scale screening. Results showed that salinity significantly reduced canopy color, scion stem diameter, leaf chlorophyll content, and fibrous root biomass, while increasing leaf Na^+ and Cl^- accumulation. Fibrous root respiration increased under salinity, suggesting metabolic adjustments to stress. US-1688 and US-1676 induced superior canopy resilience, maintaining a higher leaf chlorophyll content and experiencing less leaf necrosis among the tested rootstocks. US-1680 retained the largest fibrous root biomass, while US-1672 exhibited the highest specific root length, indicating improved water and nutrient uptake efficiency. The principal component analysis identified scion stem diameter, leaf chlorophyll content, leaf Cl^- accumulation, and fibrous root respiration as key biological markers for assessing salinity tolerance. These findings provide a framework for targeted rootstock selection in breeding programs. The identified tolerant rootstocks are promising candidates for citrus production in salt-affected regions, contributing to the sustainability of Florida's citrus industry.

[C-2] Brassinosteroids and Fruit Quality: Investigating Hormonal Influence in HLB-infected Sweet Orange

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Brassinosteroids (BRs) are a group of polyhydroxylated plant steroid hormones modulating plant growth, fruit development, and plant–environment interactions. This plant growth regulator may influence both defense mechanisms and fruit quality in different plant systems. We hypothesized that in citrus under HLB, the severe bacterial disease that is threatening citrus in Florida, preharvest application of BRs at the appropriate maturation stage could enhance and maintain the fruit's quality in HLB-infected trees. This research aimed to determine the ideal stage for applying BRs to improve external and internal fruit quality in Hamlin sweet oranges. Foliar treatment of BRs (186ml/100 gallons of water) was applied, starting in September, in two different ways: i) as a single treatment at a given date spaced by 2 weeks, and ii) a continuous treatment every other week. Fruit quality assessment was performed two weeks after each application in both cases. The results showed, in both treatments, accelerated color development in the peel, and reduced acid content, and increase in the brix-acid ratio in the juice of as compared to the non-treated trees. This finding indicated that for fruit maturation purposes, a single treatment, performed at the right time is sufficient to produce an increase in fruit quality. We also found that the treatments were more effective on trees with a good canopy, despite being infected, that in declining trees, which indicates that well managed groves have more potential for responding to these therapies.

[C-3] The Influence of Soil pH on Citrus Root Morphology and Nutrient Uptake Efficiency

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The production of citrus, a dominant fruit crop globally, is declining due to biotic constraints such as Huanglongbing (HLB) and abiotic stresses such as low or high soil pH. This study aimed to investigate the influence of soil pH on citrus root morphology, nutrient uptake dynamics, and overall root health. Forty 'Valencia' sweet orange (*Citrus sinensis* (L.) Osbeck) trees were divided into four groups by pH treatment (n=10). Trees were irrigated three days a week with four different water pH levels: 5.5, 6.5, 7.5, and 8.5. Soil acidity and alkalinity were routinely monitored with pH probes. The concentration of essential macronutrients and micronutrients from the soil, plant tissue, and leachates was also analyzed monthly to evaluate nutrient uptake efficiency. Parameters such as root length, root surface area, and root diameter were measured to assess the morphological changes in citrus tree roots under different pH treatments. After irrigation, soil pH on treatment with pH=5.5 decreased drastically since sandy soils acidify more quickly. Soil pH levels for treatments irrigated with solutions at pH 6.5 and 7.5 consistently maintained near-neutral levels, with the former gradually decreasing soil pH over time and then later increasing the soil pH to alkaline levels. The soil P and S concentrations were high at pH=5.5, contrary to the Mg and Ca concentrations, which were low at the same pH level. Soil pH showed a significant and negative correlation with S, P, and Fe, indicating a decrease in these soil nutrients as soil pH decreased and a nonsignificant positive correlation with Cu. At pH=5.5, there was significantly higher root growth, which indicates that acidic soils (~pH = 5.5) can enhance root growth in citrus trees. Acidic soils stimulate root growth, particularly around a pH of 5.5; citrus roots exhibit remarkable resilience and internal compensation mechanisms in response to pH changes. Optimizing soil pH and nutrient management can mitigate the impacts of HLB and promote the resilience of citrus trees. Trees irrigated at pH of 8.5 showed a trend of fewer living roots and lower cumulative root growth, emphasizing the possibility of root damage due to high soil pH.

[C-4] Evaluating sectoring effects of OTC administered by trunk injection in 'Valencia' sweet orange

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Huanglongbing (HLB) remains the most devastating disease affecting citrus production worldwide. Oxytetracycline (OTC) trunk injections have emerged as a promising treatment to mitigate its impact by reducing bacterial titers and improving tree health.
However, questions remain regarding the distribution of OTC within the tree. This study evaluates two registered OTC formulations, applied to mature 'Valencia' sweet orange trees growing under commercial conditions in southwest Florida. The experiment was arranged in a randomized block design with three treatments: 1) no injection, 2) ReMedium (TJ Biotech) injection, and 3) Rectify (AgroSource) injection. Trees received annual injections (2023-2024) into the rootstock and were assessed for phytotoxicity, sectoring, disease progression, yield, and fruit/juice quality. Two weeks after injection, moderate phytotoxicity was observed in the section of the canopy closest to the injection site. This localized response resulted in noticeable sectoring effects nine months after injection, with increased flushing and fruit production concentrated on the injected side of the trees. Additionally, leaf bacterial titers were reduced on the injected sides six months post-injection, suggesting localized suppression of the bacteria. Fruit yield was significantly higher and fruit/juice quality better in the injected trees compared to non-injected trees. Moreover, fruit and juice quality was better on the injected side than on the non-injected side of the trees. These findings suggest that OTC injections on multiple sides of the trunk may improve its distribution and effectiveness. Refining injection methods is essential for enhancing HLB management and ensuring sustainable citrus production.

[C-5] Exploring the Potential of Silicon Nanoparticles to Mitigate Water Stress in Citrus

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Citrus production in Florida faces multiple environmental challenges, including huanglongbing (HLB), water stress, and periodic freezing events. Optimizing nutrient management strategies is critical to mitigating these stresses. Silicon (Si) can enhance plant resilience against abiotic and biotic stresses, yet its role in citrus remains relatively unexplored. This study aimed to determine the optimum application rate of silicon nanoparticles (Si-NPs) and compare foliar versus soil application methods for Valencia sweet orange (*Citrus sinensis*) under full-scale and deficit irrigation conditions. The greenhouse experiment consisted of trees subjected to two irrigation regimes: 100% and 80% evapotranspiration. Silicon nanoparticles were either foliar- or soil-applied at concentrations of 200, 400, and 600 mM. Measured variables included growth parameters, leaf silicon concentration, and electrolyte leakage under mild freezing stress. Results indicated that foliar applications at 600 mM and soil applications at 200 mM significantly improved tree growth. Both application methods resulting in lower electrolyte leakage under stress conditions, suggesting improved cellular integrity. Foliar-applied Si also increased leaf Si accumulation, potentially forming a protective barrier against environmental stressors. These findings highlight the potential of Si-NPs to enhance citrus resilience under water stress, with the application method and concentration influencing effectiveness. Future research should explore long-term field applications to optimize Si integration into citrus management practices.

[C-6] Exploring the Systemic Delivery of Streptomycin as a Complement to Oxytetracycline for Managing Huanglongbing

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Oxytetracycline (OTC) delivery by trunk injection has been approved for treatment of commercial citrus trees in Florida impacted by the endemic disease Huanglongbing (HLB), associated with phloem-limited *Candidatus* Liberibacter asiaticus (*C*Las). Despite the proven efficacy of the method, repeated application of the same antibiotic can lead to bacterial resistance, limiting long-term efficacy. Streptomycin (STM) is another antibiotic used in plant disease management, yet its effectiveness in controlling HLB through trunk injection has been less explored. The main objective of this study was to determine the effects of OTC and STM injections on tree health and productivity in commercial citrus trees. A trial was established in June 2024 using seven-year-old 'Valencia' trees. Trees were injected with a registered OTC formulation and a proprietary STM formulation. FlexInject injectors were used for the injections. The experimental design was a randomized block design with eight replications, four trees per replication, and four treatments: 1) acidified water (control), 2) OTC, 3) STM, and 4) OTC + STM. All treatments were applied on one side of the trunk using a volume of 100 ml per injector. Leaf samples were collected to quantify *C*Las titers and evaluate bacterial suppression. Fruits were harvested in March 2025. Trees injected with OTC + STM produced significantly more fruits than control trees and trees injected with STM alone. OTC and OTC + STM injection caused larger injection holes than the other treatments. This study provides important information to optimize HLB management practices for citrus growers.

[C-7] Hedging, Thinning, Controlled Release Fertilizer, and Oxytetracycline Trunk Injections to Mitigate Fruit Disorder Incidence in HLB-Affected Sugar Belle ® Mandarin

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Citrus production worldwide has been severely affected by huanglongbing (HLB), a disease presumably caused by the bacteria Candidatus Liberibacter asiaticus (CLas). Currently there are no commercial citrus cultivars with disease resistance, but several show varying degrees of tolerance. One of the best and most consistent performers in HLB endemic conditions is the 'LB8-9' Sugar Belle ® mandarin, which has the potential for both fresh market and juice

fruit production. This variety consistently produces high yields with a good ratio of total soluble solids (TSS) to acid and high pounds-solids per acre with proper cultural care. However, in the past three seasons, many growers have had issues with fruit disorders, mainly misshapen and soft fruit. The objective of this study was to examine if different timing for hedging treatments (early summer, middle summer, and late summer), a manual thinning treatment, controlled release fertilizer application, or oxytetracycline trunk injections mitigate the incidence of fruit disorders and increase overall fruit quality at harvest. The experiment was replicated at two sites (The Citrus Research and Education Center in Lake Alfred FL, and Tamiami citrus in Avon Park FL) during two seasons 2022-2024. There were statistically significant results obtained ($p < 0.05$) among the different treatments in terms of TSS, titratable acidity in citric acid equivalents, pounds-solids per box, fruit size, percentage of asymptomatic fruit and force needed to puncture the peel. These results will be helpful to growers and could help guide management practices for this cultivar in an HLB-endemic environment.

[C-8] Impact of single and consecutive annual injections of oxytetracycline at different rates on field performance of HLB-affected 'Hamlin' sweet orange trees

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In Florida, systemic trunk injection of oxytetracycline (OTC) has emerged as an alternative approach to target and mitigate the impacts of the endemic disease Huanglongbing, which is associated with the pathogen Candidatus Liberibacter asiaticus. The objectives are to determine the optimal OTC rate and assess the difference between consecutive yearly injections and one-time injections to improve the health and productivity of HLB-affected mature 'Hamlin' sweet orange trees. In 2023, a field trial was established in a commercial citrus orchard in Polk County, Florida, using 20-year-old 'Hamlin' orange trees (Citrus sinensis) on Carrizo rootstock (C. sinensis × Poncirus trifoliata). Trees were injected with OTC at four rates (0.55, 0.85, 1.1, and 1.65 g per tree) and compared to non-injected controls over two seasons (2023–2024). A registered OTC formulation (Rectify) was applied using a FlexInject injector (100 mL per tree), except for the highest rate, which used two injectors delivering 75 mL each. In 2023, all designated trees received their respective rates, while controls remained untreated. In 2024, only half of the previously injected trees were reinjected to compare single vs consecutive injections. The trial followed a randomized block design with 10 replications, each consisting of three linear trees. Fruit quality, yield, and fruit drop were evaluated. Depending on the OTC rate, injected trees produced 37% to 150% more fruits than the control trees. Also, injected trees had higher total soluble solids (TSS) in the fruits. Trees that received consecutive injections had higher yield, number of fruits on the tree, and TSS when compared to single injections.

[C-9] Defining Best Management Practices for Trunk Injections of Oxytetracycline in Citrus: Exposure Time

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The Florida citrus industry has struggled to find viable management strategies for the devastating bacterial disease citrus greening, also known as huanglongbing or HLB, since its introduction nearly two decades ago. Recently, oxytetracycline (OTC) has been approved for use in citrus after studies showed that trunk injections of this antibiotic can consistently decrease titers of the presumptive causative agent, '*Candidatus* Liberibacter asiaticus' (*C*Las), improve overall tree health, and decrease pre-harvest fruit drop. This control method has been widely adopted by citrus growers in Florida, despite the costs associated with individual injections of each tree. In order to maximize the benefits of this labor-intensive treatment, it is important to establish best management practices. Because OTC is prone to degradation and the rate increases under intense UV radiation and high temperatures—conditions inherent to Florida citrus groves—it is essential to establish a threshold for the period it can be exposed to environmental conditions before no longer effectively managing HLB. We conducted both *in vitro* lab assays and *in vivo* field trials testing the effect of 0, 6, 24, and 48 hours of exposure time on the ability of OTC to inhibit bacterial growth. Our research shows that inhibition was negatively correlated with exposure time in the lab and even just 6 hours of exposure rendered

OTC injections ineffective in reducing *C*Las titers the field. Implications of our findings for HLB control will be discussed.

[C-10] Comparison of Conventional and Drip Irrigation Systems for Young HLB-Affected Citrus Trees

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Water scarcity is one of the major constraints in Florida citrus production systems, primarily due to erratic rainfall patterns and the low water and nutrient holding capacity of the predominantly sandy soils. These challenges are further exacerbated by the endemic citrus greening disease or Huanglongbing (HLB) which alters tree physiology and reduces root functionality. HLB-affected citrus trees are sensitive to both water stress and excessive moisture due to compromised root systems and impaired water and nutrient uptake. Thus, precision irrigation practices that enhance water and nutrient use efficiency while minimizing nutrient leaching are vital for sustainable citrus production. A field study was conducted at the Citrus Research and Education Center in Lake Alfred, FL to compare the effectiveness of conventional and deficit irrigation practices in improving water and nutrient use efficiency and the performance of young HLB-affected citrus trees. The study evaluated four irrigation systems: conventional drip irrigation (CD), alternate wet and dry irrigation with reflective mulch (ADM), conventional drip irrigation with reflective mulch (CDM), and micro-sprinkler irrigation (MS) replicated five times. Preliminary results showed significant differences among the irrigation systems ($p < 0.05$), with CDM exhibiting the highest sap flow (41.82 g/h/cm²) in summer and spring months. Similarly, canopy growth also varied significantly ($p < 0.05$), with MS showing the lowest trunk cross-sectional area and canopy volume. In contrast, yield per tree and NO_3-N concentration did not differ significantly. These findings suggest that drip irrigation with reflective mulching provide physiological benefits to HLB-affected trees by enhancing canopy development and water use efficiency.

[C-11] Evaluating the Impact of Variable Nitrogen Rates on the Growth and Yield of HLB-Affected Sweet Orange Trees

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Citrus trees affected by Huanglongbing (HLB) experience significant fibrous root loss, impairing their ability to absorb essential water and nutrients, which leads to a gradual decline in tree health and, ultimately, tree death. Nutrient management is a critical strategy for mitigating the adverse effects of HLB and enhancing the productive life of affected trees. In this context, the current study was initiated to evaluate the effect of variable rates of N on mature sweet orange (*Citrus sinensis*) trees suffering from HLB. A randomized complete block design (RCBD) was used to apply five different N treatment rates (112, 168, 224, 280, and 336 kg/ha) to 10 year old mature trees. Tree responses in terms of growth parameters, tissue nutrient concentrations, and fruit yield were assessed throughout the study period at different growth stages. Results revealed that different levels of N did not have a significant effect on growth parameters such as canopy volume and trunk cross-sectional area. Additionally, a significant reduction in the concentration of various nutrients in plant tissue was recorded over time, indicating a progressive decline in tree health. Except for Mg and Fe, different treatments of N did not have significant effects on the concentrations of other nutrients in plant tissue. Similarly, fruit yield was also not significantly affected by varying rates of N application. However, the current results are based on a study duration of one and a half years, and data collection continues for few more years to validate the results.

[C12] Fine-tuning Propionic Acid Dosage for Reducing Pre-harvest Fruit Drop in 'Hamlin' Sweet Oranges and Mechanisms Involved

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Pre-harvest fruit drop significantly challenges citrus yield and economic viability and is exacerbated by Huanglongbing (HLB). Propionic acid has been used in other crops to modulate physiological processes linked to ethylene such as abscission resulting in fruit drop. This study investigated the efficacy of propionic acid in mitigating fruit drop in 'Hamlin' sweet oranges. Utilizing a block design, the experiment applied three monthly doses of propionic acid in two consecutive years—in 2023 treated doses were 300ppm, 1,100ppm, and 2,200ppm— to trees, with an untreated group serving as the control. For this experiment, results indicated that the 1100ppm of propionic acid was most effective in controlling fruit drop, significantly reducing losses by 30% compared to the control. In 2024, the second experiment aimed to fine-tune doses. Trees were treated with three monthly doses of propionic acid utilizing 700ppm, 1,100ppm, and 1,400ppm, with an untreated group serving as the control. Despite a higher HLB infection level and increased fruit drop rates due to hurricane impact that year, results showed that the 700ppm dose was the most effective treatment in preventing fruit drop, retaining 15% more fruit than untreated trees. In both experiments, propionic acid increased average fruit weight across all treated doses, where the 700ppm dose increased yield by 36% compared to the control in 2024, while the 1,100ppm dose led to a 17% yield increase in 2023 and a 6% in 2024. Propionic acid did not alter fruit quality parameters, including °Brix and acidity, compared to the control. These findings suggest propionic acid as a promising management tool for reducing pre-harvest fruit drop under HLB conditions. Future research should explore propionic acid's long-term effects and optimal application protocols to maximize its benefits for citrus production. This study contributes to the growing body of knowledge aimed at sustaining and enhancing citrus yield through innovative agricultural practices in a scenario of endemic HLB.

[C-13] Impacts of Nutrient Ratios of Calcium and Zinc on Citrus Growth and Root Development

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Calcium (Ca) is a secondary macronutrient shown to play a regulatory role in root growth and plant immunity. Zinc (Zn) is a micronutrient, which is also critical for plant metabolism. The objectives of this study were to 1) establish a ratio of Ca and Zn fertilization that is optimum for supporting young citrus tree production, 2) determine the extent to which Zn fertilization alters the influence of Ca on root development, and 3) establish a ratio of Ca and Zn fertilization which maximizes citrus tree growth. The study was conducted over six months in a greenhouse setting at the Citrus Research and Education Center in Lake Alfred, Florida using Valencia sweet orange on Swingle citrumelo rootstock grown on Candler fine sand. Rates of Ca (11.2 kg/ha and 22.4 kg/ha) and Zn (0 kg/ha, 8.4 kg/ha, 16.8 kg/ha, and 25.2 kg/ha) were applied as treatments to a total of 32 trees. The following variables were measured: tree diameter, tree height, soil nutrient content, leaf tissue nutrient content, root surface area, root volume, and root length. Zinc fertilization significantly impacted multiple variables including fibrous root weight, tissue nitrogen, potassium, magnesium, Ca, and multiple soil nutrient parameters. Combined treatments of Ca and Zn fertilization had no significant impact on citrus height, diameter, tissue nutrient concentration, or above/below ground dry matter accumulation.

[C-14] Enhancing Canopy Height Measurement Accuracy and Efficiency in Citrus Orchards with LiDAR

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Accurate canopy height measurement is crucial in precision agriculture, directly affecting crop health assessment, yield prediction, and resource management. Traditional manual measurement techniques, despite their reliability, are labor-intensive and limited by low efficiency and scalability. This study comprehensively investigates the precision and accuracy of LiDAR remote sensing methods in different platforms, ground mobile LiDAR, airborne LiDAR, and traditional manual measurement in citrus orchards. Data were collected over four sampling days on 67 citrus trees at a research orchard in south Florida, and the precision and accuracy of each method were assessed through statistical analyses and visualization tools. The findings demonstrate that ground mobile LiDAR offers exceptional precision and accuracy, characterized by the lowest variability and highest repeatability (mean CV = 0.84, ICC=0.999), confirming its suitability as a benchmark in tree height measurement. Airborne LiDAR exhibited comparable

precision, low variability, and strong repeatability, establishing it as a robust method with the additional benefit of efficient data acquisition over large orchard areas. Manual measurements showed strong agreement with ground mobile LiDAR and good accuracy (MAE = 0.092 m), but their practical application was limited due to labor-intensive operations and moderate variability caused by human error. Overall, Ground LiDAR emerged as the gold standard, ideal for applications demanding high measurement precision and accuracy, while airborne LiDAR was identified as an efficient and reliable method suitable for large-scale monitoring. These results underscore the significant potential of LiDAR technologies in enhancing orchard management practices, guiding stakeholders in selecting appropriate methods to optimize precision, efficiency, and sustainability in citrus production.

[C-15] Impact of applying Zn and Mn from black mass on citrus plant productivity

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The study demonstrates that using nutrients derived from black mass and waste from alkaline batteries as fertilizer is safe for citrus plants, with no observed toxic effects. Plants irrigated with solutions containing manganese and zinc extracted from black mass produced yields comparable to those treated with traditional fertilizers. This method promotes industrial waste recycling and provides a sustainable alternative to conventional fertilizers. It reduces reliance on finite resources, minimizes environmental impact, and encourages more eco-friendly agricultural practices. An experiment was conducted on young citrus plants (Navelina cultivar and Carrizo and C35 rootstock) cultivated in Valencia (Spain). A total of one hundred plants were divided into four experimental groups (Ncontrol, Pcontrol, BMS, BMLS) in both rootstocks; all irrigated with a standard nutrition supply for citrus plants. NControl nutrient supply didn't have Mn and Zn. Pcontrol was prepared with sulfates. BMS was prepared with Mn and Zn from black mass. And BMLS was prepared with black mass lignosulphates. Plants were irrigated according to Etc and monitored for various biological and productive parameters: height, volume, SPAD, foliar content of elements, chlorophyll, yield, and number of fruits per plant. The results showed no significant differences between plant nutrition treatments, which guarantees the absence of harmful substances and, therefore, the health of the plants. In consequence, no toxic effect was found in the young citrus plants treated with nutrient solutions prepared with Mn and Zn received from the black mass.

[C-16] Assessing Grapefruit Responses to Different Irrigation Rates for Managing High Salinity Water Under Greenhouse-Controlled Conditions

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In Florida, surface water becomes limited during the dry season, prompting growers to use groundwater, which often contains high salinity levels. Citrus, a major Florida crop, is sensitive to salt stress. Increasing irrigation above crop evapotranspiration (Etc) helps leach salts when using slightly to moderately saline water (0.7–3 dS/m). However, when only highly saline water (>3 dS/m) is available, increased irrigation may require unsustainable volumes, while insufficient water worsens salt buildup. The objective is to understand how irrigation water with high salinity concentrations and different irrigation rates impact plant performance and soil salinity accumulation. One-year-old 'Ruby Red' grapefruit trees grafted on 'US-942' were grown under greenhouse-controlled conditions using a weighing lysimeter system (PlantArray). High-salinity irrigation water (5 dS/m) was applied at three rates: 75% (deficit), 100% (regular), and 125% (excessive) of Etc. A control treatment received low-salinity water (0.3 dS/m) at 100% Etc. Daily measurements included transpiration, plant weight, soil moisture, and soil electrical conductivity (EC). Leaf water potential, osmotic and pressure potential, and chlorophyll fluorescence were also recorded. Etc and net weight decreased for those plants irrigated with high salinity concentration compared to the control. Soil EC was higher for those trees irrigated with 75% Etc under high salinity concentration resulting in the lowest Etc rates. Plants irrigated with 100% and 125% Etc rates showed similar results, likely due to decreasing transpiration of trees upon high salinity treatment. Different plant performance under different irrigation rates emphasized the need of evaluating irrigation strategies in mitigating salt stress in citrus.

[C-17] Physiological Impacts of Proline Supplementation on Citrus Leaves under Freeze Stress

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Cold stress poses a significant threat to citrus production in northern Florida, affecting both fruit yield and the establishment of new fields. This stress is associated with reduced photosynthetic performance, increased oxidative stress, and changes in the sugar and amino acid profiles of citrus plants. Proline, an amino acid known for its role in osmotic adjustment during stress, is hypothesized to enhance freeze tolerance. To explore this, experiments were conducted under controlled and field conditions, testing various proline concentrations and application methods. Under controlled conditions, plants treated with 128 mM proline exhibited better photosynthetic performance compared to those treated with lower concentrations, even under freeze stress. In field trials, proline-treated plants were exposed to two cold waves during the 2024/2025 winter season. Both treated and untreated plants showed significant reductions in photosynthetic efficiency, as indicated by parameters such as Fo, Fm, Fv/Fm, and ΦPSII. However, proline treatment increased antioxidant activity and reduced cellular damage, as evidenced by lower electrolyte leakage. Proline-treated plants also had a higher survival rate and more foliar buds in the recovery phase, between 30- and 45-days post-exposure. These findings suggest that proline treatment enhances recovery after freeze stress by improving antioxidant defense and promoting new leaf formation, despite photosynthetic damage. Further research is needed to investigate the metabolic changes in citrus leaves and the role of proline in cold and freeze tolerance mechanisms.

[C-18] Effects of OTC injection on 'OLL' and 'Valencia' budlines

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Citrus huanglongbing (HLB) is one of the most destructive citrus diseases worldwide, causing severe economic losses to the citrus industry. The disease is associated with the bacterium *Candidatus* Liberibacter asiaticus, which is transmitted by the Asian citrus psyllid (*Diaphorina citri Kuwayama*). Currently, there is no cure for HLB, making the development of HLB-tolerant citrus varieties a promising management strategy. One approach involves selecting new Orie and Louise Lee (OLL) budline selections to improve disease resilience. In this study, young and mature trees of OLL budlines were selected and injected with oxytetracycline (OTC) to evaluate its effects on fruit and juice quality. Each fruit was individually assessed for multiple traits, including fruit weight, width, length, central diameter, peel thickness, juice color, titratable acidity, total soluble solids, and the solids-to-acid ratio. Statistical analysis revealed statistically significant differences between OTC-injected and non-injected budlines, as well as between young and mature cultivars. Notable variations were observed in titratable acidity, total soluble solids, solids-to-acid ratio, weight, and peel thickness, among others. The findings indicate that OTC treatment affects fruit quality traits across different OLL budlines of different ages. However, further research is needed to determine the long-term efficacy of OTC in enhancing HLB tolerance and fruit quality.

[C-19] Impact of Volume and Number of Injection Sites for Management of Huanglongbing by Oxytetracycline Trunk Injection

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Huanglongbing (HLB), associated with the bacterial pathogen *Candidatus Liberibacter asiaticus* (*C*Las), is one of the most destructive citrus diseases. Systemic delivery of oxytetracycline (OTC) by trunk injection has emerged as a viable strategy to manage HLB in commercial citrus in Florida. This study evaluates the impact of injection volume and number of injection sites to optimize the efficacy of this treatment in mature HLB-affected citrus trees. Two experiments were conducted on 8-year-old 'Valencia' orange trees in two different commercial groves in Southwest Florida. Each injected tree received 0.825 g (a.i.) of OTC (Rectify, AgroSource, Inc.) dissolved in acidified water (pH 2) and injected using FlexInject injectors. The OTC solutions were prepared right before injection, following the

volume and application mode described for each treatment. Four OTC treatments were applied: 1) OTC dissolved in 50 mL and delivered with one injector, 2) OTC dissolved in 100 mL and delivered with one injector, 3) OTC dissolved in 100 mL and delivered with two injectors containing 50 mL each, and 4) OTC dissolved in 200 mL and delivered with two injectors containing 100 mL each. These were compared against an untreated control. The experimental design was a complete randomized design with 10 single-tree replications. Trees in both commercial locations were injected on the same day, during the morning. Injectors were placed on opposite sides of the trunk for the treatments with two injectors. Leaf samples were collected at different time points after injection to assess bacterial titer reductions and OTC persistence over time. HLB disease symptom severity and canopy thickness were evaluated on both sides of each tree. We hypothesize that increasing the number of injection sites and the volume of the injected OTC solution enhances its distribution within the tree, thereby improving its efficacy in reducing bacterial titers, and increasing yield and juice quality. The findings of this study will provide insights into optimizing trunk injection strategies for HLB management and improving citrus production practices.

[C-20] OTC affects fruit quality on OLL-8 sweet orange grown on different rootstocks

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Huanglongbing (HLB) is a bacterial disease of citrus vectored by a small flying insect. The disease has decimated the Florida citrus industry and has been in the State for almost two decades. Despite the efforts of plant pathologists and entomologists to mitigate the disease and destroy the vector, respectively, no adequate solutions have been developed to assist growers. So far, the only horticultural practice that works is pest exclusion in the citrus under protected screen cropping system, which is expensive but greatly effective in keeping trees healthy and profitable. Oxytetracycline (OTC) is an antibiotic that has been recently approved for use in Florida citrus. Since its approval, millions of trees have been injected and the efficacy of this method is still under observation. In this study, mature OLL-8 trees on several rootstocks were injected and compared to trees that were not injected. The rootstocks evaluated in this study were 'UFR-2', 'UFR-4', 'UFR-6', 'US-942', 'US-897', and 'Swingle'. Data collected included total fruit yield per tree, fruit size, fruit weight, fruit drop, soluble solids (TSS), titratable acidity (TA), TSS:TA ratio, pounds-solids per box, and juice color. There was evidence for statistically significant differences among OLL-8-rootstock combinations and OTC treatment for yield, TSS, TA and other variables. There also appeared to be a statistical interaction between rootstock and OTC treatment. Overall, rootstock and OTC treatment had effects on fruit quality and fruit yield, but more research is needed to understand the effects of rootstock and OTC in the HLB environment.

[C-21] Comparative Analysis of Stabilized and Non-Stabilized Silicon Sources on Photosynthetic Performance of Young Orange Trees

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Silicon (Si) mitigates plant stress, yet the role of stabilizers such as sorbitol in enhancing its efficacy remains underexplored. This study evaluated the effects of stabilized (SiKE) and non-stabilized (SiK) potassium silicate on the photosynthetic efficiency of young orange trees (*Citrus sinensis*). Three concentrations (2, 4, and 6 mmol L^{-1}) using four replicates were evaluated in completely randomized design. Following a single foliar Si application to 13-month-old trees, growth parameters, chlorophyll fluorescence, and pigment composition were assessed. SiKE significantly increased plant height, while SiK promoted leaf production at 4.0 mmol L^{-1} and SiKE at 6.0 mmol L^{-1}. As Si polymerization above 3 mmol L^{-1} may reduce availability, stabilization appears to enhance physiological benefits. Multivariate analysis revealed distinct treatment responses. SiKE, particularly at 4 and 6 mmol L^{-1}, improved photochemical efficiency by increasing maximum quantum efficiency, potential photochemical efficiency, and electron transport rates in photosystem II. In contrast, SiK was associated with higher initial fluorescence, absorbed energy per reaction center, and relative fluorescence at the J-step, suggesting mild photoinhibition. Pigment stability varied with treatment, influencing chlorophyll degradation and electron transport capacity. Notably, 4 mmol L^{-1} SiKE correlated with enhanced electron transport per reaction center and higher photochemical performance, reinforcing its role in optimizing light energy use. These findings highlight stabilized Si as a promising strategy for improving photosynthesis, young orange growth, and sustainable agricultural practices.

[C-22] Effects of OTC trunk injection on various citrus scions

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Huanglongbing (HLB), a plant disease believed to be caused by a bacterium and vectored by the Asian citrus psyllid, has affected the Florida citrus industry to the point of collapse. Commercial citrus cultivars are typically not able to produce profitable yields when affected with HLB in Florida. The disease causes poor yields and fruit quality, tree decline, and tree death. Typically, HLB-affected fruit are smaller, lopsided, and more acidic than fruit not affected with HLB. Total soluble solids are also often lower, which greatly affects solids to acid ratio when coupled with the relatively higher titratable acidity. 'OLL-8', Sugar Belle™ and 'Valquarius' trees were trunk injected with oxytetracycline to determine effects of this antibiotic on fruit yield and quality. Yield, fruit diameter, fruit weight, total soluble solids, titratable acidity, ratio, pounds-solids, and color data were collected and analyzed. It was determined that OTC affects important horticultural variables of the cultivars tested, but the effects are not the same across all cultivars and the effects are not always statistically significant. The results indicate that OTC does have effects on citrus fruit, but more research is needed to determine if these injections are cost-effective and lead to profitability in the long term.

[C-23] Systemic delivery of oxytetracycline for treatment of citrus huanglongbing using a drill-based and no-drill injection system

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The systemic delivery of oxytetracycline (OTC) by trunk injection has emerged as a viable strategy to manage Huanglongbing (HLB, aka citrus greening), an endemic bacterial disease devastating citrus production around the world. The associated pathogen, *Candidatus* Liberibacter asiaticus (*C*Las), resides in the phloem, limiting the efficacy of foliar applied therapies. Contrary to foliar delivery, trunk injection is a targeted method for delivering therapies directly into the tree vascular system resulting in their systemic distribution. Most injection methods are drill-based, i.e. they require drilling a hole in the trunk to insert the injection device. No-drill injection systems are designed to deliver therapies without the need of a drill, so they cause less injury, while delivering therapies more precisely and requiring lower doses of the active ingredient. This study examines the efficacy of delivering OTC systemically into the trunk of young, HLB-affected citrus trees using a drill-based and a no-drill system to improve tree health and productivity and reduce injury. Two field trials were conducted in two different commercial production sites in Florida. Trees were four years old at the start of the study and composed of 'Valencia' (site 1) or 'OLL-8' (site 2) sweet orange (*Citrus sinensis*) trees grafted on X-639 (*C. reticulata* × *Poncirus trifoliata*) rootstock. Injections were performed in May and/or August of each year. Using the drill-based injection, 0.75 g of OTC was injected into each tree, whereas 0.15 g or 0.3 g OTC were delivered using the no-drill system. We found that delivering a higher dose of OTC by drill-based injection increased fruit yield and improved juice quality considerably more than delivering lower doses by no-drill injection. However, results varied between cultivars, with 'Valencia' trees responding better than 'OLL-8' trees. Extensive injury was noted on the trunk when OTC was applied with the no-drill injection system. In contrast, trunk injury was minimal to moderate using the drill-based system. In conclusion, higher doses of OTC delivered by drill-based injection were more effective in mitigating HLB and less injurious than lower doses delivered by no-drill injection.

[C-24] Effect of OTC trunk injection on three HLB tolerant citrus cultivars

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Huanglongbing (HLB) or citrus greening is a bacterial disease affecting citrus trees worldwide. It is believed to be caused by the bacterium *Candidatus* Liberibacter asiaticus (*CLas*) and is spread by Asian citrus psyllid (ACP) called *Diaphorina citri*. HLB is a devastating disease that has seriously impacted the citrus industry in Florida. Since HLB was first reported in 2005 in Florida, it has caused over 90% loss in citrus production. Oxytetracycline (OTC) is a broad-spectrum antibiotic that targets bacterial protein synthesis and inhibits growth and reproduction of pathogens. The injection of this antibiotic was seen to enhance the tree growth, fruit yield and quality of infected trees. The breeding team at the University of Florida has developed varieties of citrus that are tolerant to HLB. Three HLB tolerant cultivars which are Bingo, Greenie and Marathon were injected by OTC to determine its effects on fruit yield and quality. Data collected, included percentage fruit juice, juice color, total soluble solids, titratable acidity, and ratio were collected and analyzed. There was evidence for statistically significant interactions between OTC treatment and cultivar for color and ratio. There were also significant differences among cultivars for the traits evaluated. More research on the effect of OTC on HLB tolerant citrus cultivars is needed to determine whether the effectiveness of OTC on these cultivars can bring profitability back to the industry.

[C-25] Maximizing budbreak and winter growth of 'Washington' navel in the citrus nursery through supplemental LED lighting and use of 6-benzylaminopurine

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Citrus nurseries face reduced budding activity in the winter due to short photoperiods and low temperatures. Light-emitting diodes (LEDs) and plant growth regulators (PGRs), such as 6-benzylaminopurine (6-BA), may mitigate these winter challenges by extending day length and stimulating budbreak. This study evaluated the effects of different LED spectra and 6-BA on 'Washington' navel orange (*Citrus sinensis*) budbreak and growth on two rootstocks during winter. A 4 × 2 × 2 factorial experimental design was implemented and included four LED treatments (NoSL: no supplemental light; FSL: full-spectrum light; BWSL: blue-white light; BWSL+FSL), two rootstocks (Carrizo citrange and Rubidoux trifoliate orange), and two PGR levels (NoPGR and 6-BA). Each treatment had six replicates of 24 plants, 2304 in total. LED supplemental light was used for 12 weeks post-budding, with periodic assessments. FSL and BWSL+FSL significantly improved budbreak (82% and 79%) compared to NoSL (65%). Carrizo rootstock enhanced budbreak by 30% over Rubidoux. Carrizo + FSL resulted in the largest rootstock diameter (7.80 mm), scion diameter (4.37 mm), and total leaf area (455 cm^2), with a 5.7-fold increase in scion dry biomass (7.87 g) over Rubidoux + NoSL. FSL promoted shoot growth, increasing node number (16) and internode length (345 mm). BWSL + 6-BA improved chlorophyll content (81.8), while FSL raised leaf temperature by 5.7%. These findings highlight the potential of tailored LED lighting, rootstock selection, and PGRs to optimize citrus nursery production and quality, particularly during low-light winter conditions.

[C-26] Homobrassinolide application enhances yield and quality of 'Sugar Belle' mandarin fruit under endemic Huanglongbing (HLB)

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'Sugar Belle' is a hybrid mandarin well-suited for Florida citrus production due to its early maturity, high fruit quality, and Huanglongbing (HLB) tolerance. Despite its relative tolerance to HLB, the disease remains a challenge, reducing fruit yield and juice quality, underscoring the need for innovative management strategies to maintain commercial production. Homobrassinolide (HBr), a plant growth regulator, has shown promise in enhancing plant resilience and improving fruit characteristics under stress conditions. This study investigates the influence of monthly foliar HBr application during the 2023 and 2024 growing seasons on 'Sugar Belle' yield and fruit quality in trees grafted on Sour

Orange (SO) or 'US-942', and previously covered or non-covered for 3 years, with Individual Protective Covers (IPCs). As a widely adopted strategy, these covers protect young citrus trees from HLB by preventing psyllid transmission. Our results revealed that HBr significantly increased the yield of non-covered (No-IPC) trees during the 2023 and 2024 seasons. However, HBr did not influence fruit production of the uncovered (IPC removed after three years) trees for both seasons. HBr also improved the internal (Brix, and Brix-to-acid ratio) fruit quality of non-covered (No-IPC) trees regardless of the rootstock, compared to those with no HBr application, leading to sweeter and more balanced fruit flavor. Additionally, HBr-non-covered trees exhibited more advanced fruit color development. These findings highlight HBr's potential as an effective citrus management tool, for improving 'Sugar Belle' fruit quality in HLB-endemic regions.

[C-27] Optimizing Antibiotic Rotations and Alternative Therapeutics for Sustainable HLB Management in Florida Citrus

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Huanglongbing (HLB), presumably caused by *Candidatus Liberibacter* asiaticus (*C*Las) and transmitted by Asian citrus psyllids (*Diaphorina citri*), continues to devastate Florida's citrus industry, significantly reducing production. Oxytetracycline (OTC) is the only approved therapeutic consistently effective against CLas and is widely adopted by Florida citrus growers. However, prolonged OTC use raises concerns about bacterial resistance. This study evaluates antibiotic rotations (kasugamycin, oxolinic acid, nalidixic acid, streptomycin, validamycin A, and gentamycin) and alternative therapeutics, including plant defense inducers and insecticides, to enhance HLB management and mitigate resistance risks. Field trials in a citrus grove assess individual antibiotic injections (spring 2024) followed by injections with rotation partners (fall 2024) using Hamlin and Valencia citrus varieties. Tree health, HLB symptoms, canker incidence, and CLas titers are regularly monitored. While the trial is ongoing, preliminary data indicates significant CLas reduction across OTC-containing treatments, with OTC + Xytect (imidacloprid) and OTC + oxolinic acid demonstrating better bacterial suppression. Additional trials are investigating the synergistic effects of OTC combined with kasugamycin or streptomycin as an injection mix. This research is crucial for developing sustainable HLB management strategies to extend OTC efficacy while long-term solutions are pursued.

[C-28] Insights into OTC adoption and profitability from a Florida citrus survey

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Florida produced over 73% of the total oranges in the US in 2005-06. However, acreage, yield, and hence total value of production have consistently fallen since 2005, when Huanglongbing (HLB, a.k.a. citrus greening) was first detected in the state. In 2021-22, the total on-tree value of orange production was 32% of the 2006-07 total production value. This was worsened in 2022 when Hurricane Ian affected most major citrus production regions, dropping the on-tree value of citrus crops by 61% from the 2021-22 season. In 2022, the EPA approved the use of oxytetracycline (OTC) via citrus trunk injection. Trunk injection is an alternative way to deliver pesticides systemically in woody crops that is more precise, generally safer, and more environmentally friendly than applying them by foliar sprays. OTC trunk injection is thought to be widely practiced by the Florida citrus industry to control HLB. In 2024, 2 years after EPA approval, we surveyed FL citrus growers to assess OTC via trunk injection use and growers' perceptions of the outcomes. This statewide online survey captures trunk injection costs, yield benefits, tree health, cultural practices, and farm demographics to assess the outcomes and profitability of this newly adopted practice. We have usable responses from 71 respondents who operated groves in 21 counties, of which 80% use OTC and 14% plan to use OTC. Of those who use OTC, 56% improved the Brix ratio by up to 20%, 49% increased pound solid by up to 20%, and 11% did not see decreased fruit drop. We report on these findings and share any statistical differences across groups.

[C-29] HLB-Tolerant Early-season Sweet Oranges: Genetic Insights for Controlling Citrus Greening Disease

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Huanglongbing (HLB), or citrus greening disease, caused by the phloem-limited bacterium *Candidatus* Liberibacter asiaticus (*Ca*Las), poses a significant threat to citrus production worldwide. Identifying and developing HLB-tolerant cultivars has become necessary to mitigate its devastating impact. Recently, several trees in a Buck Hill block in Lake County, Florida exhibited significant tolerance to HLB. Interestingly *Ca*Las bacterial titer for most of the trees was comparable with the susceptible check with quantitative polymerase chain reaction (qPCR) threshold values ranging from 28 to 37. Tolerant cultivars have shown increased chlorophyll and carotenoid content compared to the susceptible checks. Juice quality assessments have shown a brix acid ratio of 15-25. Interestingly, despite being labeled as Hamlin cultivars, these trees displayed variations in seed count, some aligning more with Parson Brown cultivars. To investigate their genetic origin, whole genome DNA sequencing was performed on these trees, as well as on reference cultivars such as Hamlin and Parson Brown. Genomic analysis revealed that the escape trees from the Buck Hill block were genetically diverse; most were either likely parson brown types or Hamlin clones. Among them, the two most promising cultivars -R20-T30 (Parson Brown-type) and R21-T36 (Hamlin-type) were included in the Citrus Research and Field Trials (CRAFT) program. Both cultivars demonstrated excellent yield and juice quality, with notable genetic divergence observed between different cultivars within the same type. The genomic analysis of these cultivars revealed genetic divergence within their respective types. Hamlin types such as Hamlin 1-4-1 and Hamlin R21-T36 and Parson Brown types such as R20-T30 and Parson F-56-2 displayed differences at the DNA level. Root DNA analysis identified Swingle as the predominant rootstock among escape trees. These findings highlight the crucial role of genetic analysis in identifying HLB-tolerant cultivars, laying the foundation for targeted breeding strategies, and improving citrus resilience against the disease.

[C-30] The impact of phosphorus rates on HLB-affected tree health and performance in sandy soils

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Studies on nutrient therapies are critical for managing huanglongbing (HLB citrus greening). Nutrient leaching below the root zone is aggravated because of Candidatus Liberibacterasiaticus-induced root loss up to 80%. Leaching nutrients from agricultural fields and citrusgroves into groundwater sources may bring about severe economic loss and environmental
hazards that may affect downstream ecosystems. Therefore, researchers developed bestmanagement practices (BMP) to preserve the environment while maintaining sustainableagricultural productivity. Thus, the objective of the study was to optimize site-specific variablephosphorus (P) rates on tree growth of Hamlin and Valencia citrus tree growth and fruit yield,and postharvest fruit quality. The studies were conducted on mature sweet 'Valencia' sweetorange trees (*Citrus sinensis* (L.) Osbeck) on Swingle citrumelo (*Citrus paradisi* Macf.× *Poncirus trifoliata* L. Raf.) at three sites: Arcadia, Clewiston, and Lake Wales from 2022–2025.The P treatments were 0, 10, 20, 40, and 80 lb/acre per year. The experiment was arranged in a randomized complete block design with four replications. Semi-annually, soil and nutrientconcentrations, trunk cross-sectional area, canopy volume and annual fruit yield and postharvestattributes are documented. The P rates are expected to improve the yield and postharvest fruit quality.

[C-31] Impact of Nitrogen Fertilizer Rates on Citrus Fruit Quality and Maturity

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Satsuma mandarins may reach full internal ripeness but fail to develop the proper external color, which affects their marketability. This study aimed to investigate how fruit quality evolves from the green stage to peak ripeness and evaluate the impact of various nitrogen fertilizer rates on fruit characteristics. Fruits were harvested from an on-farm experimental site starting in early September 2024, with subsequent harvests every two weeks until early December 2024. Nitrogen fertilizer (45-0-0) was applied at rates of 100, 150, 200, and 250 lbs/acre in 3, 5, and 7 splits. The quality parameters studied included fruit weight, fruit diameter, peel weight, titratable acidity, pH, juice percentage, fruit firmness, total soluble solids (TSS), and the maturity/ripeness index (TSS-acid ratio). Additionally, the antioxidant potential of the fruit was assessed. From September to early November 2024, fruit weight increased by 46%, fruit diameter by 10.65%, juice percentage by 28.31%, and brix by 28.66%. After early November, no significant increases were observed. Fruit firmness declined gradually by 34.19% until early November, followed by a sharper decrease of 66.47% until the first week of December. The highest fruit weight (144.5g) and brix (8.48%) were recorded when 200 lbs/acre of nitrogen fertilizer was applied in five splits. These findings suggest that applying nitrogen fertilizer at 200 lbs/acre in five splits results in favorable outcomes for fruit weight and TSS development. However, a multi-year evaluation is necessary to make a final recommendation on the optimal nitrogen rate for producing fruits with high yield and quality.

[C-32] Developing Site-Specific Recommendations on Nitrogen Application Rates and Timing for Satsuma mandarin Production in North Florida

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Citrus production is expanding quickly in north Florida. Research-based recommendations for nitrogen application rates are crucial for clay soils in North Florida, as their nutrient retention and water-holding capacities differ significantly from the sandy soils of central and south Florida. This project aims to develop site-specific recommendations for nitrogen (N) application rates and timing to optimize Satsuma mandarin production in north Florida. By integrating local soil, climate, yield and fruit quality data, the study seeks to enhance fruit yield and sustainability while minimizing N use and environmental impact. This study evaluates N application rates (100, 150, 200, and 250 lbs/acre) and split-timing strategies (7, 5, and 3 applications per season) in Satsuma mandarins on US942 and trifoliata rootstocks. Leaf nutrient analysis showed that N concentrations ranged from 2.3% to 2.7%, phosphorus (P) from 0.11% to 0.15%, and potassium (K) from 0.8% to 1.1%, with no significant differences among N treatments and their split applications. Soil analysis similarly indicated no significant variation in macronutrient availability across treatments. Frit yield data also showed no significant differences between N levels because winter storms negatively impacted production, highlighting the need for adaptive nutrient management. Ongoing assessments of fruit quality and postharvest performance, along with the planned integration of drone-based monitoring in 2025, will further refine site-specific nutrient recommendations for sustainable and profitable citrus production in north Florida.

Handling & Processing

Presiding: **Moshe Doron**

[HP-1] Dry Matter in Florida Avocados Does Not Necessarily Correlate with Taste Preference

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In Guatemalan x Mexican avocados such as 'Hass', maturity is typically assessed through the dry matter content (DM), which is often considered an indicator of fruit quality and readiness for consumption. The Florida avocado industry consists mainly of West Indian varieties, which are deemed ready to harvest when they reach a minimum size. There is a lack of knowledge about the relationship between DM content, firmness, and taste preference in avocados grown in Florida. This study observed two West-Indian ('Hall' and 'Lula') and two Guatemalan x Mexican ('Bacon' and 'Ettinger') hybrids harvested in South-Central Florida. Fruit were harvested every 3 to 4 weeks and ripened at 20 - 22°C. A taste panel consisting of 25 panelists evaluated the sensory attributes and preference of avocados softened to 15 N or lower. Results showed that within a cultivar, fruit harvested later tended to have an increase in DM and a decrease in ripening time. When harvested at their full physiological maturity, fruit required 10 days to reach full ripeness. However, increases in DM did not result in a higher taste preference. 'Bacon' and 'Ettinger' DM percentages ranged from 14% to 32%, with the taste ratings ranging from 5 (neither like nor dislike) to 6.1 (like slightly). 'Hall' and 'Lula' showed a DM percentage ranging from 16.7% to 28.3%, with taste ratings similar to the two Guatemalan x Mexican cultivars. This study contributes to understanding factors that can help optimize fruit quality and provide valuable insights for the Florida avocado industry.

[HP-2] Effects of Postharvest Melatonin Treatment on Quality and Pink Rib Development in Lettuce

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Lettuce (*Lactuca sativa* L.) is highly perishable crop with shelf life largely limited by visual factors, including tissue discoloration and texture degradation. A key factor driving postharvest losses in lettuce is pink rib (PR), a stress-induced disorder characterized by pink to red-brown discoloration in the midribs or at cut ends and edges. PR development is variable and may be influenced by environmental stresses, mechanical damage, and storage conditions, making its management a challenge for growers and processors. Recent work has demonstrated that melatonin, a naturally occurring antioxidant and plant growth regulator, has potential as a postharvest treatment for reducing PR occurrence and severity in lettuce. However, the underlying mechanisms behind its inhibitory effect and interaction with key enzymatic and metabolic pathways associated with PR development remain unclear. The objective of this study was to explore the potential of melatonin as a postharvest treatment for mitigating PR in lettuce, focusing on solubilization, application methods, and overall impact on quality and shelf life. Excised and intact lettuce midrib sections (n = 5) were wounded with transverse slices at set intervals, subjected to melatonin treatments via immersion or spray applications, and stored in breathable, high-density polyethylene bags at 10ºC/95% RH. Several quality and physiological parameters were assessed over 10 days. Findings from this study will provide additional insight into melatonin's role in reducing PR while maintaining lettuce quality and shelf life.

[HP-3] Segregation Analysis of Tolerance to Pink Rib Discoloration in Lettuce Potentially Reveals Inheritance of Multiple Loci

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Lettuce as a crop faces substantial postharvest losses up to 30% due to tissue deterioration and physiological discoloration disorders such as browning and pinking. Pink discoloration, known as pink rib, occurs along the veins and midribs of lettuce leaves when cut for packaging or damaged during handling, rendering the product unappealing for consumers. While cultural control practices help mitigate pink rib disorder, previous research has demonstrated genetic variation for this trait, indicating the potential for breeding new lettuce cultivars with pink rib tolerance. The inheritance of pink rib tolerance remains unknown; therefore, this research aimed to elucidate the segregation pattern for tolerance to inform future breeding strategies. A segregating F_2 population and parents from the cross 'Galactic' (T) × 'Tall Guzmaine' (S) were grown using deep water hydroponics and harvested at market maturity. Two midribs from fully mature leaves of each plant were excised, manually lacerated perpendicularly along the entire longitudinal axis and stored in unsealed polyethylene bags for two weeks. The severity of pink discoloration from each laceration was rated visually using a 1-to-5 scale and averaged across both midribs for each plant. Overall, the distribution of pink rib severity appeared normally distributed, potentially indicating the inheritance of multiple loci for pink rib tolerance from 'Galactic'. Future experiments are needed to confirm whether breeding for pink rib tolerance should consider using strategies congruent with a genetically complex trait, including the identification of genomic regions, to help reduce losses to the lettuce industry from this unappealing disorder.

[HP-4] Identifying relationships between muscadine (*Muscadinia rotundifolia*) peel characteristics and postharvest quality

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Peel characteristics play a vital role in fruit postharvest performance, influencing water retention, gas exchange, and texture. In muscadine, traits such as lenticel density, lenticel area, lenticel distribution, peel thickness, and cell wall composition may contribute to differences in postharvest storability. Unlike bunch grapes (*Vitis vinifera*), which can be stored for several months when refrigerated and fumigated with SO_2, muscadine typically lasts only 2–3 weeks under optimal storage conditions, with shriveling and decay being major contributors to quality loss. Lenticels may facilitate gas exchange but could also serve as pathways for moisture loss and microbial entry. Additionally, peel and flesh cell wall composition influence fruit texture and softening, further affecting postharvest behavior. Understanding how these factors contribute to fruit deterioration can provide valuable insights for optimizing muscadine storage strategies. This study evaluates the influence of peel traits on postharvest storage across six muscadine cultivars, including three purple ('Supreme', 'Paulk', 'Alachua') and three bronze ('Granny Val', 'Hall', and 'Triumph'). Lenticel morphology and distribution were assessed using scanning electron microscopy, while peel thickness and cell wall composition were analyzed to determine their relationship with fruit shelf life. A five-week storage study tracked changes in fruit firmness, weight loss, and decay incidence. Preliminary findings suggest that cultivars ('Alachua' and 'Granny Val') with higher lenticel densities and larger lenticel areas exhibit increased moisture loss, while variations in peel thickness may influence firmness retention. These results highlight the importance of peel characteristics in postharvest stability and suggest that differences in epidermal traits could play a role in muscadine storability. By providing a clearer understanding of peel-related postharvest traits, this research may help inform breeding efforts aimed at improving fruit shelf life and quality.

[HP-5] Establishing Moisture Content Isotherm for Florida Grown Macadamia Nuts (Macadamia integrifolia)

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Florida's citrus industry has experienced a significant decline, with orange production dropping 90% from 2005 to 2023 and overall citrus production decreasing by 60% from 2022 to 2023. This decline due to citrus greening and other diseases necessitates alternative crops, such as macadamia nuts. However, the emerging Florida macadamia industry lacks region-specific postharvest processing and storage guidelines. This study aimed to develop a moisture content isotherm for Florida-grown macadamia nuts (FMN) to assess differences from established data on macadamia nuts from Mexico and Australia. FMN samples were collected from two Florida sources and subjected to three drying stages: ambient air drying, desiccator drying, and oven roasting. Water activity and moisture content were measured, and data were modeled using the Guggenheim-Anderson-de Boer (GAB) model. Results indicate that FMN exhibit distinct sorption isotherm properties compared to macadamia nuts from other regions, emphasizing the need for tailored environmental controls. High relative humidity (above 80%) was identified as a major risk factor for mold growth, underscoring the importance of optimized storage conditions. These findings highlight the necessity of Florida-specific postharvest guidelines to ensure the safety and quality of FMN, supporting the crop's viability as an alternative to citrus in the state's evolving agricultural landscape.

[HP-6] Estimated Shelf-life of Lettuce Grown in Early and Late Season Heat Using an Accelerated Testing Methodology

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Lettuce is a rapidly deteriorating fresh vegetable whose shelf-life can be influenced by preharvest factors such as cultivar genetics and above normal temperatures during production. Florida lettuce producers commonly face supraoptimal temperatures during the beginning and end of the winter growing season, in addition to unpredictable rain events. Therefore, this research was conducted to determine how higher temperatures prevalent at the beginning or end of the season impacted the subsequent shelf-life of different morphological types of lettuce. Two sets of germplasm were separately cultivated in three plantings of the 2023 and 2024 seasons, respectively, consisting of an early heat planting, a middle cool planting and a late heat planting. Crops were cultivated using commercial plasticulture at the Hastings Agricultural Extension Center, harvested at market maturity, and transported to the UF/IFAS Postharvest Laboratory in Gainesville, FL. Accelerated shelf-life testing was performed at 10◦C and 90% RH, and plants were evaluated for visual quality utilizing a 1-to-9 scale until unsalability. Preliminary results indicate that both early and late season heat reduced lettuce shelf-life, and early season heat reduced shelf-life greater than late season heat in the first season. Substantial rain events early in the 2024 season also reduced shelf-life, but made it difficult to validate the previous season's early- vs. late-heat comparison. Genotypes 'Monte Carlo' and 'North Star' consistently exhibited longer shelf-life, whereas breeding line 20c4426 and 'Rex' exhibited shorter shelf-life. These results indicate the potential for breeding improved shelf-life in lettuce throughout the dynamic temperature changes of the Florida growing season.

[HP-7] Identifying HLB-Symptomatic and Asymptomatic Citrus Fruit Characteristics Using Deep Learning Methodologies

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Huanglongbing (HLB), also known as citrus greening disease, poses a severe threat to the global citrus industry, causing significant economic losses and reduced fruit quality. This study explores the application of deep learning techniques for automated detection of HLB-symptomatic citrus fruit using image-based analysis. As the first of many distinguishing features of HLB-symptomatic fruit, an existing Compac 900CIR vision system has been trained to identify both the stem and blossom ends of the fruit, so that the angle between them ("stem angle") is determined. In "healthy" fruit, the stem angle is approximately 180 degrees, while HLB-symptomatic fruit is less. Ray Ruby grapefruit from both Citrus Under Protective Screen (CUPS) and unprotected, open field locations were sampled and initially processed through the Compac system to measure stem angle. The fruit were then cut lengthwise, and the stem angle measured manually, along with internal Brix and titratable acidity. Images were also collected using different cameras (including hyperspectral, RGB, etc.), and advanced deep learning methods using state-of-the-art open-source models used to detect features indicative of HLB conditions. The dataset comprising these categories, annotated with labels, was fed into the model for classifying the fruit and data augmentation techniques employed to enhance model generalization and equip with close to accurate performance. A robust framework is being developed to identify fruit exhibiting symptoms of HLB.

[HP-8] A New Strawberry Postharvest Decay Caused by *Gilbertella persicaria* in Florida and Its Control Using Cold Temperature, Gaseous ClO2, and Thyme Oil

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Strawberries are extremely perishable, with postharvest decay being one of the major causes of fruit losses and reduced shelf life. A new postharvest strawberry fruit rot, caused by *Gilbertella persicaria* on Florida strawberry fruit, was first reported in 2020 and caused severe losses in some strawberry harvests during the 2023-24 season. Effective management of this decay is needed. The current studies evaluated the effects of temperature, gaseous ClO_2, and thyme oil (Thyme Guard) vapor for controlling *Gilbertella* decay on inoculated strawberry fruit. Results showed that *Gilbertella* sporangiospores did not germinate and mycelia did not grow when temperatures were at 5ºC and lower, and at 10ºC, spore germination and mycelia grew slowly. In addition, the fungus did not develop visible lesions and decay on inoculated strawberries incubated at 10ºC or lower. Inoculated strawberries exposed to 20 ppm gaseous ClO_2 completely killed *Gilbertella* mycelia within 1 h. Inoculated strawberries treated with 2 mg of ClO_2 fast-release materials per gram of fruit for 2 h in a sealed container reduced *Gilbertella* decay by 80% compared to that of control, with no visible fruit damage observed. Gaseous ClO_2 higher than 2 mg/g fruit or exposed for longer than 2 h could negatively affect fruit quality. Thyme oil vapor at 50, 60, and 80 ppm reduced *Gilbertella* rot incidence by 55%, 73% and 83%, respectively, compared to the control during 3 days of treatment at 25ºC. However, this treatment also caused some fruit calyx browning and reduced sensory quality. In summary, these results indicate that postharvest management using low temperatures combined with gaseous ClO_2 and/or thyme oil treatments could effectively reduce *Gilbertella* rot and increase fresh strawberry shelf life commercially.

[HP-9] Optimizing Shelf Life: Strategies for Enhancing Nutritional Value and Health Benefits

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This research explores the concept of "food as medicine" by focusing on how to preserve bioactive compounds in fresh produce to maximize their health benefits postharvest. Many fruits and vegetables serve as nutrient-dense sources of bioactive compounds, including terpenoids, flavonoids, and polyphenols, which have demonstrated anti-cancer, anti-inflammatory, antimicrobial, and antioxidant properties. However, the stability of these health-promoting compounds is highly influenced by postharvest handling, storage conditions, and processing techniques, which can significantly impact their nutritional value and therapeutic potential. This research aims to understand the factors

affecting the stability of bioactive compounds in fresh produce, with a focus on postharvest strategies that enhance their retention and efficacy. By integrating postharvest biology, breeding, and food science, this work seeks to enhance the shelf life of nutrition in fruits and vegetables, ensuring that their health benefits are preserved from farm to consumer.

[HP-10] Postharvest storage and quality of edamame varieties in South Florida

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Edamame is a nutritionally rich and economically valuable vegetable soybean, widely appreciated for its taste and health benefits. However, its perishability challenges for storage and marketability. Among the factors influencing edamame's storage potential, genetic variation plays a crucial role, yet its impact remains underexplored. The objective of this study was to evaluate the pod quality during storage of 13 commercial edamame varieties grown in South Florida under uniform agronomic conditions in Spring and Fall-Winter 2024/2025. Pods were stored at 4 °C ±1 and 85% ±5 RH, with assessments conducted on days 0, 6, 12 and 15 post-harvest. Weight loss (%) was measured using an analytical balance, and color changes were analyzed with the CIELAB Color Space Diagram method, where the a* (–green to +red), b* (–blue to +yellow) and L* value indicates (lightness, black at 0 and white at 100). General appearance and disease incidence (%) were assessed using a visual scoring scale. Statistical analysis was performed using Two-Way ANOVA, LSD mean test ($p < 0.05$) and multivariate Hierarchical Cluster analysis. On the 15th day post-harvest, pods of the 'KAS 355-11' variety exhibited the least weight loss, losing 101.1% less than, 'Butterbeans', the worst-performing variety. Additionally, 'KAS 355-11' and 'Young Soybean' maintained significantly better overall appearance than the other varieties, and had the lowest disease rates, along with 'UA-Kirksey'. 'KAS 355-11' also retained more of its green color. These results provide valuable insights for growers and grocery store operators, enabling them to choose varieties with enhanced postharvest durability.

[HP-11] Effect of rootstocks and storage temperatures on quality and postharvest storage life of Florida-grown finger lime fruit (*Citrus australasica*)

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Since the advent of Huanglongbing (HLB) disease in Florida, citrus growers are looking for alternative crops to sustain the Florida citrus industry till a cure is available for HLB. Recent reports suggest that finger limes are more tolerant against HLB than sweet orange and grapefruit genotypes. Thus, some citrus growers are considering finger lime cultivation in Florida. However, the selection of suitable rootstock and its effect on fruit quality in HLB-affected finger lime trees in Florida conditions remain unknown. Also, the optimum storage temperature for Florida-grown finger limes to avoid chilling injury and extend shelf life is not well-documented. To address this, fruit from 8-year-old commercially available *sanguinea* type Florida Division of Plant Industry 50–36 cultivar (DPI) scions grafted on the rootstocks US-802, Volkamer lemon (VO), or Kuharske (KE) at the UF/IFAS CREC, Lake Alfred, Florida, were used in this study. After sorting and grading, defect-free finger lime fruit were stored either at a presumed chilling temperature (5 °C) or a non-chilling temperature (10 °C) with 90% relative humidity (RH) for 3 weeks followed by shelf-life at 20 °C with 90% RH for 2 weeks. Randomized Complete Block Design was used. Each treatment consisted of three five-fruit replicates. Fruit evaluations were done on day 0, day 21 of low temperature storage, and days 7 and 14 of shelf life. Statistical analyses were performed using two-way ANOVA in Sigma Plot version at $\alpha = 0.05$. At harvest, KE and US-802 had greater fruit weight and peel *L** values compared to VO. During the shelf-life period, KE fruit retained higher puncture resistance forces, had greater marketability (%), and lower weight loss (%) and peel

*L** value, as well as low scores for aging. So, the rootstock effect on desirable attributes at harvest and during storage was as follow: KE > US-802 > VO. During shelf life, the 10 °C-stored fruit had lower scores for postharvest pitting, aging, and skin discoloration, and had less weight loss (%), lower peel *L** value, higher puncture resistance forces, and more marketable fruit (%) than the 5 °C-stored fruit. Taken together, results for storage at 10 °C for 3 weeks plus 1-2 weeks shelf-life at 20 °C seems promising for successful storage and marketing of Florida-grown finger limes.

[HP-12] Postharvest changes in finger lime fruit (*Citrus australasica*, F. Muell.) during storage at chilling or non-chilling temperatures

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As one of the few citrus tolerant of HLB, finger lime (*Citrus australasica*) should see increased commercial production in Florida, expanding its market reach and consumer base. In addition, its currently high retail prices necessitate optimal storage conditions and other measures to extend storage and shelf life while maintaining high quality. In this study, we continued developing the 'UF SunLime' fruit quality assessment aide chart and examined the effectiveness of fruit coatings in maintaining quality and delaying development of postharvest chilling injury and senescence symptoms in 'UF SunLime' finger lime fruit. Commercially mature 'UF SunLime' fruit were harvested at the UF/IFAS CREC in Lake Alfred and transported to the UF/IFAS HOS Postharvest Lab in Gainesville. After overnight storage at 10 °C with 95% relative humidity (RH), fruit were manually coated by brushing with water (control), coconut oil, or a commercial zein protein-based mango coating (Akorn Technologies) and stored either at 10 °C for 3 weeks followed by 1 week at 20 °C for shelf life evaluation or for 2 weeks at 4 °C followed by 1 week at 10 °C (for chilling symptoms assessment under optimal storage temperature) and an additional week at 20 °C for shelf life evaluation, all with 95% RH. Under chilling conditions, coconut oil-coated fruit retained their weight and firmness significantly better than water-coated fruit after 2 weeks at 4 °C and after 2 weeks at 4 °C followed by 1 week at 10 °C plus an additional week at 20 °C, respectively. Throughout the 4-week chilling experiment, non-coated fruit exhibited more severe pitting incidence (level 5) than coated fruit. Akorn-coated fruit lost significantly more weight than water- and coconut oil-coated fruit during 3 weeks storage at 10 °C. Coconut oil-coated fruit were significantly firmer than water-coated fruit after 3 weeks at 10 °C plus 1 week at 20 °C. Water-coated fruit showed more pitting incidence than Akorn-coated fruit after 3 weeks at 10 °C and after 3 weeks at 10 °C plus 1 week at 20 °C. Akorn-coated fruit were darker (lower L* values) than water- and coconut oil-coated fruit after 2 weeks at 10 °C. The results indicated that coconut oil coating can extend the storage potential of finger lime fruit at both 4 and 10 °C, maintain fruit quality during storage and shelf life by reducing water loss and pitting incidence, and maintain fruit firmness better than water-coated fruit.

[HP-13] Tree Nutrition Effects on Postharvest Fruit Quality and Shelf Life of 'Hamlin' Sweet Orange

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Citrus tree nutritional requirements continue to be reevaluated considering the devastating effects of citrus greening (Huanglongbing, HLB). For the current experiments, 'Hamlin' orange trees on two rootstocks received nitrogen at (150, 200, and 250 lb/acre) over two seasons (2020-2022), slightly modified nitrogen rates at 100, 150, 200, 250, and 300 lb/acre, and phosphorus at 0, 10, 20, 40, and 80 lb/acre applied to three locations over three seasons (2022-2025) in split broadcast applications. Fruits were harvested in December of each season and their size and juice and storage quality were evaluated. There were significant differences in fruit size and juice quality between rootstocks and fertility treatments, but there were no significant treatment effects on fruit shelf life in the study between 2020 and 2022. Compared to 'Cleopatra' mandarin rootstock, 'Swingle' citrumelo developed larger fruit size, lower Brix, and lower titratable acidity (TA). Trees receiving the 150 lbs N/acre treatment produced larger fruit with lower Brix and

TA than treatments at 200 and 250 lbs N/acre. Growing location significantly impacted fruit size, juice content, Brix, and storage quality. Fruit from the Clewiston and Lake Wales trial sites both had about 14% larger fruit than those from the Arcadia site. Fruit from Clewiston also developed 46% and 38% less decay compared to the Lake Wales and Arcadia locations, respectively. However, Arcadia fruit developed the highest Brix and juice content than the Clewiston and Lake Wales sites. Fruit from the 20 and 80 lb P/acre treatments were the largest but contained the lowest juice content, while the 100 and 200 lb N/acre treatments resulted in the highest juice content but the smallest fruit. Overall, the N and P treatments resulted in no significant differences in fruit shelf life.

[HP-14] Postharvest Performance of 'Marathon' Mandarin Fruit After Degreening, Washing and Waxing

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'Marathon' is an early season, easy-peeling, seedless mandarin released by the University of Florida in 2019 through the revised New Varieties Development and Management Corporation FAST TRACK program. 'Marathon' fruit were harvested on October 7 and October 24, 2024, from both open field (F) and Citrus Under Protective Screen (CUPS) environments. Trees from F were also divided into those that received oxytetracycline (OTC) trunk injections and those that did not. Fruit were assessed for initial size, color, and juice quality and then split into two groups for degreening (5 ppm ethylene, at 72ºF with 95% relative humidity) or wash/wax (Carnauba) treatments. Control fruit were held without ethylene in similar conditions and were left unwashed/un-waxed. Fruit peel color was assessed pre- and post-treatment. After treatments, fruit were stored at 40ºF for 6-8 weeks and then evaluated for the development of decay and disorders. The results showed that 'Marathon' CUPS fruit were significantly larger (120-122 g) at harvest than those from F (77-78 g). Additionally, 'Marathon' CUPS fruit exhibited better initial peel color and contained significantly lower titratable acidity (TA) than fruit from Ffield. In contrast, OTC treatments resulted in no significant difference in fruit size, peel color, or juice quality. After degreening, both 'Marathon' CUPS and Ffield fruit resulted in improved peel color compared to the control of both harvests. Degreened Ffield fruit showed a higher percentage of decay during storage, with degreened CUPS fruit and their control still having100% healthy fruit after 8 weeks of storage. After washing/waxing the CUPS fruit, subsequent color development was slowed compared to the untreated control.

[HP-15] Postharvest hypoxia and anoxia stresses on bioactive compounds and total antioxidant activity of 'Moro' blood orange fruit

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The effect of different gas compositions on total anthocyanin content (TAC), total phenolic content (TPC), and total antioxidant activity (TAA) of 'Moro' blood orange fruit during cold storage was investigated. The fruit were kept at 10 °C in hermetically closed chambers (190 L) with different gas compositions, including 1) normal air (control), 2) 20% CO_2 in air, 3) 30% CO_2 in air, 4) 20% CO_2 in N_2, 5) 30% CO_2 in N_2, and 6) 100% N_2, for 21 days. The highest levels of total anthocyanin content (TAC), total phenolic content (TPC), and total antioxidant activity (TAA) were observed under normal air conditions. By the end of the storage period, TAC had increased threefold compared to harvest levels, whereas other treatments showed only slight increases or remained stable. TPC exhibited a consistent upward trend across all treatments, with the highest levels observed in normal air, similar to TAC. Treatments containing O_2 had higher TPC levels than those without. TAA followed a similar pattern, increasing across all treatments by day 7. The normal air treatment showed the most significant rise in TAA by days 14 and 21, maintaining the highest activity levels, while other treatments exhibited more moderate increases or remained stable. Overall, storing blood oranges in normal air was most effective in enhancing TAC, TPC, and TAA. Moreover, fruit quality was superior in treatments containing O_2 compared to those stored under anoxic conditions, suggesting that O_2 promotes the accumulation of bioactive compounds, particularly anthocyanins, in cold-stored blood oranges.

Postharvest Performance of ‘Marathon’

[HP-16] Quality of Three Mandarin (Citrus reticulata Blanco) Cultivars When Grafted Onto Commercial Rootstocks

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Plantings of cold-hardy, mandarin oranges continue to increase in northern Florida and southern Georgia and Alabama. Three seedless mandarin cultivars from the University of Florida breeding program were grafted onto three commercial rootstocks. ‘UFSunrise’, ‘UFSun’ and ‘UFDawn’ were grafted onto ‘Rich trifoliate’ (RTF), ‘Carrizo citrange’ (CZO) and ‘HRS812’ rootstocks; ‘UFGlow’ was grafted onto RTF, CZO and ‘Sun Chu Sha’ (SCS) rootstocks. Fruit from these cultivars were rated by untrained sensory panelists and compared to commercially planted ‘Owari-satsuma’ and ‘Orlando’. Panelists rated the three UF cultivars as having just about right juiciness, and being softer and less chewy compared with ‘Owari-satsuma’ and ‘Orlando’. ‘UFSunrise’ on all rootstocks was preferred to ‘Owari-satsuma’ for overall liking and mandarin flavor. ‘UFGlow’ on CZO had higher overall-liking than ‘Orlando’. Ascorbic acid and pulp total carotenoids were higher for ‘UFSunrise’ on all rootstocks, and for ‘UFGlow’ than for ‘Owari-satsuma’; however, the latter had higher ORAC than the UF cultivars. Postharvest hypoxia and anoxia stresses on bioactive compounds and total antioxidant activity of ‘Moro’ blood orange fruit .

[HP-17] Hydrocooling with or without chlorine and storage temperature effects on green snap bean discoloration

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Green snap beans (*Phaseolus vulgaris*) develop brown discoloration in response to abrasion and other physical injuries that may occur during harvesting and handling. This is a particular problem with mechanically harvested beans. We investigated the potential benefit of hydrocooling with or without chlorine in the hydrocooling water, as well as the effects of storage temperature on discoloration and other quality factors. Strike cv. green snap beans were hand-harvested and beans from the same harvest were used for two simultaneously conducted experiments. In one experiment, the beans were placed directly in cold rooms at 1, 5, 10, or 20°C for 7 days then transferred to 20°C for 2 days. In the second experiment, the beans were either hydrocooled in 40°F (4.4°C) or 75°F (23.9°C) water, with or without 175 ppm chlorine (sodium hypochlorite solution adjusted to pH 7), or room-cooled at 10°C, with all treatments stored at 10°C for 7 days plus 2 days at 20°C. In both experiments, prior to cooling, individual bean pods were either uniformly abraded using sandpaper (20 single pod reps per treatment) or broken (10 reps per tmnt) to simulate abrasion damage or broken end discoloration (BED), respectively. Browning severity was scored subjectively on 9-point scales (from 1=worst to 9=best). The beans in both experiments were stored in glass jars with perforated PVC stretch film covers to minimize water loss. Beans room-cooled and stored at 1°C developed pitting from chilling injury (30% incidence), while pitting incidence was only 5% at 5°C and nil at 10 or 20°C, although desiccation was moderate or severe at 10 or 20°C, respectively. Abrasion damage was significantly reduced when chlorine was present in the hydrocooling water, with no affect of water temperature (average 7.6 with chlorine vs. 5.1 without). In contrast, BED showed no response to hydrocooling, with or without chlorine, (average 7.4 for hydrocooling vs. 8.1 for room cooling and storage at 10°C). Storage temperature for room-cooled beans affected abrasion and BED differently. Abrasion discoloration was strongly affected by storage temperature with scores of 8.9, 7.1, 5.5, and 3.0 for 1, 5, 10, and 20°C storage. In contrast, BED was similar for beans cooled and stored at 1, 5, or 10°C, with scores of 9.0, 8.8, and 8.1, respectively, but was must worse at 20°C (score of 5.9). Only green snap beans stored at 5°C were considered

marketable at the end of these experiments. Quality of Three Mandarin (Citrus reticulata Blanco) Cultivars When Grafted Onto Commercial Rootstocks

[HP-18] Tracking Postharvest Quality of Caladium (*Caladium x hortulanum*) Tubers and Plants after Extended Refrigerated Storage

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Caladium, a popular ornamental crop, is commercially produced primarily in Florida, with an estimated market value of $20 million and up to 100 million tubers produced annually. Florida growers typically harvest and cure caladium tubers in winter, storing them under ambient conditions. However, rapid weight loss leads to decay and reduced viability by late summer, causing significant losses. The caladium industry is under pressure to expand market windows to include U.S. holidays in November and December and cater to international customers in the southern hemisphere. Current collaborative research efforts are focused on evaluating storage conditions and screening cultivars to address these challenges. These studies show that tubers stored at ambient temperature for six months lost more weight (62%) compared to refrigerated storage (46%). However, tubers stored at 13 °C had higher decay rates (20%) after three months than those stored at ambient or 18 °C (10%). By six months, decay rates were similar (21-25%) across all temperatures. Defects like tuber cracking and desiccation increased during storage, with higher cracking at 13 °C (18%) compared to ambient (9%) or 18 °C (11%) while more desiccation occurred at ambient and 13 °C (9%) compared to 18 °C (6%). Ambient storage resulted in better sprouting and overall plant quality, while lower temperatures (13 °C) delayed sprouting and reduced plant quality, especially in later planting periods. July plantings produced the highest quality caladiums, with more leaves and better growth. Varieties BSL and H2T consistently showed lower quality ratings and fewer leaves, regardless of storage temperature. Ongoing research aims to identify resilient varieties and improve storage techniques to address industry challenges, benefiting growers and consumers alike.

Krome Memorial

Presiding: **Jeff Wasielewski**

[K-1] Papaya Ringspot Virus Diversity in Florida and its Virulence on Diverse Papaya Germplasm

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Papaya ringspot virus (PRSV) remains a major threat to papaya production in tropical and subtropical regions. Understanding the diversity and virulence of PRSV strains in papaya is essential for developing effective and durable management strategies and breeding resistant cultivars. The molecular epidemiology of PRSV was investigated by comparing the publically available coat protein gene sequences from different PRSV isolates worldwide, along with new sequences representing South Florida region. Distinct PRSV clades were identified, corresponding to the U.S. and South American region, Southeast Asia (excluding India), and specifically India. The new PRSV strains from south Florida showed close genetic similarity to strains from Cuba, Jamaica, Venezuela, Mexico, Guatemala, and a previously collected strain from south Florida. Low sequence variation was observed between the new and old PRSV strains from south Florida, suggesting that the virus is evolving slowly, likely due to limited papaya cultivation in the region. Currently, these PRSV strains are being used to inoculate several domesticated and recently collected wild papaya accessions from south Florida, to identify PRSV tolerance and resistance to help develop PRSV-resistant papaya cultivars.

[K-2] Jaboticaba, *Plinia* spp., can be an excellent choice as a potted tree, or specimen tree in central Florida.

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Many Floridians grow fruit trees in their home yards, with varying degrees of success. Some species are relatively easy to grow, while others require care that can be too much for the average homeowner. Fruit trees offer an impressive variety of tree shapes and sizes, and fruits to please most palates. Jaboticaba is a cauliflorous (flowers and fruits grow directly from the trunks and large branches) member of the myrtle family with red to black fruits. It is an attractive tree that typically grows to 10-25' tall with a dense, bushy, rounded form. Jaboticaba originated in Southeastern Brazil, but it has been grown for many decades in Florida. Although the tree grows best in the frost-free tropics, it can also thrive in a subtropical climate like that in Winter Garden, FL (Latitude 28° N). Different species and clones of jaboticaba vary in their precocity, fruit color, and bearing habits. There are a few central Florida nurseries that sell jaboticaba trees, and they tend to be more expensive than other fruit trees. Seedling trees can have a long juvenility period (many years) before they bear fruit. But once they do, there tends to be multiple fruiting periods in a typical year. A few jaboticaba trees in different locations around Winter Garden were observed over a three-year period to record growth traits, potential cold injury, and fruiting. There were significant differences in fruiting between the trees. These differences were likely due to species and clone, rather than tree location.

[K-3] Usage, Benefits, and Pitfalls of the Miami-Dade County Tropical Fruit Learning Grove

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The Miami-Dade County Tropical Fruit Learning grove sits on one acre of land adjacent to the UF/IFAS Miami-Dade Extension offices. The grove is home to just under 100 trees made up of 35 species, and 61 cultivars. The trees are widely spaced at 20' by 15' and follow the original planting grid established over 45 years ago. The trees receive sporadic maintenance, mostly through volunteer work, but are pruned annually to control size and open them up to air flow and light by the Extension agent responsible for the grove's upkeep. For the past ten years, the grove has been used annually for demonstrations, hands-on training, tours, and propagation material. This paper will illustrate the usage, benefits, and pitfalls of the Miami-Dade County Tropical Fruit Learning Grove.

[K-4] Optimizing In Vitro Methodologies Through Literature-Derived Data Synthesis: Case Studies in Sugarcane *(Saccharum officinarum)* and Mango *(Mangifera indica)*

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Developing efficient plant tissue culture protocols is often labor-intensive and requires extensive trial and error. This project presents the application of a novel computational tool designed to streamline this process by leveraging published literature to support data-driven protocol development. While the program is crop-agnostic and broadly applicable, this presentation focuses on case studies in sugarcane (*Saccharum officinarum*) and mango (*Mangifera indica*). The tool aggregates experimental parameters into visual summaries that reveal methodological trends and anomalies across diverse studies. This helps researchers identify promising in vitro conditions by highlighting both widely adopted techniques and potentially overlooked treatments. It offers an unbiased foundation for selecting initial protocols—especially useful for lesser-studied explant types or when entering a crop system for the first time. The broader aim is to accelerate the development of effective, evidence-based tissue culture strategies for horticulturally important species. While technical details of the tool are not disclosed here, this presentation emphasizes its output and practical value in guiding experimental design and reducing redundancy.

[K-5] Progress Towards Finding a Sustainable Solution for Laurel Wilt Disease Affecting Commercial Avocado Production

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Laurel wilt (LW), caused by the fungus *Harringtonia lauricola* (HL), is a lethal vascular disease that affects numerous hosts in the Lauraceae, including many vital forest species and avocado trees. Since its introduction to the U.S. in 2002, LW has killed over 500 million trees, including 300,000 avocado trees. HL acts as a nutritional symbiont for several invasive, native, and naturalized ambrosia beetles, and it is present in twelve states. LW continues to spread through beetle vectoring, root grafting, and the human-mediated transport of infested wood, posing a significant threat to the global avocado industry. The broad geographic range of multiple susceptible hosts, combined with the abundance and generalist behavior of the beetle vectors, has facilitated the rapid expansion of LW across forest, urban, and agricultural ecosystems. Disease management in avocado orchards relies on the removal of symptomatic trees, the reduction of insect vector populations, and the prophylactic injection of fungicides. However, none of the recommended cultural practices are 100% effective or widely adopted by producers, and propiconazole, the only EPA-approved fungicide, has proven ineffective in preventing infection and disease development. Our team continues to explore novel approaches for disease management, including the search for resistant genotypes in unique germplasm sources, testing alternative xylem-mobile fungicides and endophytic biological control agents, and enhancing pathogen detection under field conditions. This talk will provide an update on the current status of LW management, and an overview of the knowledge gained from five years of research.

[K-6] Interspecific *Mangifera* hybrids for boutique mango orchards in South Florida

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Mango Men Homestead, LLC is a 0.75-acre boutique mango orchard that sells fresh fruit and mango products on-farm and by direct mail-order. Planting began in 2014 with modern mango cultivars developed over the last 30 years with superior, unique flavor profiles, small stature, superior natural flowering potential and disease tolerance. In the last three seasons we have evaluated the suitability of interspecific mango hybrids developed by conventional breeding techniques over the last 15 years by Mango Men Homestead, LLC. These hybrids, termed wangos, are the result of reciprocal crosses between desirable mango cultivars and several *Mangifera* species collected in Borneo, Indonesia and Peninsular Malaysia. These wangos offer reliable natural blooming, disease tolerance and unique flavor profiles previously unavailable in mango in Florida and hold considerable potential for boutique mango growing in Florida.

[K-7] Is Dragon Fruit a Sustainable Industry for Florida? An Assessment of Five Years of Research and Extension on Disease Management

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Dragon fruit is a widely cultivated neotropical cactus. Commercial plantings can be found in California, Florida, Hawaii, Puerto Rico, and Texas while a growing urban gardening movement exists in Arizona, Georgia, Louisiana, and Oregon. Optimal growing conditions fall within USDA plant hardiness zones 10a-11; however, a reassessment of current and projected meteorological data, along with cultivar-dependent growth parameters, may reveal a broader range of suitable conditions. Dragon fruit is an attractive crop due to its high demand and market prices, rapid growth, early bearing age, high yield, long lifespan, and water efficiency. However, there is a lack of critical information on high-performance varieties, cultural practices to enhance fruit yield and quality, comprehensive pest and disease management programs, and established fruit quality standards. Furthermore, while dragon fruit pulp can be transformed in various ways, no assessment has been conducted on the feasibility of developing an ancillary industry to process fruit not intended for fresh consumption, including fruit of lesser aesthetic value. While Florida leads the U.S. dragon fruit industry, it faces multiple challenges that have slowed its growth. The high incidence of disease, combined with a lengthy production season that coincides with the summer months, requires growers to invest in various disease management strategies, many of which are costly or limited. This paper will address the challenges the industry faces regarding disease pressure and the solutions proposed by our working group at the UF-IFAS Tropical Research and Education Center. It will also provide insights into future research and extension programs aimed at enhancing the industry's sustainability and potential expansion.

[K-8] South Florida Performance Evaluation of Selected Avocado Cultivars

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There is much interest in cultivars selected and grown in California for commercial production in Florida, in particular for Central Florida. These include ‘Carmen’, ‘GEM’, ‘Harvest’, ‘Hass’, and ‘Lamb Hass’. A 1.7-acre scion-rootstock avocado planting was established in 2015 at the Tropical Research and Education Center, Homestead, Florida. In total there were eleven scions including ARS-1, ARS-2, ‘Brogdon’, ‘Carmen’, ‘GEM’, ‘Harvest’, ‘Hass’, ‘Lamb Hass’,

'OroNegro', UCR-1, and UCR-2, and two rootstocks, seedling 'Waldin' or clonal 'Dusa'. From 2021 to 2024 tree phenology (vegetative flushing and reproductive growth), fruit counts, and fruit quality (e.g., size, weight, dry matter content) were periodically recorded. Flushing patterns and periods of panicle emergence and flowering varied. In general, there was little to no vegetative growth during December-January with panicle emergence and flowering during late January through April. During the fall and winter months dry matter content was used to determine fruit maturity and compared to those standards developed in California. In general, fruit from all cultivars were at or above the standard dry matter content considered as mature for all the selections tested.

[K-9] Progress Towards Determining Nitrogen Fertilizer BMPs for Commercial Blueberry Production in Florida

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Currently, no research-based nitrogen (N) fertilizer recommendations exist for commercial blueberry (V*accinium corymbosum* interspecific hybrids) production in Florida. Efficient N management is critical, as excessive N rates can lead to nutrient leaching, while insufficient rates may limit yield and growth. A key factor influencing N availability in blueberry farms in Florida is pine bark. Pine bark is used as a soil amendment but varies in characteristics. This study aims to determine optimum N fertilization rates for southern highbush blueberries grown in soils amended with pine bark. Field trials were initiated in Spring 2024 at commercial farms in Archer and Umatilla, FL. Two-year-old 'Sentinel' plants (in Archer, FL) and four-year-old 'Optimus' plants (in Umatilla, FL) were evaluated in a randomized complete block design with six replications and five N rates (78, 140, 224, 336, and 448 kg/ha). Leaf samples were collected quarterly to assess leaf N levels. Pine bark samples were collected quarterly to assess C:N ratio, particle size distribution, and N concentration in pore water. Two representative plants from each research plot were selected, and fruits were harvested weekly throughout the harvest period to assess total fruit yield and quality attributes. Preliminary results indicate there were significant differences in pine bark decomposition rates between sites, potentially affecting N availability. The short timeframe between treatment initiation and harvest likely limited treatment effects on yield and quality. Given the perennial nature of blueberries, long-term data will be critical in evaluating N rate impacts on yield and plant growth.

[K-10] Progress in Raspberry Breeding and Variety Trials at UF/IFAS/GCREC

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There has been a huge shortage in fresh market red raspberries in the U.S. Florida growers have identified this shortage as a potentially highly lucrative market window for winter and spring production of raspberries in Florida. In recent years, a number of new red raspberry cultivars have been introduced in the U.S., and some of them have the primocane-fruiting habit. We launched a new red raspberry breeding program at UF/IFAS/GCREC in spring 2023, aiming to develop high-yielding cultivars with superior flavor, improved disease resistance, and better adaptation to Florida's climate and production systems. We have trialed 12 primocane-fruiting cultivars under a modified high tunnel structure with open sides and 30% shade above. Our results suggest that at least two cultivars ('Vintage' and 'Kokanee') outperformed others. They grew fast and were the first to flower, with ripe berries to harvest 5 months after transplanting and 1 month after flowers opened. 'Vintage' yield ranged between 0.83 and 2.32 kg per plant (average of 1.30 kg/plant); 'Kokanee' yield ranged between 0.73 to 1.75 kg per plant (average of 1.05 kg/plant). Powdery mildew was observed on some raspberry leaves in winter and spring. Varietal differences in powdery mildew susceptibility were observed, suggesting genetic resistance among the raspberry varieties tested. To develop new raspberry varieties, cross pollinations were performed among 20 varieties, resulting in the first generation of raspberry seeds in Florida. Seeds were surface-sterilized, cut manually, and germinated in vitro, resulting in high germination rates. More than 4,000 seedlings were transplanted to field in summer and fall 2024 and have been grown in raised,

plastic mulched beds. Raspberry progenies that are early to fruit and produce large berries with good qualities have been selected for further evaluation. Additionally, we have been testing a number of containers and potting mixes to reduce production costs. With new raspberry cultivars bred and selected in Florida and locally produced potting mix, we envision the development of an annualized system for winter, spring, and early summer production of raspberries in high tunnels and raised plastic-mulched field beds.

[K-11] Identifying Low-Chill Blackberry Cultivars for Optimal Performance in Florida

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The successful cultivation of blackberries in subtropical regions, such as Florida, requires the identification of low-chill cultivars that can withstand high temperatures, disease pressure, and shorter chilling periods. This study aims to evaluate the performance of 17 breeding lines and four commercial cultivars (Freedom, Ponca, Horizon, and Osage) to determine their adaptability to Florida's climatic conditions. The central hypothesis posits that specific blackberry germplasm can thrive in Florida's hot, humid summers and mild winters, offering viable options for commercial production. Field trials were established in late June 2023 in UF/IFAS Plant Science Research and Education Unit, Citra, Florida, to assess yield potential, fruit quality, and postharvest performance. Key variables include total yield, marketable fruit percentage, berry weight, and chemical composition (pH, Brix, tartaric acid, citric acid, and malic acid). Subjective assessments of firmness, flavor, and seed content were conducted, alongside post-harvest evaluations of decay, leakage, and softening after seven days at 5 °C. Results indicate that BL B, BL H, BL A, and Freedom were among the highest-yielding cultivars, while BL G, BL P, and BL I exhibited the lowest yields. BL A and BL E demonstrated the highest initial marketability (91.1% and 90.6%, respectively), though marketability declined over 7 days of storage. BL M and BL C exhibited the highest Brix content (11.8 and 10.8 respectively), indicating superior sweetness. These findings highlight the importance of cultivar selection for optimizing yield, fruit quality, and marketability in Florida's challenging growing conditions. Identifying heat-tolerant and low-chill-adapted blackberry cultivars can enhance profitability and support extended growing seasons, ultimately improving the sustainability of subtropical blackberry production.

[K-12] Progress in Blackberry Breeding and Variety Trials at UF/IFAS/GCREC

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Blackberry, the fourth most significant berry crop in the U.S., generates over $500 million in annual retail sales. Since the mid-1990s, consumer demand has surged rapidly, propelling an expansion of blackberry production in the U.S., Mexico, and other countries. In Florida, blackberries have emerged as a promising alternative crop. The 2022 USDA Census of Agriculture reported that 277 farms in Florida grew blackberries, with acreage increasing by 191%, reaching 702 acres in five years. The predominant concern among growers has been alarmingly low yields, with reported yields ranging from as little as 1,000 to 4,000 lbs per acre. With the price per lb ranging from $3.45 to $5.50 (averaging $4.42), increasing yield is essential for the sustainability and expansion of Florida's blackberry industry. To address these challenges, UF/IFAS launched a blackberry breeding program in 2015 at the Gulf Coast Research and Education Center (GCREC) in Wimauma, Florida. Over the past nine years, we have trialed 22 commercial varieties and screened over 25,000 blackberry seedlings. Among the commercial varieties tested, 'Osage', 'Ponca', 'Prime-Ark® Freedom', and 'Prime-Ark® Horizon' outperformed others in this low-chilling environment, producing 8,000 to 18,000 lbs of fresh berries per acre in small-scale replicated trials after chemical budbreak induction with lime sulfur or urea sprays in late January or early February. In Florida's low-chilling growing conditions, blackberry varieties tend to have a more trailing growth habit, lower budbreak, shorter fruiting laterals, fewer flowers, lower yields, lower Brix values, and higher titratable acid contents. Developing low-chill varieties with improved adaptation to Florida's warm winters and better berry qualities is essential. We have identified 65 promising breeding lines out of the breeding populations.

Thirty-two selections have been transplanted to grower fields for further evaluation. In 2024, replicated trials conducted at the GCREC showed that three lines achieved yields of 10,000 to 12,000 lbs per acre, more than double the current average yield reported by Florida growers. Additionally, preliminary 2024 trials with single plots showed four breeding lines with even greater yields of up to 32,000 lbs per acre. These results suggest significant potential for lowering blackberry chilling requirements and introducing improved new cultivars for the Florida blackberry industry.

[K-13] Assessing Black and White Groundcovers on Blackberry Production in Florida

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Cultivating blackberries holds great potential as a viable choice for fruit growers in subtropical areas such as Florida. Typically, blackberries are commonly cultivated with a black color cover in order to mitigate the growth of weeds and pests, as well as to enhance moisture retention over extended periods. This study evaluates the effects of two groundcover colors, white and black, on plant growth and fruit production in two breeding lines, “BL L” and “BL E”. White groundcover is known to reflect light and reduce soil temperature, potentially influencing plant physiological responses. The findings indicate that plants grown with white groundcover exhibited a higher growth rate than those cultivated with black groundcover. Temperature measurements recorded between September and January revealed that the average temperature of the white groundcover was 19°C, while the black groundcover averaged 20.8°C. Furthermore, previous yield data was higher under the white groundcover treatment compared to the black cover. Photosynthetic parameters (Pn, Tr, Gs, Ci) and SPAD readings will be assessed before harvest, while fruit quality attributes will be analyzed post-harvest to determine the influence of groundcover color on overall plant performance. Given the temperate nature of blackberries, their cultivation in subtropical climates presents challenges. However, adopting a modified production system incorporating white groundcover may improve growth conditions and yield outcomes. Further research is necessary to comprehensively elucidate the physiological and agronomic benefits associated with white groundcover compared to black groundcover.

[K-14] Developing a Guideline on NPK Application Rates for Low-chill Peach Production in the Subtropical Climate of Florida

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In this study, the effects of NPK (15-5-10) fertilizer at four levels (0, 1, 2, and 3 lbs) have been studied on 10-year-old ‘Tropic Beauty’ peach trees budded onto ‘Flordaguard’ rootstocks in Citra, FL. Fully expanded leaves were collected in September, March, and late May to assess macro- and micronutrient concentrations. Soil samples were collected at three depths (0-30 cm, 30-60 cm, and 60-90 cm) in September, January, March, and late May. The experiment followed a factorial randomized block design (FRBD) with replicates of each treatment combination. Each plot contained two trees, totaling 32 trees for data collection. Fertilizer treatment effects on leaf mineral status revealed significant differences across treatments and time points. Nitrogen (N) increased from September to March, then declined by May, with no significant treatment differences at each sampling. Phosphorus (P) and potassium (K) decreased from September to May, with the highest P in September (control) and the highest K at 2 lbs in September. The highest Mg was in May (highest at 2 lbs), while calcium (Ca) declined until March, then increased by May. Zinc (Zn) peaked in March, manganese (Mn) in May, and iron (Fe) in September. Copper (Cu) was highest in March at 0 lbs. Fertilizer application significantly affected soil mineral concentrations. For instance, nitrate ($NO3^-$) and ammonium ($NH4^+$) were highest at 0-30 cm with 3 lbs in March and May, respectively, and lowest at 0 lbs. Deeper soil layers had generally lower concentrations. Overall, higher rates of NPK fertilizer significantly impacted mineral concentrations in peach leaves and soil. However, no significant differences were observed between 2 and 3 lb application rates per tree. These findings support the development of nutrient management strategies to maximize fruit yield and quality in peach orchards in FL.

[K-15] Fruiting-wall Training System for Production of Low-Chill Peaches in Florida

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Commercial peach production is highly labor-intensive, requiring substantial manual work for critical management practices such as pruning, thinning, and harvesting. Although Florida peach growers benefit from an early and profitable market window, hand-labor is the most significant component of production costs. Therefore, adopting training systems that reduce hand-labor requirements could enhance the sustainability of peach production. The current study aims to determine the suitability of the fruiting-wall (trellis) training system, a high-density approach, for commercial peach production in Florida and to assess its impact on hand-labor demand and productivity. A high-density (280 trees/acre) and a traditional (140 trees/acre) orchard were established in Citra, FL, in March 2023, using low-chill 'UFBest' peaches grafted on the 'Flordaguard' rootstock. Trees in the high-density plot were trained in a multi-leader structure by bending the scaffolds and securing them to the trellis system along the row direction. Trees in the traditional plot were trained in an open-center (vase) structure, the standard training system in Florida. The first year of the study focused on tree establishment and survival, while the second year focused on securing healthy canopy growth and development to prepare trees for production. In 2024, trees underwent pruning in early summer and early winter. Thinning was conducted in mid-March 2025, and the first harvest is expected by May when yield and fruit quality data will be collected and analyzed.

[K-16] Evaluation of Pierce's disease resistant wine grapes (*Vitis vinifera*) cultivars under the climate of Florida

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There are different challenges in growing table and wine grapes in Florida, but Pierce's disease (*Xylella fastidiosa*) is one of the major limiting factors. This study aimed to evaluate the growth, yield, and fruit quality of different resistant wine grape cultivars, including 'Ambulo Blanc', 'Caminante Blanc', 'Camminare Noir', 'Errante Noir', 'Paseante Noir', 'Blanc du Bois' and 'Black Spanish' grown at Plant Science Research and Education Unit, the University of Florida, Citra, FL. The experiment was laid out under a randomized complete block design with four replications, and each replicate consisted of eight vines. During the last three years of growth, no symptoms or mortality due to Pierce's disease were observed in any of the cultivars. 'Errante Noir' and 'Camminare Noir' produced the highest yield among all cultivars, whereas the highest bunch weight (412.8g) and average berry weight (3.64g) were recorded in 'Black Spanish' and 'Blanc du Bois', respectively. 'Errante Noir' and 'Blanc du Bois' showed a medium cluster compactness level with fewer unmarketable berries. 'Paseante Noir' showed maximum TSS/TA ratio, total phenolic content, and total antioxidants, whereas total anthocyanins were the highest in 'Black Spanish'. In conclusion, Pierce's disease-resistant cultivars are showing good resistance against the disease, but other climate-related challenges to getting quality fruit for wine production in Florida still need to be explored in these cultivars.

[K-17] FAMU Muscadine Breeding Line 'D8-7-1' Shows High Industrial Potential

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'D8-7-1' is a new breeding line from the cross of 'Florida Onyx' x FAMU breeding line 'A19-13-8', it is self-fertile, highly productive, and yields large fruits, each weighing approximately 13.2g. The fruits of 'D8-7-1' have a crunchy,

pleasant taste and an attractive shape with smooth skin. They ripen around September 1 in Tallahassee, FL, with a harvesting window of approximately two weeks.

[K-18] Exploring the relationship between fruit size and its quality attributes in passionfruit (*Passiflora edulis*) cultivar Purple Possum

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Passionfruit is an important fruit crop with a unique taste and aroma. A considerable variation in fruit size is observed in mature and ripened fruit of 'Purple Possum'. Mature fruit of 'Purple Possum' grown under a high tunnel at the University of Florida, Plant Science and Education Unit (PSREU), Citra, FL were collected from the ground and transported to UF fruit crops laboratory at the Horticultural Sciences Department, University of Florida in Gainesville. The fruit was sorted for any visible defects and disease symptoms, and the relationship between the fruit size and quality was examined by categorizing the fruit into four weight groups: less than 40g, 40-50 g, 50-60 g, and above 60 g. Results revealed notable variations in different parameters, highlighting a significant correlation between fruit size and physico-chemical attributes. Larger fruit (above 60g) generally exhibited higher seed numbers, flesh weight, juice contents, fruit firmness, total soluble solid (TSS), and maturity index with less peel thickness. No significant difference was recorded in fruit shape index and titratable acidity (TA) of fruit with different sizes. Analysis of bioactive compounds and confirmatory experiment is in progress and results will be shared after collection of data.

[K-19] Yellow passionfruit (*Passiflora edulis f. flavicarpa*) as a companion crop in South Florida

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The yellow passionfruit is a tropical liana native to South America that grows and fruits well in South Florida. The liana is fast growing and requires a trellis, fence or tree to provide proper support, blooming and fruiting. There are many clones and sources of seed, however, we have had success with large-fruited, thrifty and high-quality clones commercially available in Brazil where this crop is widely grown. Plants can be propagated by seed or cuttings and will typically come into flowering and fruiting within 1 year of planting under good conditions in South Florida. Yellow passionfruit is suited for use on trellises or fences in combination with other crops such as mango, lychee or papaya. The major diseases in our location in Homestead have been *Fusarium* and *Phytophthora* wilts of the vines and have been managed by avoidance through rotation and grafting on tolerant rootstocks. The average life expectancy of an individual vine is 3 to 4 years. The major insect pests are the heliconius butterflies (gulf fritillary, zebra longwing and Julia). Caterpillars can devastate young vines but are easily controlled. The flowers require hand pollination in Homestead and pollen from distinct vines will increase pulp yield and overall size and weight. The fruit of good clones can reach the size of a large grapefruit and weigh over 500 g. The edible flesh cavity is filled with hundreds of black seeds surrounded by gelatinous flesh and ample juice. The fruit can be eaten fresh, with a refreshing tropical sweet/tart flavor and they excel in juices, jams, jellies, and in baking. The fruit store well at room temperature for several weeks and can be readily shipped.

[K-20] Comparing Sensory Evaluation of Passion fruit Varieties

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Passion fruit (*Passiflora edulis*) contains variation within the species, affecting characteristics such as size, shape, color, aroma, and flavor. A lack of marketing research about which varieties of passion fruit consumers prefer can significantly affect passion fruit grower planting decisions. Determining which varieties consumers prefer can lead to increased demand for passion fruit and encourage passion fruit production in Florida. To gauge potential consumer interest in different passion fruit varieties, a sensory evaluation of two passion fruit varieties was conducted in Marion County, FL at the Ocala Downtown Market. A total of 121 participants completed the anonymous online survey. Participants were asked if they had previously consumed fresh passion fruit. Participants responded 69% (n=84) "no" they had not, while 31% (n=37) responded "yes" they had. Participants were then asked if they had consumed *any* kind of passion fruit product. Participants responded 40% (n=48) "no" they had not, while 60% (n=76) responded "yes" they had. A likability rating scale of 1 to 9 was used for the sensory portion of the survey. The evaluation provided participants with fresh cut samples of a purple (P) and yellow (Y) variety. Participants provided the following ratings: overall appearance 7.4 (P) and 7.6 (Y), aroma 7.8 (P) and 7.5 (Y), flavor 7.4 (P) and 6.7 (Y), and overall liking 7.4 (P) and 6.8 (Y). When asked if they preferred one over the other, participant results showed 62% preference for the purple variety over a 38% preference for the yellow variety. This sensory evaluation provides essential marketing information to current and prospective growers about consumer preferences for two different passion fruit varieties.

[K-21] Evaluating the Viability of Olive Cultivation in Florida: Insights from a Two-Year Statewide Study

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The cultivation of olives in Florida has expanded tenfold over the past decade, with over 60 growers managing 800 acres across 26 Florida counties. Despite this rapid growth and increasing global olive oil demand, research on olive production in Florida remains limited. To address this gap, a two-year study was conducted across three locations: Jay (Northwest Florida), Wauchula (Southwest Florida), and Fort Pierce (Southeast Florida); beginning in Summer 2023 and concluding in December 2024. The objective was to identify the most productive olive varieties and optimal cultivation practices for Florida's diverse climate and soil conditions. Due to differences in grove management and tree maturity, cultivar selection varied by site, with 'Arbequina' serving as the consistent variety across all trials. Additional cultivars tested included 'Koroneiki' and 'Sikitita' in Wauchula and 'Lecciana' and 'Sikitita' in Fort Pierce. Soil nutrient levels, temperature, moisture, leaf nutrient content, and phenological observations were recorded biannually. Findings from the study indicate no significant nutrient deficiencies in either soil or leaf samples. However, flowering and fruit production were highly variable across locations, with no consistent patterns observed. Notably, 'Arbequina' demonstrated the highest survival rate across all sites, while 'Sikitita' showed promising vegetative growth but inconsistent reproductive performance. Leaf nutrient analysis revealed that nitrogen and potassium levels remained within optimal ranges, yet site-specific variations suggested potential interactions between soil type and nutrient uptake. While this study provides critical baseline data, further long-term research is needed to determine the feasibility of commercial olive production in Florida. The findings will help guide growers in selecting suitable cultivars and refining management practices tailored to the state's unique environmental conditions.

[K-22] Root proteomics and protein interaction studies showed shift in biosynthetic pathways to different salt stress levels in Pistachio

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Pistachio (*Pistacia vera* L.) is an economically important tree nut that commonly thrives in semi-arid and arid environments. *P. vera* is a highly adaptable to various abiotic stresses, and it can tolerate drought and salinity stresses, which makes it suitable for reforestation of arid and salinized zones. The present study was aimed at physiological and molecular investigations to unravel the metabolic pathways associated with the salt tolerance mechanisms in UCB-1 cultivar. Five one-year-old pistachio rootstocks were treated with four saline water regimes for 100 days. The rootstocks adopted Na+ exclusion strategy to resist the salinity stress. Total proteins were isolated from the roots and treated with different NaCl concentrations. The proteins were characterized using high throughput LC-MS/MS spectrometry searched against *the Citrus* database. Over 1600 protein IDs were detected, among which the comparative analysis revealed 245 more abundant and 190 low abundant proteins to three stress levels. The proteins associated with amino acid metabolism, cell wall organization, protein homeostasis, response to stress, signal transduction, TCA cycle, and vesicular trafficking were constantly overexpressed at all stress levels. At low and moderate stress levels, the chromatin and cytoskeleton organization lipid metabolism proteins were overexpressed, while at higher salt concentrations, they were unaffected. Transcription and translation processes were affected by all stress levels, as the proteins showed down-regulation in response to all stress levels. The protein interaction network with all the orthologous proteins was mapped to *Arabidopsis thaliana*, revealing clusters associated with these proteins. The analysis showed that under control conditions, the highest number of proteins were involved in chloroplast and cytosolic pathways. Under low salinity stress, there was a slight shift, with the most interconnected node activity assigned to mitochondrial and cytosolic pathways. As salinity increased, the pathways shifted again, focusing on carbohydrate metabolism under moderate salinity stress and to amino acid metabolism under severe levels of salinity.

[K-23] Data-Driven Simulation to Forecast Economic Outcomes and Guide Fertilizer Decisions

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The economic sustainability of Florida's citrus industry continues to be challenged by rising input costs and yield declines associated with Huanglongbing (HLB). To support more informed, data-driven fertilizer decisions, this study used yield data collected from eight commercial sites over two growing seasons to analyze the economic outcomes of five nitrogen (N) application rates. Through Monte Carlo simulations based on empirical yield distributions, we quantified the variability and uncertainty in production outcomes for each treatment. These results were paired with a partial budget approach to evaluate the potential net returns across nitrogen strategies. While differences in yield across treatments were not statistically significant, the analysis identified an economically optimal range of 150–200 lbs N/acre. Increased tree planting density also showed promise as a way to enhance profitability in high-risk conditions. This simulation-based approach helps growers and advisors make fertilizer decisions grounded in real-world data and risk considerations, rather than assumptions. Moreover, the methodology can be adapted to other specialty crops, offering a practical tool for improving nutrient management in diverse production systems.

[K-24] Values Based Marketing and Supply Chains for Florida Produce Industry

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In today's competitive market, smaller producers often struggle to stand out. This presentation will explore the concepts of values-based marketing and its potential to differentiate producers within the regional produce industry and food system. The discussion will highlight how small and midsized producers can mitigate risk by developing additional enterprises, value-added product lines, and values-based supply chains.
The presentation will also examine the role of agents and intermediaries in building networks and programs that support values-based supply chains. By fostering collaboration and trust among stakeholders, these networks can

enhance the visibility and marketability of smaller producers. An important support role of Extension will be emphasized, focusing on facilitating relationships that strengthen these supply chains.
Through case studies we will provide insights for implementing values-based marketing and developing robust supply chains. Attendees will learn how these approaches can transform Florida's produce industry and create lasting positive impacts.

[K-25] The Economics of Markets and Marketing Risk Analytics for Florida Fresh Produce Growers

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As economists, we view risk as the possibility of adversity or loss, or "uncertainty that matters." Decision-makers can manage this uncertainty by choosing among available alternative solutions specific to those risk factors that matter the most in each timeframe. These risk factors are defined across five categories: production, financial, human resources, marketing, and legal/regulatory. In this paper, we focus on the economics underlying market and marketing risks facing specialty crop growers in Florida. Specialty crops include high-value fresh fruits and vegetables that carry relatively higher exposure to market buyer demands and marketing activities such as storage requirements, distribution logistics, and product promotion. Market risk economics is characterized by uncertainties about prices received for products and/or price of inputs. For most Florida-grown fresh produce, prices are dictated by global markets, and individual producers are price-takers. Producers may sell direct to consumers or retail outlets which empowers them to act as price-setters. Markets and marketing require the agribusiness invests time and resources into the "4Ps" of the marketing mix – price, place, product, and promotion. The "price story" requires the answers to key questions: What can you control? What are the number of units produced vs. number of units sold? Key questions for the "place story" are: How much can you grow? How far can you ship it? How many people are within that circle? Through marketing analytics, we include demonstrations for blackberries, tomatoes, orange juice, and avocado to demonstrate application of the marketing mix to better manage market risk for fresh produce growers.

Ornamental, Garden and Landscaping

Presiding: **Kara Krueger**

[OGL-1] Compost suitability in ornamental container production demonstrated with gardenia and crape myrtle

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The addition of compost to container grown ornamentals may prove beneficial by increasing water holding capacity, reducing fertilizer leaching, and reducing cost. Two studies were conducted, one at Homestead, and one at Plant City, incorporating compost into container potting soils to determine if compost affected plant growth. In the evaluation conducted at Homestead, FL, the pine bark-based compost was mixed into a bark-based commercial potting mix at three ratios: 0, 20%, and 40% of the total substrate. The addition of compost tended to increase the substrate's bulk density and pH but decreased the total porosity. Overall, gardenia plants performed the poorest in the substrate containing 40% compost, while they performed similarly in substrate containing 0 and 20% compost for the recorded total number of flowers and canopy size. At the Plant City location, crape myrtles were potted into one-gallon containers with ratios: 0, 30%, and 40% compost added to a bark-based commercial potting mix. There were only slight differences in plant width and no differences in height at harvest. Plants were then stepped into three-gallon pots and grown in the same ratios of compost. There were no differences in either plant height or width at maturity. Our findings demonstrated that compost could be used as a component of substrate in container production without affecting the plant performance when added within a certain ratio.

[OGL-2] Pittosporum, Loropetalum, and Abelia Growth in a Nursery Using Plastic and Fabric Containers

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Two multiple branched liners (each from two cuttings) of *Pittosporum tobira* `Variegata´, *Loropetalum chinense* `Purple Diamond´, and *Abelia grandiflora* `Kaleidoscope´ were planted in a pine bark-based substrate with a trade 3-gallon plastic or a fabric container (≈10 L) on 13 Oct. 2022. Approximately, 150 plants of each container type and species combination were placed in full sun on black polypropylene ground cover at Hibernia Nursery, Webster, Florida. On 20 March 2023, plants were arranged in a triangular spacing and grouped by container type so that additional sprinkler irrigation could be applied to plants grown with fabric containers. Heights and two perpendicular widths of ten plants for each container type and species combination were measured approximately every three months (12 April, 13 July, 18 Oct. 2023, and 24 Jan. 2024). Growth indices (height plus average width) on 18 Oct. and 24 Jan. were larger for *Pittosporum* grown with fabric containers compared to plastic containers, while the growth indices for *Loropetalum* were not different due to container type. The growth indices were slightly larger on those dates for *Abelia* grown with plastic containers compared to fabric containers. The fact that *Pittosporum* grown with fabric containers had more shoot growth than *Pittosporum* grown with plastic containers is likely due to the evaporation of water from the fabric, and thus lower substate temperature that has been documented previously for fabric containers.

[OGL-3] Developing Optimal Nitrogen Fertilizer Recommendation for Sod Producers in Florida

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This project is focused on improving nutrient management recommendations for sod producers as part of Florida's best management practices (BMPs) program. This project will evaluate the current University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS) nitrogen (N) fertilizer recommendations for Florida sod producers that are based on a 1988 Electronic Data Information Source (EDIS) publication that was last revised in 2016. There are essentially no published research results on Florida sod production and stakeholders recognize the need to update N management recommendations to shorten the length of time to harvest while also considering water quality impacts. The goal of this project is to evaluate N fertilizer rate recommendations for Florida sod growers to achieve yield goals (shorten time to harvest) without negatively impacting water quality. The study is being conducted at four sod farms across the state and at the West Florida Research and Education Center (WFREC). At each farm, the project is being conducted on two grass species. The N fertilizer (70% soluble plus 30% slow release) rate treatments are 0, 120, 190, 260, and 330 lbs N/acre/year, which includes the range of current UF/IFAS recommendations. The annual N rate is being split into monthly applications throughout the growing season. At the WFREC location, N applications are also being combined with P fertilizer applications at 0 and 44 lbs P/acre/year to determine both N and P leaching. The treatments are arranged in a randomized complete block design with four replications. All other normal agronomic practices (irrigation, pesticides, etc.) are being followed. Data collection includes monthly visual turfgrass quality ratings, visual estimated percent cover, percent green cover via digital image analysis, and normalized difference vegetation index (NDVI). Soil cores and tissue samples are collected at the beginning and end of each growing season to determine soil chemical properties and nutrient concentrations. At harvest, sod samples are collected to measure nutrient exports from fields. At WFREC, leachate is collected weekly and as needed based on rainfall events. Leachate volumes are measured at each water sampling event and subsamples from the leachate are being analyzed for N and P concentrations.

[OGL-4] Back to Basics: Publishing A Bilingual Landscaping Flipbook

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Florida's environmental horticulture industry generates over $10 billion annually and employs over 100,000 individuals, with 33% identifying as Hispanic/Latino. This sector plays a crucial role in this industry, yet many positions lack formal certification, leaving training dependent on in-house instruction that varies in quality. Furthermore, most educational materials are in English, creating a barrier for multilingual teams thus limiting the adoption of Best Management Practices (BMPs) and Integrated Pest Management (IPM). A multi-county team of UF/IFAS Extension Agents secured a USDA-NIFA IPM Extension grant in 2021 to develop bilingual training materials that enhance landscaping practices. The *Basics of Landscaping in Florida / Conceptos Básicos de Paisajismo en Florida* booklet—a resource featuring BMPs and IPM principles presented in English and Spanish. Since April 2024, 366 copies were distributed, of which 216 were provided in conjunction with a 1 -2-hour class in English or Spanish. Thereafter, 164 individuals completed post-class surveys, with 99% (162) planning to use the information in their home landscapes and 63% (103) intending to apply practices on the job—44% (72) of whom believed the booklet would directly support BMP adoption among multilingual teams. Post-class surveys reported 80% (131) increased BMP knowledge. A 3–6-month follow-up survey confirmed sustained impact, as 85% of respondents (41 of 48) reported applying the information, and at least 83% (40) implemented one or more BMPs. The UF/IFAS Bookstore sold 100 copies, generating $1,600 in revenue. By starting with the basics and addressing language barriers, this initiative is empowering Florida's landscaping workforce.

[OGL-5] Two New Caladium Cultivars 'Juicy Gossip' and 'Passion Punch'

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Caladiums are prized by the floriculture industry for their vibrant foliage that adds a splash of color to gardens and landscapes. Florida has been the leading producer of caladium tubers, supplying all the tubers that are used by greenhouse growers, nurseries, and landscapers across the United States and in the world. The UF/IFAS caladium breeding program introduced two new cultivars in 2024. 'Juicy Gossip' shares a similar growth habit in the containers or in the ground with 'Cranberry Star', but the new cultivar has shown improved plant growth, sunburn tolerance, and leaf health. 'Juicy Gossip' produces high-quality plants in containers and performs well in full sun. 'Juicy Gossip' is well suited for forcing in containers, producing potted plants, and planting in a range of landscape conditions. 'Juicy Gossip' appears resistant to Fusarium tuber rot, moderately resistant to Pythium root rot, resistant to root-knot nematodes *Meloidogyne javanica*, and moderately resistant to *M. arenaria*. 'Passion Punch' is a lance-leaved pink variety, falling into the novel caladium cultivar group represented by 'Passionista'. 'Passion Punch' plants are significantly taller and wider with longer and wider leaves. For producing potted plants in small containers (5 inches or smaller in diameter), this new cultivar may require tuber de-eyeing. 'Passion Punch' has demonstrated excellent sunburn tolerance and leaf health. This cultivar is expected to perform much better than 'Passionista' in the landscape. 'Passion Punch' is a good replacement of 'Passionista' in sunny landscape locations. 'Passion Punch' appears resistant to Fusarium tuber rot.

[OGL-6] Identifying drivers of invasive scale insect density and distribution on palms in Florida landscapes especially the phantasma scale, *Fiorinia phantasma*

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Palms play an important role in the economy and in shaping the cultural and aesthetic identity of much of the state. Unfortunately, invasive scale insect pests, including the recently established phantasma scale (*Fiorinia phantasma*), represent a major threat to Florida's ornamental plant production and landscape management industries. Ongoing University of Florida research efforts involve the identification of landscape design characteristics that influence phantasma scale density and distribution, determination of biological control agents, and identification of pathways of scale insect invasion into and within the state. The phantasma scale is both a nursery production and ornamental landscape pest, affecting growers and landscape professionals, which represent the two largest sectors of Florida's green industry, valued at over $16 billion in combined direct sales output. Because the challenge of managing armored scale, particularly in the genus *Fiorinia*, due to their layered protective covering and where they feed within the plant, this pest poses a direct threat to Florida's nursery growers. Non-chemical solutions and management strategies are needed to mitigate the direct and indirect negative effects of phantasma scale. The main objectives of this research will be: determine how urban landscape design characteristics influence phantasma scale density and distribution, identify key biological control agents attacking phantasma scale across its Florida distribution, determine the genetic relatedness between phantasma scale populations across its Florida distribution, and educate nursery growers and landscape management professionals on how to detect, prevent, and manage invasive scale insects in nurseries and landscapes.

[OGL-7] Effects of Paclobutrazol on Salinity Tolerance of Bald Cypress, Taxodium distichum

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A 30-month study was conducted in South Florida to evaluate paclobutrazol (PBZ) in moderating salt tolerance of bald cypress (Taxodium distichum) trees. Young trees growing in a natural area close to the Gulf of Mexico were selected for the study. PBZ was applied to the soil at two label rates in the beginning of the study. Tree quality (canopy density and leaf color) was evaluated visually on a scale of 0 = dead to 5 = excellent. At 17 MAT, both rates of PBZ resulted in 30% improvement in tree quality compared to untreated trees. By the end of the study that difference was 17% improvement in tree quality over untreated trees. PBZ, to some extent, aids in ameliorating salt tolerance in bald cypress. Additional studies are needed to evaluate other rates of application on bald cypress and other tree species.

[OGL-8] Testing infectivity of a *Pythium aphanidermatum* strain for use in hydroponic research

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Pythium aphanidermatum is a common waterborne plant pathogen that causes root rot and damping off in hydroponic and ornamental crops. The objective was to evaluate the infectivity and host range of a *P. aphanidermatum* strain isolated from turfgrass. In the first experiment, leaf-baiting was used to quantify infectivity in lettuce, tomato, impatiens, and geranium species. Leaf disks were placed in a petri dish containing deionized water and an agar plug with actively growing *Pythium*. Visual observations of hyphal penetration indicated that *P. aphanidermatum* successfully colonized all tested species, with colonization of 100% of geranium, 93% of tomato, 91% of lettuce, and 89% of impatiens leaf disks. In the second experiment, seeds sown in 60% peat:40% perlite (by volume) substrate were inoculated with *P. aphanidermatum* at 1,000 (run 1) or 10,000 (run 2) zoospores/g of dried substrate, followed by a second inoculation two weeks after sowing. A 56% reduction in tomato and 44% reduction in vinca seed germination for *Pythium*-inoculated seedlings was significant for each species using chi-square at the p=0.05 level. Additionally, *Pythium* inoculation significantly reduced the total and shoot dry mass of tomato and vinca seedlings, and root dry mass of tomato based on ANOVA at the p=0.05 level. The isolate did not affect germination or plant growth parameters in lettuce and impatiens. These findings demonstrate that the strain is suitable for research on tomato and vinca to evaluate irrigation sanitation strategies in hydroponic systems.

[OGL-9] Enhancing Lawn Health and Water Efficiency with Compost Topdressing

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Florida's growing population is increasing water demand, making it even more important to use water efficiently. Lawns can require supplemental irrigation to maintain turfgrass quality, but as water resources become more limited, conservation strategies are needed to balance aesthetic and environmental concerns. This study evaluates compost and fertilizer applications under different irrigation levels to enhance turf quality and water efficiency. Conducted at the UF/IFAS Plant Science Research and Education Unit in Citra, Florida, this research tests six management practices: a control, compost applied once per season, compost applied twice per season, compost with fertilizer once per season, compost with fertilizer twice per season and fertilizer alone twice per season. Compost is applied at 0.5 yd^3/1000 ft^2, and fertilizer at 1.0 lb N/1000 ft^2. Irrigation treatments include 50%, 75%, and 100% of UF/IFAS recommended rates. Results indicate that applying compost and fertilizer twice per season (CTD+F-2) led to the highest turf quality, percent cover and normalized difference vegetation index (NDVI), with superior performance compared to other treatments. Additionally, turf maintained under 75% irrigation sustained acceptable quality, demonstrating that water use can be optimized. CTD+F-2 with 100% irrigation yielded the highest average soil moisture. These findings suggest that strategic compost and fertilizer applications, combined with efficient irrigation management, can enhance turf resilience while supporting water conservation efforts.

[OGL-10] Production Recommendations for Philodendron 'Moonlight' Grown in a Central Florida Greenhouse

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Philodendron 'Moonlight' is readily available to Florida foliage growers. Specific production guidelines are not available for this cultivar. Tissue-cultured plugs of *Philodendron* 'Moonlight' obtained from AG2[TC] were potted up in 15.24cm standard pots using conventional peat/perlite soilless mix amended with dolomite, STEM, and either one of three rates of Harrell's 15-6-11 (10-12 month) fertilizer or a single rate of Diamond R 18-5-9 (360 day) fertilizer in September 2025. The pots were placed in randomized blocks within a split-plot design under two different shade levels. The controlled-release fertilizers (CRF) were formulated to release evenly at soilless medium temperatures of 30°C. Medium temperatures were measured using Onset HOBO Data loggers buried in several pots; light levels and humidity at plant height were also measured. All pots received the same irrigation treatment. Plants were produced under either 50% (aluminet) shadecloth or 40% white shadecloth environments. The electrical conductivity (EC) and pH were measured; sample leachate solutions from all pots were evaluated for nitrate ions, potassium ions, calcium ions, and phosphate ions using several different methods. Hurricane Milton damaged the greenhouse roof; greenhouse temperatures were not well maintained throughout the trials. None of the fertilizer treatments were exhausted 180 days from potting date. Daily light integral (DLI) for the two shade levels were calculated. A plant quality evaluation survey conducted after 200 production days determined that plants produced in either the 40% or 50% shade environments with the lowest rate of Harrell's fertilizer trialed were equivalent to plants grown under any other treatment combination.

[OGL-11] Enhancing Vanilla indoor production through nitrogen and light management

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Vanilla is a suitable crop for indoor environments as it requires low light conditions. Managing nutrient applications, specifically nitrogen, and light levels are two key elements for indoor production; the objective of this study was to determine the optimal conditions for these two factors by performing separate experiments which were conducted in shipping containers (24° - 28° C and 70% RH). Two commercial vanilla species, *Vanilla* × *tahitensis* and *Vanilla planifolia*, were used for nitrogen and light studies, respectively. In the nitrogen study, a randomized complete block design with fourteen replicates per treatment was implemented, using five nitrogen treatment levels of urea ammonium nitrate (UAN, 28%). Applications were given monthly; phosphorus and potassium were also provided at rates that supplied 3 g and 9 g per plant per year, respectively. To explore the effects of light level, a randomized complete block design with three replicates per treatment was utilized. Two light treatments (8% and 18% of LED lights) were applied to two *V. planifolia* genotypes ('AG3' and 'Painter Clone'). Plant height, leaf number, chlorophyll content (SPAD), and stem girth were recorded monthly for all plants in both experiments. With respect to nitrogen level, results showed that 2 and 16 g N promoted growth, while 0 and 32 g N was detrimental. In the light experiments, a significant genotype × intensity interaction was observed, with 'AG3' under 18% light exhibiting the highest plant height, leaf number, and chlorophyll content. These findings provide insights into optimizing nitrogen and light management for vanilla production in controlled environments.

[OGL-12] Optimization of Parameters in Biocoupler™ Temporary Immersion Bioreactors for the Micropropagation of *Vanilla planifolia*

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Evaluating and validating the efficiency of temporary immersion system bioreactors using *Vanilla planifolia* has been the focus of several studies in tissue culture. The volume of culture medium and the immersion frequency are critical factors in these systems, directly influencing plant growth, nutrient absorption, and seedling quality. Proper adjustment of these parameters is essential to optimize in vitro production, reduce production costs, minimize undesirable effects in vitro cultivation, such as hyperhydricity, and ensure vigorous and uniform seedlings, enhancing market potential and validating the system's efficiency. This study had the goal of validating protocols and assessing the effects of culture medium volume and immersion frequency variation on the production of *V. planifolia* plants. Nodal segments were cultured in MS medium supplemented with B5 vitamins (1 ml L^{-1}), myo-inositol (100 mg L^{-1}), 2iP (2.5 mL L^{-1}), and sucrose (30 g L^{-1}), with the pH adjusted to 5.7. Two immersion frequencies were evaluated in the Biocoupler/Biotilt™ (Plant Cell Technology) temporary immersion system (5 min per immersion): every 1 hour and every 3 hours. Additionally, the effect of culture medium volume was evaluated by comparing 150 mL and 300 mL per Biocoupler/Biotilt™. The experiment was conducted over 40 days. The research results will be presented and discussed.

[OGL-13] Evaluation of Biocoupler™ Temporary Immersion Bioreactor for the Micropropagation of *Vanilla planifolia*

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The micropropagation of *Vanilla planifolia* continues to be extensively studied, and temporary immersion bioreactors, including the innovative Biocoupler™, have been developed as promising alternatives for optimized large-scale production, requiring comparative studies to validate their efficiency and optimize protocols. This study evaluates the viability of using the Biocoupler™ temporary immersion bioreactor system in liquid medium, compared to the conventional semi-solid culture medium for micropropagation of vanilla. Nodal segments of *V. planifolia* were subjected to two types of cultivation systems: Biocoupler™ (Plant Cell Technology) with a 5-minute immersion cycle every 2 hours, using 150 mL of culture medium per container, and a semi-solid system with Phytagel containing 45 mL of culture medium. For both systems, MS culture medium was used, supplemented with vitamin B5 (1 ml L^{-1}), Myo-Inositol (100 mg L^{-1}), 2ip (2.5 ml L^{-1}), and sucrose (30 g L^{-1}), and the pH adjusted to 5.7. The explants were maintained in each system for 40 days, and at the end of this period, the multiplication rate and propagation efficiency were evaluated. The Biocoupler system showed a significantly higher number of shoots and roots compared to the conventional system. Furthermore, the final length of the explants exhibited a substantial increase, indicating more vigorous and efficient growth. These results validate and reinforce the potential of the Biocoupler system as an alternative for the micropropagation of *V. planifolia*, which also demonstrated ease of handling, ensuring crucial optimization for in vitro propagation.

[OGL-14] Expanding Home Landscapes with Alternative Fruit-Bearing Plants

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Homeowners are increasingly interested in incorporating fruit-bearing plants into their landscapes for both beauty and functionality. However, challenges such as limited space, maintenance demands, climate suitability, and pest pressures—especially with traditional fruit trees like citrus—can be discouraging. To address this, an educational

workshop introduced participants to native fruit trees as low-maintenance alternatives that provide edible yields, ecological benefits, and ornamental value. The two-hour session covered plant selection, care, and adaptability, and attendees had the opportunity to take home one of five native fruit species: pawpaw (*Asimina triloba*), flatwoods plum (*Prunus umbellata*), Chickasaw plum (*Prunus angustifolia*), American persimmon (*Diospyros virginiana*), or southern crabapple (*Malus angustifolia*). Of the 21 participants, 8 took home a tree, while the remaining 13 either expressed interest in growing native fruit trees or already had them in their landscapes. Attendance at this workshop was comparable to sessions focused on traditional fruit crops, suggesting that homeowners are open to learning about alternative fruiting plants. These findings highlight the need for continued educational efforts to promote native fruit trees as sustainable, practical, and attractive additions to residential landscapes.

[OGL-15] Addressing New Home Landscape Challenges with a Florida-Friendly Inspiration Demonstration Garden

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In 2021, the UF/IFAS Extension Alachua County offices moved to a new building with compacted, high pH sandy soils like those found in new housing developments. This provided an opportunity for the Master Gardener Volunteer (MGV) program to create a garden demonstrating Florida-Friendly Landscaping™ (FFL) principles that addressed common challenges in new home landscapes. The Environmental Horticulture agent and MGV program collaborated to design, plan, and implement an FFL demonstration garden in fall 2022. The 1500 ft² area was divided into five sections: seasonal color garden, pollinator garden, vertical garden, drought-tolerant garden, and wildflower garden. Each section was designed, installed, and maintained by a group of 5-6 MGVs. Plants, hardscaping materials, irrigation supplies, mulch, rain barrels, and soil were donated or funded by MGVs, who contributed over 1000 service hours and spent less than $3000 on the project. The Florida-Friendly Inspiration Garden was installed in May 2023, taking nine months to complete. It consists of five interconnected sections utilizing native and FFL plants to address challenges such as wind protection, water runoff, poor drainage, high soil pH, limited water access, shade, and high temperatures. The garden supports environmental horticulture extension programming and has attracted over 500 visitors. The garden promotes FFL practices in new home developments and provides inspiration for homeowners to apply these practices in their own yards. It also enhances community engagement through the involvement of Master Gardener Volunteers.

[OGL-16] A Published EDIS Series: Florida-Friendly Edible Landscaping

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Interest in urban agriculture is growing, and it is essential that homeowners and landscapers are well-informed on the principles by which to create a sustainable edible landscape. The Florida-Friendly Landscaping™ (FFL) Edibles series aids homeowners, neighborhood organizations and landscapers in creating resilient, fruitful edible landscapes. These eight collaborative publications are an Edible FFL series that brought together UF/IFAS Extension Agents and Specialists from all over the state to holistically address the client need to foster an edible Florida-Friendly Landscape. The eight publications presented here cover a range of topics including:

- Edible Landscaping Using the Nine Florida-Friendly Landscaping™ Principles
- Efficient Irrigation for Florida-Friendly Edible Landscapes
- Mulching Herbs, Vegetables and Fruit Trees in The Florida-Friendly Edible Landscape
- Soil Health and Fertility of Florida-Friendly Edible Landscapes
- Rethinking Wildlife in Your Florida Friendly Edible Landscape
- A Florida-Friendly Landscaping™ Approach to Pest Management in Your Edible Landscape
- Pruning, Harvesting and Maintenance of Florida-Friendly Edible Landscapes

- Recycling Organic Materials to Improve Your Florida-Friendly Edible Landscape

These tools focus on edible landscape care, post-planting and plant establishment to aid homeowners, neighborhood organizations, and landscapers. They are currently available at https://edis.ifas.ufl.edu/collections/ffl-edible-landscaping.

[OGL-17] Master Gardener Volunteers Amplify Impacts of Great Southeast Pollinator Census Citizen Science Program

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The Great Southeast Pollinator Census (GSPC) is a citizen science initiative, designed to engage the public in monitoring pollinator populations to contribute to a larger understanding of pollinator health, populations, and trends. Master Gardener Volunteers (MGVs) provide valuable data to researchers while raising awareness of the importance of pollinators. Participants were provided clear instructions and resources to assist in their accurate data collection. Agents extended pilot trainings prior to the official dates of census. Participants selected a flowering plant, observed it for 15-minutes, using the provided count sheet with photos of honeybees, native bees, wasps, flies, butterflies, and others. Data submitted through a live online platform, was aggregated and analyzed to track pollinator trends over time. Locations were coordinated with the county agents and advertised via social media, signage, posters, flyers, newspaper, and blogs. Citizen scientists and MGVs hosted the event at private residences, community gardens, and County Extension offices. Participants had two-weeks to submit their counts brought into the county offices where MGVs entered the data. By participating in the GSPC, MGVs not only enhanced the program's reach and data quality but also fostered a greater appreciation for pollinator conservation globally. The total number of insects counted statewide in 2024 was 398,269. This enables research to explore the multifaceted ways in which MGVs amplify the impacts of the GSPC, highlighting their contributions to community engagements, data accuracy, and the broader goals of citizen science.

[OGL-18] In Vitro Production Methods for an Endangered Florida Endemic Cactus

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Harrisia aboriginium is an endangered cactus endemic to Southwest Florida. This study provides a protocol for sterile micropropagation of the species. This protocol was established using nursery-produced seeds donated by James Freeman of Cactus Island Nursery. The disinfestation protocol this research suggests is using a 15-minute wash in soapy water, followed by a quick dip in 95% ethanol, followed by a 15-minute wash in 1.875% sodium hypochlorite (25% Clorox), finished with three rinses in sterile deionized water to remove any bleach. Seeds were introduced into sterile culture successfully using this protocol with a 0% contamination rate and 98.6% germination rates. The *H. aboriginium* seedlings grew well on a half-strength modified Murashige and Skoog nutrients and vitamins medium (Phytotech M541), supplemented with 15g/L sugar and solidified with both 4.1g/L agar and 1.1g/L Gelzan. Various kinds and concentrations of plant hormones were trialed on the in vitro seedlings of this species and it was determined that 6-benzylaminopurine (6-BAP) gave the most desirable multiplication results. Increasing concentrations of 6-BAP

in the medium also increased shoot formation with the highest rate trialed (13.3 µM) resulting in an average of 12.2 shoots being produced per seedling. Plants readily formed roots without the need of rooting hormone. Acclimating plants from culture was easy with 100% success rate. Plants with roots were moved into SW Florida greenhouse conditions with a substrate of half potting soil, half perlite. Plants were watered when dry, about once a week, and fed with diluted all-purpose Miraclegro fertilizer on every watering.

Vegetables

Presiding: **Wael Elwakil**

[V-1] Assessing the Effects of Phosphorus and Solid Oxygen Fertilization on Potato (*Solanum tuberosum* L.) Growth, Yield, and Nutrient Uptake: A Two-Year Field Study

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Potato (*Solanum tuberosum*, L.) is a major spring crop in Florida, highly sensitive to low-oxygen stress in soil, especially under conditions of deep-well irrigation or elevated salinity from seawater intrusion. Due to its shallow, low-density, and sparsely branched root system, potato has a limited capacity for phosphorus (P) uptake, necessitating a high P supply for optimal growth. The objective of this study was to evaluate the effects of preplant solid O_2 and P fertilizer application on tuber yield, plant growth, and nutrient uptake of 'Atlantic' chipping potatoes grown in Northeast Florida through a two-year field experiment. We employed a Randomized Complete Block Design (RCBD) with four replications, comprising two oxygen fertilizer rates of 0 and 67 kg ha^{-1} of solid O_2 fertilizer as calcium peroxide (CaO_2), and five phosphorus rates of 0, 90, 135, 180, and 225 kg ha^{-1} of phosphorus pentoxide (P_2O_5) as triple superphosphate (TSP). The changes in plant growth, nutrient uptake, yield, as well as soil properties were determined to evaluate the effectiveness of oxygen and phosphorus fertilization as plant growth promoters and maintain soil quality. The results showed that P application significantly increased potato tuber yield compared to the control, with the highest yield observed at 225 kg ha^{-1} P_2O_5. Oxygen fertilization did not enhance tuber yield, and while shoot P content was slightly higher with O_2 application, tuber P content remained stable across all treatments. Pearson correlation analysis indicated strong associations between plant growth, tuber yield, and nutrient accumulation. Principal component analysis (PCA) highlighted notable seasonal differences in tuber yield and soil characteristics. Overall, this study demonstrated that application of O_2 fertilizer is a potentially effective method to alleviate hypoxic conditions in soil, which, in turn, enhances P use efficiency and improves crop productivity. These findings contribute to filling the knowledge gap regarding the effectiveness of O_2 and P fertilization under field conditions, suggesting that O_2 fertilizer could serve as a cost-effective soil amendment for enhancing potato production.

[V-2] Phosphorus Fertilizer Application Threshold for Snap Bean (*Phaseolus vulgaris* L.) Based on Plant Nutritional Requirement in Spodosol

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Phosphorus (P) is a macronutrient essential for plant growth and yield; however, its availability in spodosols is often limited due to high acidity, low organic matter, and strong adsorption to soil minerals, particularly iron (Fe) and aluminum (Al). Efficient P management is essential for optimizing crop productivity while minimizing environmental risks. This study investigated the effects of different P fertilizer rates on snap bean (Phaseolus vulgaris L.) growth, yield, and nutrient dynamics in a subtropical spodosol over two consecutive growing seasons (Fall 2022 and Fall 2023). A randomized complete block design was employed, with five P application rates (0, 45, 90, 135, and 180 kg ha^{-1} of P_2O_5) in 2022 and two additional rates (225 and 270 kg ha^{-1}) included in 2023 based on prior results. The effects of P application on soil P availability, snap bean growth, yield, and P uptake were assessed through periodic biomass sampling, pod yield evaluation, and nutrient analysis. Results demonstrated that increasing P rates increase pod yield, pod length, and dry weight, with optimal yields achieved at 135–180 kg ha^{-1}. Soil available P concentrations maximum at higher P fertilizer rates but declined over time, indicating active crop uptake. Phosphorus accumulation in plants increased with P fertilization, reaching saturation at 135–180 kg/ha, beyond which additional P application provided diminishing returns. The study highlights the importance of site-specific P recommendation to synchronize

nutrient availability with crop demand, particularly in nutrient-poor spodosols. These findings provide a scientific basis for establishing P fertilizer thresholds that balance crop productivity with environmental sustainability in agricultural systems.

[V-3] Optimizing Phosphorus Rates for Snap Bean Production in Calcareous Soils

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Phosphorus (P) plays a crucial role in regulating plant growth, yield, and product quality. However, excessive P application increases the risk of ground and surface water pollution, making site-specific P rate management essential. This study aims to develop P recommendations for snap bean production on calcareous soils in South Florida. Multi-year experiments were conducted from 2022 to 2025 using research plots at the Tropical Research and Education Center and commercial farms in Homestead, Florida. Six P application rates (0, 40, 80, 120, 160, and 200 lbs./ac of P_2O_5) and two irrigation treatments: evapotranspiration (ET) based, and the growers' practices were tested. Soil, tissue, and plant biomass samples were collected biweekly throughout the crop growing seasons and analyzed for nutrient contents. Results showed no significant difference in snap bean yield between the two irrigation treatments. Background soil P levels showed high variability, commercial fields having the highest content of P reaching up to 400 ppm. Preliminary findings indicate that snap bean yield increased with higher P application rates, reaching a plateau at approximately 191 lbs./ac of P_2O_5. However, the study is still ongoing, and the final recommendation will be determined upon its completion.

[V-4] Effect of Organic Compost Material on Basil Growth and Yield

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Compost is known to improve crop productivity and are necessary for optimal plant growth in growing systems that are comprised of primarily sandy soils. This study evaluates the use of an invasive species of blue tilapia (*Oreochromis aureus*) as potential sources of sustainable composting material for horticulture crops grown in sandy soils. The experiment, conducted in a complete randomized block design with two factors (composting material and concentration), was used to investigate the effects on the growth of 'Prospera1' basil (*Ocimum basilicum*). Whole fish, filet fish, and food waste compost were each produced as treatments to evaluate the efficacy of the type of material composted. Additionally, the concentration of materials added (0, 25, 50, and 100%) was tested on its effect on the growth of basil. Field soil (Immokalee fine Sand) was collected from a vegetable production field at the Southwest Florida Research and Education Center. The soil was then used with the compost treatments to plant basil in 12 one-gal containers. Four weeks after planting, measurements of plant height (cm) were collected weekly (6 weeks), and wet tissue biomass was collected at the conclusion of the experiment. According to the results, 'Filet' and 'Whole fish' treatments resulted in increased plant height and weight, regardless of the percentage of material added. Furthermore, 'Whole fish' treatment showed a significant increase in plant height and weight relative to the percentage of material added, with the greatest increases observed at 100% of the fish material. Notably, the effect of increasing the percentage of 'Whole fish' in the mixture was evident throughout the production period, with plant height and weight continuing to increase as the percentage of the fish material was increased.

[V-5] Effects of Biochar and Cover Crops on Yield of Collard Greens (*Brassica oleracea*)

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Collard greens (Br*assica oleracea* L) are among the oldest members of the cabbage family. The crop is unique to the southeastern United States, where it is highly popular in traditional cuisine. Today, collards play an important role as a nutritious, low-calorie item in school lunch programs and as a cash crop for small-scale farmers. This new role is sufficient justification for researching new techniques for maximizing collard green production yields. A longitudinal study is being conducted at the FAMU Research and Extension Center in Quincy, FL, to evaluate the effects of biochar and how it can improve soil health productivity in combination with a cover crop, Buckwheat (Fagopyrum esculentum). Applications of 0, 1, 2.5, and 5 percent biochar were made to a sandy clay loam native soil and applied accordingly to the experimental plots. Collards were grown in the Fall and harvested in Winter, followed by two applications of Buckwheat as a cover crop in the Spring and again in the Summer. Preliminary results have shown no significant difference between the control and the biochar treatments applied to the soil. An annual timeline for the study has been established to collect yield and core soil samples to determine how biochar impacts infiltration and other soil properties.

[V-6] Evaluating the Combined Effects of Irrigation and Nitrogen Fertilization on Potato Growth, Yield, and Water and Nitrogen Use Efficiency Under Sprinkler Irrigation in Florida

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Florida is the major producer of spring potatoes, bridging the supply gap when production declines in northern states. Potatoes in Florida are primarily grown on sandy soils with shallow water tables, traditionally managed using seepage irrigation. With increasing concerns over water scarcity and nitrogen leaching, precision irrigation methods like sprinkler irrigation are being explored. This two-year study at NFREC, Live Oak, FL, evaluated the combined effects of irrigation and nitrogen fertilization on potato growth, yield, and resource use efficiency. Treatments included full irrigation (FIT), 75% FIT, and a control (no irrigation or nitrogen), with nitrogen rates ranging from 112 to 392 kg N ha^{-1}. Results showed no statistical difference among irrigation levels for plant height, LAI, total and aboveground biomass, tuber yield, and Grade ‘A’ potatoes. However, water use efficiency was consistently higher under 75% FIT. Among nitrogen treatments, plant height and LAI increased with higher nitrogen rates, while total and aboveground biomass peaked at 336 kg N ha^{-1} in 2022 and 392 kg N ha^{-1} in 2023. Nitrate-nitrogen at 60–90 cm soil depth was higher at elevated nitrogen levels, indicating increased leaching potential. Tuber yield and Grade ‘A’ potatoes were statistically similar for nitrogen applications ranging from 280 to 392 kg N ha^{-1}. In conclusion, 75% FIT with 280 kg N ha^{-1} appears to be an optimal strategy for maintaining yield while minimizing nitrogen loss.

[V-7] Purple Sweet Potato as a Source of Health Promoting Food Colorants

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Anthocyanins, from the flavonoid class of compounds in fruits and vegetables are responsible for purple, blue, and red colors of many plants. Also, they are excellent antioxidants serving as the primary component of health promoting impacts of plant-based food. Purple sweet potatoes are excellent sources of anthocyanins which can also be used in coloring food items in place of artificial colorants such as Red 40 which could have negative health impacts. In this study we examined the total anthocyanin content of four varieties of purple sweet potatoes grown in Florida. We tested the stability of color when extracted in an aqueous fraction and stored at different pH conditions over a 3-month period. Results indicated that the purplish red color of the sweet potato is stable for several months under acidic conditions and extracts from purple sweet potatoes can be used as convenient food colorants.

[V-8] Watermelon Fruit Detection for Automated Yield Mapping

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Accurate preharvest yield estimation plays a pivotal role in enhancing harvesting and marketing efficiency for watermelon farmers. Currently, no precise method exists for counting fruit in the field. We propose assessing yield by counting melons using machine vision with automated object detection during routine field operations before and during the harvest season. This will allow farmers to make informed harvesting decisions regarding adverse weather and resource allocation such as labor, equipment, and storage facilities. Four hundred and twenty-six synthetic and 56 real watermelon images were labeled to define all fruit objects in the images with bounding boxes. The resulting 482 labeled 1920x1080-pixel images were randomized, then partitioned as 80% for training, 20% for validation, using a Python script. A YOLOv11-large (YOLOv11-l; Ultralytics) model was selected for training the fruit image dataset using transfer learning. The model was trained to convergence in one hour on a Linux computer equipped with a NVIDIA RTX3090 GPU. The validation precision and recall of the trained model were >=0.97. Thirty-five independent real test images of 32-megapixel resolution were used for real-world predictive testing of the trained YOLOv11 model for use in watermelon fruit counting. Watermelon fruit identified and counted by the YOLOv11 model in each test image were compared with ground-truth counts determined by visual (human) assessment of each image. The images contained from 0 to 4 fruit each. A scatter plot regression and root mean square error (RMSE) was used to calculate the accuracy of fruit counting using YOLOv11. Fruit in 86% of the test images were correctly counted by YOLOv11 and 92% of the 63 fruit objects visible in the images were correctly identified by YOLOv11. Counting watermelon fruit in the field is challenging even for humans, due to partial occlusion of the visible fruit by watermelon vegetation. The YOLOv11 model trained in this research performed accurately to detect and count watermelon fruit in such difficult conditions, with insignificant bias and low RMSE of 0.378 fruits per image. Ultimately, this practice, when implemented, will not only enhance the economic viability of watermelon and other cucurbit farming (such as squash, cucumber, and cantaloupe) but will also promote sustainable agriculture by reducing food loss and promoting efficient resource utilization.

[V-9] Impact of Late-Season Heat on Phytochemical Content of Lettuce Grown in Two Florida Production Systems

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Lettuce is a highly adaptable crop generating revenue in different seasons throughout Florida, where it is cultivated in controlled environments and diverse field operations. While consumers may desire a high-quality product year-round, growers are faced with environmental challenges that decrease quality, including warmer temperatures. Previous research has identified germplasm which maintains marketable appearance in warmer temperatures, however, it remains unclear which phytochemicals may be important for lettuce heat tolerance. Therefore, this research aimed to evaluate how the antioxidant capacity and contents of chlorophyll, total phenolics, % soluble solids and dry matter were impacted for lettuce grown in warmer vs. cooler plantings, across two Florida production systems. Ten lettuce cultivars were grown using commercial practices in two experiments each for plasticulture in sandy soils of Hastings, FL and direct seeding in organic soils of Belle Glade, FL. Lettuce was harvested at market maturity, transported on ice, and tissue samples were snap-frozen and stored at -80°C. Samples were extracted and colorimetric assays performed via spectrophotometer using previously published protocols. Preliminary results show contents of chlorophyll, % soluble solids and dry matter were not significantly impacted by late-season heat, whereas antioxidant capacity and total phenolic contents tended to increase, indicating their potential role in adapting to heat stress. Further analyses will compare phytochemical content between production systems and determine whether higher contents of certain phytochemicals may be associated with genotypes that maintain higher marketable appearance in warmer plantings, thus potentially providing an additional target for breeding improved heat tolerance in lettuce.

[V-10] Exploring Synergy Between Pre-Emergence Herbicides to Enhance Nutsedge Control in Plastic Mulched Tomato Beds

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Nutsedge (*Cyperus spp*.) poses a significant challenge for Florida tomato growers due to its ability to puncture plastic mulch, its persistent tubers, and rapid rhizome growth. Pre-emergence herbicides applied under plastic mulch can effectively control nutsedge. However, repeated use of the same herbicide active ingredient (a.i.) on raised beds under plastic mulch may lead to the development of herbicide resistance and tolerance in weeds, reducing control effectiveness. To address this, combining herbicides with different modes of action in a single application can help mitigate resistance and tolerance issues. Additionally, herbicide application rates under plastic mulch must be carefully optimized to avoid phytotoxicity in tomato plants. This study aims to evaluate the effectiveness of pre-emergence herbicides, applied either alone or in combination, to improve nutsedge control while ensuring crop safety in tomato plasticulture. The trial was conducted at the Southwest Florida Research and Education Center (SWFREC) in Immokalee, Florida, using a randomized complete block design with four replications. Herbicide active ingredients tested include S-metolachlor, rimsulfuron, sulfentrazone, and halosulfuron. The herbicides were applied either as standalone blanket sprays or tank mixtures at two doses from the labeled rate range (minimum and maximum) before plastic mulch installation on raised beds. Data were collected on nutsedge counts, plant height, tomato plant vigor, chlorophyll content, and yield. The results from this study could provide Florida tomato growers with integrated strategies for managing the problematic weed nutsedge in plastic mulched beds, with a focus on enhancing crop safety.

[V-11] A Case for Breeding Heat-Tolerant Broccoli

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Broccoli (*Brassica oleracea* L. var. *italica*) is a nutrient-rich vegetable containing phytochemicals associated with reduced risks of cancer, autism, cardiovascular diseases, and other illnesses. However, current broccoli cultivars are poorly adapted to Florida's tropical and subtropical climate, limiting local production in a state where nutrition insecurity and diet-related health issues are significant concerns. Florida relies on long, carbon-intensive supply chains from California and Mexico to access fresh broccoli, making it vulnerable to disruptions and increasing its environmental footprint. Developing heat-tolerant broccoli varieties would enable year-round, locally grown production, strengthening Florida's regional food systems, reducing environmental impacts, and improving public health while alleviating strain on the healthcare system. This paper outlines a vision for breeding heat-tolerant broccoli specifically for Florida, integrating insights from the biology and genetics of broccoli, global food production and trade patterns, health benefits, and advanced breeding technologies.

[V-12] Effectiveness of Commercial Biostimulants in Enhancing Tomato Production and Fruit Quality

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Biostimulants are gaining popularity as sustainable tools for enhancing plant growth, mitigating abiotic stress, and improving crop yield and quality. Defined as substances or microorganisms that stimulate natural plant processes, biostimulants act by enhancing nutrient uptake, nutrient use efficiency, and tolerance to environmental conditions. Biostimulants influence plant physiology through various mechanisms such as improved photosynthesis, and the promotion of suitable root architecture development, adequate nutrient acquisition, and stress mitigation. This study

evaluates the effects of eight commercial biostimulant of different compositions and modes of action on tomato (*Solanum lycopersicum*) growth, fruit quality, and yield. The objectives are to: 1) quantify the effects of biostimulants on plant growth parameters and leaf chlorophyll content; 2) assess their impact on crop yield and fruit quality. 3) identify optimal biostimulant products and application strategies to promote sustainable tomato production. The experiment employs a randomized complete block design with three replicates, each containing eight treatments. Each plot contains 75 tomato plants, of which 10 plants will be used for detailed data collection. Biostimulants will be applied weekly or biweekly to the plants via drench or spray applications, according to the schedule, height and stem diameter will be measured every two weeks, while stomatal conductance and chlorophyll content will be measured weekly. Yield and fruit quality will be conducted upon harvest and during postharvest storage. Findings from this study will contribute to a better understanding of biostimulant efficacy under field conditions in Southwest Florida, providing practical guidelines for optimizing their use in tomato production systems.

[V-13] Battling Whiteflies in Cucurbita Crops – Exploring Host Resistance for Cultivar Development

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Cucurbits are a major group of economically and culturally significant vegetable crops, including squash and watermelon. In the United States, Florida is the leading producer of summer squash (*Cucurbita pepo* L.), contributing significantly to the vegetable industry. However, rising temperatures and expanding vector populations have intensified the threat of plant viruses, posing major challenges to cucurbit production. One of the most damaging vectors is the whitefly (*Bemisia tabaci*). Whiteflies cause direct feeding damage leading to silverleaf disorder and transmit viruses such as *Begomovirus* and *Crinivirus*, significantly reducing yields. Current management relies on insecticides, which are costly and environmentally unsustainable. Developing host resistance is the most effective long-term strategy, but no resistant cultivars are currently available. The goal of the current project is to identify squash germplasm resistant to whiteflies and their associated viruses and disorders. Our previous work identified resistance to silverleaf disorder and whitefly-transmitted viruses in several genotypes of C. pepo (PI 442294, PI 458731, PI 177373, PI 438700, PI 171625) under field conditions in Liveoak FL. In a subsequent study, greenhouse screening of candidate-resistant accessions was conducted at IFAS TREC, Homestead FL. Our findings indicate that 'Kakai' and 'Dostal' exhibit potential resistance, making them promising candidates for breeding programs. This research provides a framework for screening cucurbit germplasm against whiteflies, supporting the development of resilient cultivars for Florida's agroecosystems. Future research will focus on the genetic characterization of resistance traits and validation through multi-location trials.

[V-14] The Effect of Phosphorus Fertilizer Rates in Romaine and Iceberg Lettuce in Histosol Soils

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In Southern Florida, romaine and iceberg lettuces are grown on dominant Histosol soils, which chemically bind phosphorus (P), reducing its availability and fertilizer uptake. Lack of P fertilizer leads to stunted growth, decreased yields, and compromised quality. Excess of P fertilizer could lead to other unknown and undesirable characteristics. Determining the correct P fertilization rate is essential for sustainable production. This study explores the different P rates above and below what is currently recommended to find the one that generates competitive yields and sustainable usage. A randomized complete block design experiment was conducted with two commercial lettuce cultivars: Sawgrass (romaine) and Cooper (iceberg), commonly utilized in Southern Florida. Soil analysis determined 150 lbs. P_2O_5 per acre was the optimal recommended P rate. Three lower P rates (0, 48, 97 lbs. P_2O_5 per acre) and four higher P rates (210, 300, 400, 600 lbs. P_2O_5 per acre) were tested. Phenotypic traits including head weight, marketable heads and shelf life were evaluated to assess the impact of varying P rates. Results showed significant differences among P rates for both romaine and iceberg lettuces. Optimal responses were achieved at 210 lbs. P_2O_5 per acre, with significant

reductions at all rates below this level. Higher rates beyond 210 lbs. P_2O_5 did not show significant increase on head weight and marketable heads. These findings suggest the need to adjust the recommended P rates for lettuce. Future studies should focus on optimizing competitive P fertilization that ensures sustainable production.

[V-15] Assessing Warm Season Cover Crops as Carbon Sources for Anaerobic Soil Disinfestation in Organic Broccoli Production

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Sustainable management of soilborne pests and pathogens is a significant challenge for organic growers in Florida. Anaerobic soil disinfestation (ASD) as a preplant soil treatment is a promising non-chemical approach for addressing these issues. In Florida, molasses, a byproduct from sugarcane processing, has been suggested as an effective carbon (C) source for ASD application, while cover crops may be economically feasible alternatives. Two field trials were conducted during Sep 2023-Feb 2024 (Y1) and Aug 2024-Feb 2025 (Y2) assessing cover crop efficacy as C sources for ASD and impact on broccoli (transplanted Dec 2023 and Nov 2024) yield and quality. The split-split plot design included cover crop and molasses-based ASD treatments (3 weeks) with a non-irrigated control in whole plots, with sunn hemp (SH), sorghum sudangrass (SS), mustard (M), and weedy fallow in subplots. A humic substance (NutriHold™) was included in sub-subplots. Cover crop and ASD treatments were applied to the same plots in both years. Across years, SH generated the largest aboveground biomass and highest nitrogen (N) contents in leaf and stem tissues. Broccoli crown yield was greatest with SH in both cover crop and molasses-based ASD treatments. Average C:N ratios of cover crop treatments were lower in Y2 vs. Y1, with greater broccoli crown yields in Y2. Cover crop and molasses-based ASD treatments showed lower weed pressure compared with the non-irrigated control before broccoli transplanting in both years. Comprehensive examination of warm season cover crop residues for ASD application will help optimize integrated, non-chemical soilborne pathogen management.

[V-16] The Extremely Needed Heat Tolerance in Lettuce for Cultivation in Controlled Environment Agriculture

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Lettuce (*Lactuca sativa* L.) is a staple crop for controlled environment agriculture (CEA). Cultivating lettuce in CEA has the potential to increase the production window in Florida that nearly vanishes from May to September due to excessive heat. To bridge this gap, the University of Florida's lettuce breeding program screened over 100 accessions (commercial cultivars, breeding lines, legacy cultivars, and plant introductions) to identify germplasm capable of thriving under warmer temperatures. These accessions represented four morphological types: butterhead, Latin, leaf, and romaine. Experiments were conducted using an Augmented Randomized Complete Design with three replicates in a hydroponic nutrient film system across two greenhouse trials (January through February and March through April). At harvest, data was assessed for head weight, bolting, and tipburn. Results indicated significant differences among accessions for each trait within each morphological group. Top performers for reduced bolting included PI 667690, Lalique, and Salanova Green Oakleaf (leaf); 60182 (romaine); Casey (butterhead); and C1145 (Latin). Starfighter (leaf), 60182 (romaine), Casey (butterhead), and C1145 (Latin) exhibited minimal tipburn. Head weight top performers were Western Red Leaf (leaf), Manatee (romaine), Density (butterhead), and BG22-0884 (Latin). While these results highlight promising candidates, further screenings are essential to confirm their heat tolerance. Future studies will explore physiological and molecular factors, and the genetics influencing heat tolerance in lettuce, providing additional tools to plant breeders for selecting the heat tolerance needed in lettuce for the CEA industry.

[V-17] Evaluating Edamame Commercial Varieties for Seasonal Adaptation in South Florida

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Florida stands as one of the top states for year-round fresh vegetable production in the United States. However, specialty vegetables, like edamame [*Glycine max* (L.) Merril], remain relatively new to the region. While yield studies have been conducted in Northern Florida, limited knowledge available on the crop's cultivation poses a challenge to its successful production. The aim of this study was to evaluate sixteen commercial edamame varieties (maturity groups from 0-V) across South Florida's two main bean production seasons, i.e., Spring (early Feb to mid-May) and Fall (early October to mid-December). The objectives were to a) identify suitable varieties to grow under South Florida's climate and b) determine the optimal growing season for each variety. Growth parameters (i.e., emergence, plant height, canopy, leaf area, and nodes per plant) and agronomic traits (i.e., fresh pod yield and 10-pod weight) were assessed to provide insights into the crop's adaptability to local climate and overall productivity. In the spring season, 'UA-Kirksey' produced the highest yield at 5.0 t/ha, while 'Midori Giant' had the lowest yield at 0.8 t/ha. During the fall, 'Chiba Green' had the highest yield (3.2 t/ha), whereas 'Karikachi #3' yielded the lowest at 0.5 t/ha. Six varieties, including 'KAS 355-11', 'Kahala, 'Karikachi #3', 'Shirofumi', 'UA-Kirksey'', and 'Young Soybean' exhibited higher yield ($p \leq 0.5$) in the spring compared to the fall, while no significant seasonal difference was observed for the other varieties. This study is still ongoing, however, observations from the first-year trials offered a valuable insight into edamame performance across different seasons under the subtropical climate.

[V-18] On the Nature of *Me3*, The R Gene Responsible for *Meloidogyne* spp. Resistance in *Capsicum annuum*

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Root-knot nematodes (*Meloidogyne* spp., RKN) represent a significant limitation to pepper (*Capsicum annuum*) production, necessitating robust strategies for durable genetic resistance. An advanced inbred line developed at the University of Florida, named 'Ruby', is highly resistant to the most common species of RKN, but its genetic basis is unknown. Thus, the aim of the study was to elucidate the inheritance of RKN resistance in 'Ruby'. To approximate the number of genes involved, a biparental F_2 population derived from 'Ruby' and an RKN-sensitive line was screened using bioassays with *M. incognita* race 3. The data suggests a two-gene model, in which at least one dominant allele at either locus is sufficient to produce high level RKN resistance. The dominant *Me3* gene had been reported to confer broad-spectrum RKN resistance, especially the allelic variant linked to an indel within the 5′ untranslated region (UTR). Screening with the indel marker indicated that one of the two genes involved in RKN resistance in 'Ruby' is *Me3*. Details about allelic variations in the *Me3* coding sequence from resistant and susceptible pepper lines and their utility in breeding will be discussed.

[V-19] The Role of pH and Micronutrient Composition Around the Rootzone on Pepper Seedling Hydroponic Production Using a Floating System

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Nutrient assimilation is associated with the pH level around the rootzone of vegetable plants because it affects the minerals' absorbance. Simultaneously, the importance of micronutrients is underestimated, although they are involved in essential plant functions. A floating hydroponic system was adapted, in order to create different conditions in the

nutrient solution. Pepper seedlings (cv. SVPS2762) were grown for 40 days on solutions of different pH levels and micronutrient composition. A composite NPK water-soluble fertilizer (20-20-20) containing a portion of micronutrients was used to prepare a standard solution for all treatments. The pH was adjusted to three levels; 5.50, 6.80, and 8.00, using H_2SO_4 or NaOH. A mixture of B, Mg, and Fe was supplemented in half of the treatments at each pH level. Spectra reflectance, chlorophyll fluorescence, and stomatal conductance were recorded during growth, and after 40 days, the plant height, root length, and plant weight were measured, while chlorophyll content was determined in leaf samples. All of the growth components were significantly affected by pH, micronutrient supplement, and interaction, although most of the variance was attributed to the pH of the solution. In particular, the lower the pH, the higher the plant growth, biomass, and chlorophyll content, while the lowest values were obtained at the highest pH levels. The micronutrient supplement was able to partially alleviate the negative effects of the high pH levels, implying that the pH around the roots in pepper plants is significantly affecting the assimilation of these minerals.

[V-20] Lettuce Tolerance to Pendimethalin on Organic Soil

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Lettuce is an important crop in southern Florida, primarily grown on organic soils (Histosols). Broadleaf weed management, particularly for common purslane (*Portulaca oleracea*), is a major challenge, requiring costly hand weeding alongside herbicide applications. Currently, lettuce growers rely solely on imazethapyr for broadleaf weed control, but persistent weed interference continues to impact yields. In 2024, a study was conducted to evaluate the tolerance of direct-seeded lettuce to preemergence-applied pendimethalin on organic soil. The experiment followed a split-plot design arrangement and four replications. Pendimethalin rates (0, 1060, 1600, and 2130 g ai ha^{-1}) were the main plots, while lettuce types (iceberg, romaine, and green leaf) were subplots. Pendimethalin-induced injury was primarily observed as stunting. Greenleaf '3SX4906' exhibited >90% injury and stand reduction at all rates by 14 days after treatment (DAT). Other cultivars showed 15–40% injury with no significant stand loss. Most lettuce cultivars, except 3SX4906, recovered by 42 DAT, particularly at lower rates. Lettuce yield at the lowest pendimethalin rate was comparable to the nontreated control for most cultivars, except 3SX4906, which had >90% yield loss. At the highest rate, yield reductions reached up to 30% compared to the nontreated control, except for '3SX4906,' which remained severely affected. These findings indicate that direct-seeded lettuce tolerates pendimethalin, especially at lower rates. Ongoing research is assessing the effectiveness of pendimethalin in broadleaf weed control when applied alone or in combination with imazethapyr to optimize weed management in lettuce production on organic soils

[V-21] Tomato Resistant Variety Plays a Vital Role to Mitigate the Yield Loss

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Winter market fresh tomato production has a long history in Miami-Dade, and it is an important commodity in the vegetable industry in the county. However, the acreage and production have declined significantly in recent years. Tomato growers are facing many challenges to cause such a declination, but a fetal disease, tomato chlorotic spot virus (TCSV) caused a lot of yield loss attributed the declination significantly. The outbreak of TCSV initially occurred during the growth season of 2015-2016 in Miami-Dade County, growers had to rouge the infected plants, apply silver metallic reflected plastic mulch, and spray insecticides more frequently than ever before to control the vectors of thrips to reduce the infection. However, all these measures did not solve the problem until the adoption of resistant varieties, such as Red Bounty and Southern Ripe. This paper is to elucidate the occurrence of such a plant disease -TCSV, the measures the local vegetable growers applied and to summarize the lessons they have experienced over the last 10 years to mitigate the tomato yield loss.

[V-22] Breeding for Disease Resistance in Squash

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Cucurbita crops include cultivar groups of pumpkin and squash. With 9,600 acres in production and a value exceeding $44 million in 2023, Florida ranks first in acreage dedicated to summer squash production in the US. Squash production in the Florida is hindered by major diseases including powdery mildew, *Phytophthora* rot, and aphid and whitefly associated viruses and disorders. Here, we highlight our progress towards breeding for resistance against these diseases using a combination of conventional and genomic tools. For powdery mildew, we have identified novel sources of resistance in USDA germplasm collection and used genome-wide association studies (GWAS) and genomic selection to accelerate genetic gain in the breeding program. On the other hand, we have identified QTL linked to Phytophthora crown rot resistance in *C. moschata* (Chr 4, 11, and 14) and *C. pepo* (Chr 13). Subsequent RNAseq experiment revealed several gene pathways involved in the resistance mechanism for *C. moschata*. Furthermore, we recently mapped the resistance QTL for ZYMV (Chr 2, 4, 8, 20) and PRSV (Chr 9) potyviruses in *C. moschata* and identified SNP markers for marker-assisted selection. On the other hand, our work on whitefly-associated viruses and disorders has revealed potential resistant germplasm in both *C. pepo* and *C. moschata*. Subsequent studies will identify genetic loci associated with these traits in *Cucurbita*. Taken together, these results indicate significant gains towards development of resistant germplasm for the squash industry.

[V-23] Persistence and Behavior of Pre-emergence Herbicides in Plastic-Mulched Vegetable Beds

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Weeds in Florida vegetable production systems are typically controlled using plastic mulches, fumigants, and herbicides. Pre-emergence herbicides, such as s-metolachlor, are often applied before transplanting under plastic mulch to manage weeds; however, their behavior and fate in plastic-mulched beds are not fully understood. The primary objective of this study was to evaluate the behavior of pre-emergence herbicides in plastic-mulched pepper beds. Soil samples (from a depth of 15 cm) were collected from the beds at various crop production stages, including the time of application, early season, and late season, from beds where s-metolachlor was applied. The samples were extracted using acetonitrile as a solvent, filtered, and analyzed by high-performance liquid chromatography (HPLC). The mobile phase during the analysis consisted of 45% acetonitrile and 0.01% v/v aqueous formic acid. S-metolachlor was identified by comparing the retention time (7.8 minutes) with that of a standard. The results of this study showed that s-metolachlor persisted throughout the growing season (approximately 120 days after application) under plastic mulch with minimal degradation. These findings suggest that pre-emergence herbicides, like s-metolachlor, behave differently under plastic mulch, remaining more persistent compared to their use on bare ground. Additionally, these observations suggest that using lower rates of pre-emergence herbicides under plastic mulch may improve crop safety.

[V-24] Weed Control in Celery with Pyroxasulfone in Organic Soils

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Celery is an important crop cultivated on organic soils in southern Florida. Field studies were conducted from 2022 to 2025 to evaluate weed control in celery using pyroxasulfone on organic soils. Pyroxasulfone (119 g/ha) was applied

preemergence alone, preemergence followed by postemergence prometryn (560 g/ha), or postemergence in combination with prometryn. These treatments were compared with S-metolachlor (1070 g/ha) applied preemergence, followed by postemergence prometryn or postemergence in combination with prometryn. Pyroxasulfone, whether applied alone or with prometryn, provided over 90% control of common lambsquarters and common purslane, which was comparable to the control achieved by S-metolachlor in combination with prometryn. However, preemergence pyroxasulfone alone provided only 60% control of ragweed parthenium, indicating that a tank mix with prometryn is necessary when ragweed parthenium is present in the field. Celery yield did not differ significantly among treatments, suggesting that weed control efficacy did not impact crop productivity. Given the limited herbicide options available for celery cultivation, pyroxasulfone offers a valuable alternative, allowing growers the flexibility to use it preemergence or postemergence, especially when preemergence application timing is restricted.

[V-25] Review of New Reduced-Risk Synthetic Nematicide Experiments in Florida Plasticulture

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Florida's sandy soils and subtropical climate are ideal for many plant-parasitic nematodes, and crop damage caused by nematodes is more severe in Florida than in any other US state. Nematodes can be particularly damaging in plasticulture systems, which provide ideal temperature and moisture conditions for nematodes like root-knot (*Meloidogyne* spp.) and sting (*Belonolaimus longicaudatus*) nematodes. Historically, pre-plant soil fumigation, initially with methyl bromide, and currently with 1,3-D, chloropicrin, and metam-based products has been the standard practice to manage nematodes in plasticulture. For decades the only post-plant synthetic nematicide available was oxamyl (Vydate). The last decade several new low-tox synthetic nematicides have become available to growers, such as Nimitz (a.i. fluensulfone), Velum (a.i. fluopyram), and Salibro (a.i. fluazaindolizine). All these products have different modes of action, are more selective, less toxic, and more user-friendly than fumigants and oxamyl. For the past 8 years, we have been evaluating reduced risk nematicides on tomatoes, peppers, cucurbits and strawberries at the GCREC research farm and in growers' fields. Results indicate that the new nematicides can be effective but should not be considered direct replacements for fumigation. Nonetheless, they are long overdue and much needed new tools to help manage nematodes and can be valuable new components of an integrated nematode management program for plasticulture. The new nematicides are not only safer for applicators and the environment, but they also give growers more flexibility and allow for more effective in-crop nematode management.

[V-26] Continued Extension and Research Program for *Thrips parvispinus*, A Pest of Pepper in Florida

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Florida is a top producer of fresh bell peppers along with California in the United States. In 2020, *Thrips parvispinus*, an invasive thrips species, was first detected in the continental U.S. on ornamental plants in Orange County, Florida. In November 2022, it was reported for the first time in commercial pepper fields in Palm Beach County, causing severe injury to pepper plants. Due to extensive damage to the crop, *T. parvispinus* caused millions of dollars of loss to local growers, impacting fresh pepper markets locally and nationwide. Since its first detection, *T. parvispinus* was recorded causing severe injury on pepper varieties such a bell, Hungarian wax, jalape**ñ**o, and mini sweet pepper. *T. parvispinus* was observed on cucumber, squash, snap bean, and eggplant but caused minimal injury. A scouting guide was developed to help detect early infestations, which is crucial for management. Several on-farm insecticide trials were conducted in 2024 and 2025 in collaboration with pepper growers. Findings supporting management recommendations were shared with vegetable stakeholders via in-person and online meetings, and newsletters. Constant communication, field visits, and on-farm trials with growers and crop consultants have been crucial to the

success of our program showing early adoption of *T. parvispinus* management recommendations on approximately 3,000 acres.

[V-27] Biology and Management of a Weevil Attacking Apiaceous Crops in Florida

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The weevil *Listronotus sparsus* (Say) has emerged as a pest of celery and parsley in southern Florida during the past decade. Larvae feed within plants, reducing plant vigor and the quality of the two crops. Laboratory and field experiments were conducted in 2024-2025 at the UF/IFAS Everglades Research and Education Center in Belle Glade, FL to determine adult weevil preference for celery, parsley, carrot, cilantro, dill, and fennel. Results suggest that celery is more attractive to weevil adults than the other five apiaceous crops. Field trials conducted since 2022 have shown that foliar applications of cyantraniliprole, novaluron, and oxamyl reduce weevil larval infestations in celery. However, under relatively high pest pressure, injury and infestation levels may remain substantial. In a trial conducted during the 2024-2025 vegetable season, a tray drench application of a neonicotinoid or cyantraniliprole before transplanting celery into organic soils controlled weevil infestations for at least four weeks. The latest observations show that *L. sparsus* is a greater threat to celery than to other apiaceous crops produced in Florida. In addition, insecticide tray drench applications may represent an effective alternative to foliar applications.

[V-28] Stakeholder Directed Research: Large-Scale On-Farm Whitefly Trials

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In the southeastern United States, whitefly management has become crucial for the success of specialty crop production, including tomato, pepper, eggplant, watermelon, squash, cucumber, green beans and cabbage. In recent years, the watermelon industry, particularly in south Florida yet also throughout the southeast, has been most limited by this pest due to its associated viruses. Whitefly efficacy trials are typically conducted by lab assays or small plot field studies. These often include only 6 to 12 active ingredients and are therefore limited in their ability to lead to defendable recommendations. In response to the request from south Florida stakeholders, grower partnerships were leveraged and funding was provided by the National and Florida Watermelon Associated to conduct low-cost, large-scale, on-farm efficacy trials. These were conducted with high scientific vigor while employing commercial production techniques to determine real-world results. Efficacy trial included 4-acre trials with 30 active ingredients, and 6-acre trials with 12 spray concentration/volume and application technologies. Additionally, economic analyses are being conducted to provide recommendations that include this critical factor in grower decision making. This talk seeks to foster discussion for improving future pest management efficacy trials.

Best Management Practices (Special Section)

"Renaissance of Nutrient Management Research in Florida – Update"

Coordinators: Lisa Hickey and Michael Dukes

[BMP-1] UF/IFAS Nutrient Management Program Update

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Growers have criticized many UF/IFAS fertilizer rate recommendations for being outdated, as they do not reflect modern production systems. For example, the grain corn recommendation is nearly 50 years old, even though modern production systems —incorporating improved genetics, narrower row spacing, denser planting, and center pivot irrigation —have become standard practice. Other agricultural commodities and horticultural crops have advanced similarly. In 2021, UF/IFAS began receiving annual legislative funding to reassess fertilizer application rates (initially for tomatoes and potatoes), with a focus on agronomic and economic efficiency and on incorporating BMPs to maximize yield and quality while minimizing environmental nutrient losses. Since then, UF/IFAS launched a Nutrient Management program with $20.6 million allocated as ofFY24-25. The legislative mandate also extended to other crops, prompting studies on corn, cotton, hemp, sod, limpograss, lettuce, blueberry, citrus, and peaches, and on optimal soil tests for plant-available phosphorus, artificial intelligence for nutrient management, and biosolids use on pastures. Over 60 UF/IFAS faculty, staff, post-docs, and students are involved in these projects from the western panhandle to Miami-Dade County. The initiative has significantly enhanced the organization's extension services and research capacity through upgraded soil labs and modern equipment. To date, three years of experiments on potato and tomato, and two years on other crops, have been completed, with research on perennial fruits expected to continue for another four to five years. Interim phosphorus recommendations have been developed for potato, tomato, and snap bean, while additional data is being collected to update other fertilizer guidelines

[BMP-2] Assessing Potato Yield Response to Phosphorus Fertilizer in Soils with High Phosphorus Legacy

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Commercial fields in northeast Florida (NE) often have high Mehlich-3 P levels due to annual fertilization, yet potatoes show a linear yield response to increasing P-rates. While P deficiency can reduce yields, excess P increases leaching risk. Crop response to P also depends on soil mineral N availability, which can affect P uptake. This study aimed to assess potato yield response to increasing P-fertilizer application rates (0, 60, 120, 180, and 240 lb/acre P2O5), combined with two N-rates (150 and 240 lb/acre N) at two locations with initial P levels of 49 (low-P) and 96 (high-P) mg/kg (Mehlich-1). A field trial (2023-2024) in Hastings-FL, tested P-and N-fertilizer rates in sandy soils using a randomized block design with four replicates per site. P-fertilizer was applied pre-planting in a single dose, while N was split into three applications. Potatoes were harvested at 100 DAP and total and marketable yields were determined. Data were analyzed using mixed linear models and regression. Averages of total and marketable yield ranged from 100-425 cwt/acre and 66-372 cwt/acre across two years, respectively. Preliminary results showed no significant interaction between P-and N-rates; however, total yield at 150 lb/acre N was 54 cwt/acre higher than at 250 lb/acre N. Total yield was 44 cwt/acre higher in the high-P than in the low-P location and increased linearly with

P-fertilizer rates, averaging 80 cwt/acre more than the 0 lb/acre P_2O_5 treatment. Lack of P application can reduce potato yield even in soils with high legacy P in NE.

[BMP-3] Optimizing Phosphorus Fertilizer Practices for Potatoes: Evaluating Sources, and Timing of Application

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The spodosols in northeast Florida can present elevated levels of phosphorus (P) due to long-term fertilizer application. In general, very early applications before crop planting increase the risk of P losses, while late P applications may not match the crop uptake demand. The objective of this study was to identify a P fertilization strategy involving multiple applications and using two different sources of P-fertilizer to increase potato yield and phosphorus use efficiency (PUE). A field experiment with nine treatments and four replications was established in Hastings Agricultural Extension Center-HAEC/IFAS/UF in three areas with different soil P levels, 118±2, 179±3 and 219±3 mg/kg P (Mehlich-3). These areas were cultivated with potato cultivar Atlantic, from Jan-May of 2024. A single rate of 120 lb/ac of P_2O_5 of granular phosphate was applied at 30 and 15 days before planting, at planting, and at 25 and 50 days after planting (DAP). The same P-rate was also split in 40 and 60 lb/ac of P_2O_5 applied at 0, 25, 50 DAP, and 0 and 25 DAP, respectively. In addition, a liquid P-source was applied using this same split application and times. At the harvest, the tubers were graded according to USDA size standards, specific gravity, total and marketable yields were measured. There were no significant differences in total yield as function of the application timing within each area. The area with the lowest initial soil P concentration had the highest yield, producing 332±5 cwt/ac, while the area with the highest initial P concentration produced 268±8 cwt/ac of potatoes and the medium initial soil P area produced 324±5 cwt/ac. Marketable yield presented the same pattern, were we had 282±5 cwt/ac for the low, 281±7 for the medium, and 223±8 cwt/ac for high initial soil P area. There were no differences of treatments for specific gravity. PUE significantly decreased with the increase in soil initial P level. The low initial P resulted in 289±3 lb of tubers/lb of P, followed by 234±2, and 201±2 lb of tubers/lb of P for medium and high initial soil P. The second year of this study is needed to validate the guidelines for timing of P fertilizer application P-fertilizer.

[BMP-4] Computer Modeling to Support Best Management Practices for Vegetable Production in Florida

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Management practices for field-grown irrigated vegetables crop production have improved over time across Florida, USA. However, nitrogen (N) management remains challenging in this region. This is due to the relatively shallow root system of some cultivated plants such as Solanaceous species and the low water and nutrient holding capacity of the sandy soils along with a highly variable subtropical climate, which increase the risk of N losses to the environment. Combining field trials with a systems analysis approach that is based on computer modeling could significantly expand the potential for providing regional or site-specific recommendations for best management practices (BMP) in vegetable production. Crop growth models are valuable tools for understanding the impact of N management on crop production. In this context, the goal of this study was to evaluate the Cropping System Model (CSM)-CROPGRO model of the DSSAT using detailed growth and N measurements of field-grown, plastic mulch, irrigated crops under different N rates in contrasting environments in Florida. Modeling results for two important specialty crops in the state, tomato (*Solanum lycopersicum* L.) and bell pepper (*Capsicum annuum* L.) are presented. The model accurately simulated growth, yield, and N uptake for contrasting N rates, despite the challenges under raised bed and plastic mulch systems. The DSSAT-CSM should assist researchers and commercial growers to outline

BMP strategies for specific locations and production systems. Potential applications of the model to quantify effects of N management on yields of both crops for several sites across Florida are presented for actionable BMP decisions.

[BMP-5] Optimizing Phosphorus Rates for Different Lettuce Types over Two Seasons

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This three-year on-farm study aimed to update phosphorus (P) recommendations for fresh-market tomato production in Central Florida. Five high-Mehlich-3 soil P sites (>45 ppm) were selected across different seasons to evaluate the effects of P_2O_5 application rates. In four experiments, total marketable yield increased linearly with P_2O_5 application, with the highest yields observed at 100–200 lb acre^{-1}, resulting in an average yield increase of 21%. Plant P uptake followed a similar trend, peaking at higher P_2O_5 rates across all experiments. In two experiments, P use efficiency was maximized at 100–150 lb acre^{-1}. Tissue P concentration consistently increased with higher P_2O_5 rates, regardless of sampling time or experiment. Among soil P extractants, Mehlich-3, Mehlich-1, and Bray correlated well with P_2O_5 rates. However, Olsen exhibited the highest coefficient of determination ($R^2 > 0.60$). Olsen also showed the strongest correlation with marketable yield ($R^2 > 0.60$) and plant P uptake, this last reaching $R^2 = 0.82$ in one experiment. Across all experiments, Mehlich-1 outperformed Mehlich-3 in predictive strength. Soil test P recovery (based on total P) revealed that Mehlich-3 extracted over 80% of total P, whereas Olsen extracted less than 10%. If the current IFAS recommendation (no P application) were followed, growers would incur an average loss of up to $16,149 per acre yr^{-1}. The current Mehlich-3 P interpretation for Central Florida should be revised. We recommend incorporating additional soil P tests, such as Olsen and Mehlich-1, as official methods to improve P assessment and fertilizer recommendations.

[BMP-6] A Three-year On-farm Study to Evaluate the Phosphorus Fertilization Recommendation for Fresh-market Tomato in Central Florida

João Cardoso de Souza Jr[1]*, Shinsuke Agehara[1], Sanjay Shukla[2], Vijay Santikari[2], Mehran Homayounfar[2], Justin Schabow[2], Nikolay Bliznyuk[3], Craig Frey[4], Lisa Hickey[5], and Anna Meszaros[6]

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This three-year on-farm study aimed to update phosphorus (P) recommendations for fresh-market tomato production in Central Florida. Five high-Mehlich-3 soil P sites (>45 ppm) were selected across different seasons to evaluate the effects of P_2O_5 application rates. In four experiments, total marketable yield increased linearly with P_2O_5 application, with the highest yields observed at 100–200 lb acre^{-1}, resulting in an average yield increase of 21%. Plant P uptake followed a similar trend, peaking at higher P_2O_5 rates across all experiments. In two experiments, P use efficiency was maximized at 100–150 lb acre^{-1}. Tissue P concentration consistently increased with higher P_2O_5 rates, regardless of sampling time or experiment. Among soil P extractants, Mehlich-3, Mehlich-1, and Bray correlated well with P_2O_5 rates. However, Olsen exhibited the highest coefficient of determination ($R^2 > 0.60$). Olsen also showed the strongest correlation with marketable yield ($R^2 > 0.60$) and plant P uptake, this last reaching $R^2 = 0.82$ in one experiment. Across all experiments, Mehlich-1 outperformed Mehlich-3 in predictive strength. Soil test P recovery (based on total P) revealed that Mehlich-3 extracted over 80% of total P, whereas Olsen extracted less than 10%. If the current IFAS recommendation (no P application) were followed, growers would incur an average loss of up to $16,149 per acre yr^{-1}. The current Mehlich-3 P interpretation for Central Florida should be revised. We recommend incorporating

additional soil P tests, such as Olsen and Mehlich-1, as official methods to improve P assessment and fertilizer recommendations.

[BMP-7] Hydrologic Factors Should be Considered for Developing Phosphorus Fertilizer BMPs for Fresh-market Tomato in Florida

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Florida is the largest producer of fresh tomato in the USA. Phosphorus (P) is an essential nutrient for production of crops, but excessive P fertilizer application can adversely impact natural ecosystems. The Clean Waterways Act of Florida requires implementation of state's agricultural best management practices (BMPs), including soil test-based P fertilizer application for tomato, to minimize the excessive P losses to the environment. The main P BMP involves adjusting the P fertilizer application rate based on the Mehlich-3 P (M3P) levels (Low: < 25 ppm, medium: 25-45 ppm, high: > 45 ppm) in soil, and it dictates no application of P for soils with "high" M3P values. This recommendation was mainly based on decades old research conducted mainly on small plots at research farms with older crop varieties, which the industry perceives to be inadequate. A state-wide study, funded by the state and conducted on commercial farms in partnership with the industry, was initiated in 2021 to reassess the current recommendations. A total of 10 experiments that considered yield responses from four to six P_2O_5 application rates (0 to 200 lb/ac) were conducted at farms with different irrigation systems (seepage and drip), hydrology (e.g. depth to water table), and soil M3P values (22 to 204 ppm). Yield, plant nutrient levels (leaf tissue and biomass), soil nutrient levels, weather, and hydrologic (e.g. soil moisture, water table) data were collected for holistic analysis. Results showed statistically significant (p < 0.05) increase of up to 50% in yield compared to the zero rate when P_2O_5 was applied even with "high" soil M3P (> 45 ppm). Analyses indicate that the critical soil M3P concentration at which no additional fertilizer is required may be two to three times more than the current threshold value of 45 ppm. Preliminary results indicate that the optimal P_2O_5 rate to avoid yield losses for majority of sites is in the range of 50–75 lb/ac. Results also confirmed observations from earlier UF/IFAS research (Shukla and Santikari, 2025), which showed that yields varied significantly with distance from irrigation and drainage ditches. This is likely due to differences in hydrologic factors (e.g. water levels and movement) and nutrient dynamics between different crop rows. This finding indicates that there is a need to develop site-specific recommendations, where different parts of a field receive different water and nutrient inputs, to achieve optimal yields or to improve nutrient use efficiency. Based on the results from this study, the current P fertilizer recommendations and interpretations of the soil test in Florida will likely be revised. The revised recommendations are likely to keep the tomato industry competitive by maintaining yields and economic viability while minimizing losses to the environment.

[BMP-8] A Three-Year On-Farm Study to Evaluate the Phosphorus Fertilization Recommendation for Potato in Central Florida

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A three-year on-farm study was conducted at high-Mehlich-3 soil P sites (>45 ppm) to evaluate phosphorus (P) fertilization effects on table-stock (TB) and chip potatoes (CP) in Central Florida. Total marketable yield from Year 1 to Year 3 (Y1–Y3) was not affected by P_2O_5 application rates. However, plant P uptake increased linearly, peaking at 225 lb acre^{-1}. Tissue P concentration in CP Y1 was highest at 180 lb acre^{-1}, while in Y2, both CP and TB showed higher concentrations at 225 lb acre^{-1}. In CP Y3, the highest tissue P concentration occurred at 135 lb acre^{-1}. In Y3, Mehlich-3 showed no significant correlation with P_2O_5 rates, while Olsen had the strongest correlation (R^2 = 0.73), followed by Water (R^2 = 0.69), Bray (R^2 = 0.26), and Mehlich-1 (R^2 = 0.16). In CP Y1, P uptake correlated best with Mehlich-1 (R^2 = 0.48) and Mehlich-3 (R^2 = 0.43), followed by Bray (R^2 = 0.35) and Olsen (R^2 = 0.30). In CP Y3, Olsen showed the strongest correlation (R^2 = 0.61), followed by Bray (R^2 = 0.32). TP correlated most strongly with Mehlich-3 (R^2 = 0.62), followed by Bray (R^2 = 0.53), Mehlich-1 (R^2 = 0.39), and Olsen (R^2 = 0.36). Although P_2O_5 did not influence yield, it affected plant growth and nutrient uptake. We recommend incorporating additional soil P tests, such as Olsen and Mehlich-1, to improve P fertilizer recommendations in Central Florida.

[BMP-9] Phosphorus Bioavailability and Environmental Fate Associated with Potato Production in Northeast Florida

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Bioavailable phosphorus (BAP) is a critical factor in maximizing fertilization efficiency, as it is often a limiting nutrient for crop growth and yield. Iron Oxide Strip extraction (FeO-P) and the Haney Test (H3A-P) are two soil tests measuring bioavailable phosphorus (P), mimicking the process at the soil and root interface, and consequently a better measure of BAP compared to soil tests such as Mehlich 3 (M3). The Soil Phosphorus Storage Capacity (SPSC) is another key factor for evaluating the soil's ability to retain P and mitigate the risk of P offloading to the environment, particularly in Florida's sandy soils, where groundwater leaching of P is a significant environmental concern. The objective of this study is to incorporate SPSC, along with FeO-P and H3A-P measurements to identify areas where fertilization is needed to maintain crop yield and to understand the environmental fate of excess P in the soils. The study was conducted on soils collected from potato fields at UF/IFAS Hastings Agricultural and Extension Center, Hastings, FL (n = 216). Samples were taken from three beds with varying P initial concentrations at two depths (0-15 cm, 15-30 cm). Samples were analyzed for M1-P, M 3-P, Fe, Al, FeO-P and H3A-P. The phosphorus saturation ratio (PSR) and SPSC were calculated using P, Fe, and Al concentrations in a M3 solution. The BAP, measured as FeO-P and H3A-P increased with M3P values, consistent with the increasing P treatments across the three beds. Most samples were above the plant-available cutoff for FeO-P and H3A-P, as well as above the current recommended values for M1-P (30 mg kg^{-1} as a high value) and M3-P (45 mg kg^{-1}), suggesting over-fertilization. Negative SPSC values align with these findings, further supporting the hypothesis of excessive P in the soil and the potential for adverse environmental impacts, including water quality degradation. This research highlights the importance of incorporating BAP and SPSC into P management strategies to refine fertilizer recommendations, striking a balance between prioritizing plant needs and reducing the environmental risks associated with P application. The findings suggest that tailored P management practices, accounting for soil depth and P retention capacity, are necessary to mitigate environmental risks while optimizing crop yields in Florida's sandy soils. It is anticipated that crop yield may relate to a threshold BAP (e.g., 20 mg kg^{-1} FeO-P or 40 mg kg^{-1} H3A-P), with a negative SPSC (for both surface and subsurface layers up to 30 cm depth) that could be crop specific.

[BMP-10] Consideration of Hydrologic Effects on Florida Potato Yield Is Important while Evaluating Phosphorous Fertilizer BMP Recommendation

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Florida produces nearly one-third of the United States' winter crop of potatoes. To maintain economical production, the careful application of an adequate supply of phosphorous (P) fertilizer is essential. Florida has taken a unique approach in the protection of its iconic waterways (i.e. Everglades) through the incorporation of BMP (best management practice) recommendations into law with the Clean Waterways Act (SB 712). In addition to maintaining economic outcomes for farmers, BMPs seek to limit the surface runoff and groundwater losses of specific nutrients (nitrogen (N) and P) from Florida's sandy, low water- and nutrient-holding capacity soils. Current recommendations require knowledge of a soil's endogenous level of P, prior to planting, using the Mehlich-3 P (M3-P) soil test (Low: < 25 ppm, medium: 25-45 ppm, high: > 45 ppm) to determine the amount of P that can be applied (0 lb/ac P >45 ppm M3-P). The current fertilizer P BMP recommendations are perceived by the potato industry as insufficient to maintain economically viable yields on soils with high pH. In partnership with the potato industry, six large-scale experiments over a three-year period (2021-2024) were conducted on hydrologically diverse commercial farms. An eclectic set of data was acquired including yield, nutrient levels of soil and leaf tissue, biomass, hydrologic, and weather. The first two years of results from P application data offered a base upon which the state granted a provisional suspension of the current BMP recommendations in 2022 (120 lb/ac P_2O_5 without soil test conditions). Despite "high" endogenous soil M3-P levels (M3-P > 45 ppm) which required no fertilizer P application, the data from the experiments showed a statistically significant increase in marketable tuber yield (TMY) in response to P fertilizer application but, due to bias, failed to discover some P effects on TMY, and some tuber grades, without considering field hydrologic characteristics (proximity to irrigation and drainage ditch networks) that may create differential water and nutrient levels in crop beds. Significant increases in P_2O_5 uptake in total biomass, with increased P_2O_5 application, did not always coincide with significant yield increases (luxury consumption). The majority of experiments (66%) showed yield responses between 46 and 230 lb/ac P_2O_5. Pending the evaluation of nutrient efficiency and balance, the current results are likely to result in revised P fertilizer recommendations to maintain economic viability of the industry while reducing P losses to the environment.

[BMP-11] A Two-year On-farm Study to Evaluate the Phosphorus Fertilization Recommendation for Snap Beans in Central Florida

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Two on-farm studies evaluated the effects of phosphorus (P) fertilization on snap bean production in Central Florida. Conducted over two years at high-Mehlich-3 soil P sites (>45 ppm), the studies aim to update the official P recommendations. Total marketable yield increased linearly with P_2O_5 application, with the highest yields observed at 120 lb acre^{-1}, resulting in an average yield increase of 20% (Year 1) and 59% (Year 2). Plant P uptake followed a similar trend, peaking at higher P_2O_5 rates in both experiments. In Year 2, P use efficiency was maximized at 80 lb acre$^{-1,}$ and Year 2 showed the same trend but with no statistical difference. Tissue P concentration in Year 1 consistently increased with higher P_2O_5 rates, but no significant difference was found in Year 2. Among soil P extractants tested in Year 1, Mehlich-3 and Mehlich-1 correlated well with P_2O_5 rates. However, Bray exhibited the

highest coefficient of determination (R^2 = 0.71), followed by Olsen (R^2 = 0.68). Bray also showed the strongest correlation with marketable yield (R^2 > 0.38) in Year 1. However, Mehlich-1 showed the strongest (R^2 = 0.20) in Year 2. Soil test P recovery (based on total P) revealed that Mehlich-3 extracted 80% of total P, whereas Mehlich-1, Bray, and Olsen extracted 71, 56, and 11%. If the current IFAS recommendation (no P application) were followed, growers would incur an average loss of up to $1,792 per acre yr^{-1}. More experiments should be carried out to confirm the present trend so it can be used for updating the current Mehlich-3 P interpretation for Central Florida should be revised. We recommend incorporating additional soil P tests, such as Bray and Mehlich-1, as official methods to improve P assessment and fertilizer recommendations.

[BMP-12] Evaluation of Phosphorus Fertilizer Best Management Practices for Fresh-market Bean.

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Phosphorus (P) is an essential nutrient for crops including snap bean. However, excessive amounts of P in waterbodies can adversely impact the ecosystem. Sustainable crop production calls for efficient phosphorus (P) management to maximize productivity while minimizing environmental losses. Florida ranks first nationally in the fresh market snap bean production. Florida's Clean Waterways Act requires the state to verify the implementation of Best Management Practices (BMP) on farms. One of the main BMPs is the use of soil test-based P fertilization. The current BMP for snap bean uses soil Mehlich-3 (M3) P values to determine how much P-fertilizer to apply: up to 120 lb/ac P2O5 when M3P <25 ppm (low), up to 80 lb/ac P2O5 when M3P is 25-45 ppm (medium) and no P-fertilizer when M3P is higher than 45 ppm (high). These recommendations are, however, based mainly on decades old research from mainly small-scale experiments on research farms that may not be representative or applicable to the state with diverse soils and hydrology, especially shallow water table environment of South Florida. A study was initiated in North, Central, and South FL in 2022 with funding from the state and conducted in cooperation with the bean growers, to assess the P fertilizer BMP. Results for three experiments conducted from 2022 to 2024 in south Florida will be presented. Dry P fertilizer rates of 0, 40, 80, and 120 lb/ac of P2O5 and a grower standard rate (80 to 113 lb/ac P2O5; dry plus liquid) were tested. Replicated experiments were conducted on large fields (10-45 ac) on commercial farms. Soil and plant nutrient concentrations, yield, weather, and hydrologic data were collected for two growing seasons. Pre-plant M3P levels varied from 49 ppm to 106 ppm. Preliminary findings indicated a statistically significant increase in yield to fertilizer P even when soil M3P values were above the current BMP threshold of 45 ppm. Early results also showed that water (irrigation and drainage) was also a co-factor in affecting differential yield response. Yield increases were up to 50% compared to the BMP treatment (0 lb/ac P2O5). Positive yield response to P fertilizer above the BMP recommended rates suggests that the current recommendations are likely to be insufficient for maintaining economical yields in South Florida and need to be revised. Phosphorus uptakes, use efficiencies, and potential losses—calculated through P balance—are being examined to update P recommendations. This study is ongoing for another year (2025-2026) to develop robust P recommendations to maintain current production while minimizing the P losses to the environment.

[BMP-13] Optimizing Phosphorus Application Rates for Snap Bean Production: A Three-Year Trial Summary in North Florida

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In our three-year field study, we examined the impact of phosphorus fertilization on snap bean yields, focusing on the crop's susceptibility to phosphorus deficiency. Using the 'Caprice' snap bean variety, we applied a Randomized Complete Block Design with four replications across five phosphorus rates (0 to 179 kg/ha of phosphorus pentoxide from triple superphosphate). The study assessed plant growth, nutrient uptake, pod yield, and soil properties. Our findings consistently showed that phosphorus fertilization significantly improved plant growth and pod yield, especially at rates exceeding 160 lbs/acre P_2O_5, particularly in soils with high aluminum and iron content. Additionally, data from North-Central and Northeast Florida soils with 70 to 140 ppm M-3 P indicated that 94% of treatments responded positively to phosphorus fertilization under 200 lbs/acre of P_2O_5, with pod yield increases ranging from 2,504 lbs/acre at 120 lbs/acre of P_2O_5 to 2,922 lbs/acre at 160 lbs/acre. Economic analysis revealed strong returns on investment for phosphorus fertilization. Fertilizer costs ranged from $90 to $150 per acre, with incremental market prices increasing by $1,252/acre at 120 lbs/acre of P_2O_5, resulting in net economic returns of $29,051,952 for Florida’s 25,000 acres of bean production. This research highlights the importance of optimizing phosphorus application rates for boosting snap bean yields and improving soil health, offering valuable insights for sustainable agricultural practices.

Mango Summit

Organizer: Nathalia Tello

[K-26 (MS-1)] Mango Cultivars Suited to Boutique Mango Growing in South Florida

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New mango cultivars developed in conventional controlled breeding programs over the last 20 years offer considerable potential for boutique orchard systems in Florida and beyond. 'Angie', 'Carioca', 'King Lion', 'Diamond', 'Jem', 'Nebula', and 'Sunny' have proven to flower with no chemical induction, yield consistent crops, have excellent disease tolerance and can be maintained in a high-density system of 3X4 m for over 12 years. All these cultivars are exceptionally unique in flavor and overall eating quality and have mass-appeal to a wide variety of consumers. They are adapted to sustainable and/or organic management systems that rely on physical inputs instead of modern chemical systems. All respond to yearly pruning and training programs with consistent flowering and fruiting. Under current climatic conditions in South Florida, these cultivars have flowered each year without chemical induction and suggest that they would be good candidates for mango growing in the tropics and for inclusion in crop improvement programs. There are many superior new mango cultivars and interspecific hybrids that are not included in this work due to insufficient information but evaluation is ongoing.

[K-27 (MS-2)] Description and comments on selected mango cultivars developed by Gary Zill, Zill High Performance Plants

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Florida currently has 3,644 acres of commercial mango production. The mango industry has entered a renaissance with new unique, high-quality cultivars and great enthusiasm by growers and consumers and expanded marketing avenues. This renaissance may be attributed largely to Gary Zill who began his mango selection program in 1992 and over a 33-year-period evaluated over 10,000 seedlings in a search to select superior quality mango cultivars. The selection criteria were based on his desire to select mangos with intense and more interesting Southeast Asian- and Chinese-like aromas and flavors. Over forty distinct selections were made. Here within are descriptions and comments on twenty-six new cultivars including All Season (All Summer), Butter Cream, Cecilove, Coconut Cream, Cotton Candy, Fruit Cocktail, Fruit Punch, Giselle, Harvest Moon, Honey Kiss, Karen Michelle, Lemon Zest, Little Gem, M-4, Orange Sherbert, Orange Essence, P22, Phoenix, Pina Colada, Pineapple Pleasure, Super Alphonso, Sugar Loaf, Super Julie, Sunrise, Sweet Tart, Ugly Betty, and Venus. Information on fruit quality and disease tolerance will be described. These described cultivars range from early to late season harvest, vigorous to less-vigorous trees, various peel colors, fruit shapes and sizes, a range of aromas and flavors, and varied disease resistance and production.

[K-28 (MS-3)] Exploring the World of Unripe Mangoes

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As the ethnic composition of the US has diversified in the past few decades, the ways that consumers are utilizing this fruit has also changed drastically. Whereas the original goal in developing commercial varieties, such as Tommy Atkins and Haden, was sweetness and color; now varieties such as Keitt are prized for their texture and sour flavor characteristics. Immigration from Latin American and Asia has been the main driving force behind this trend, which is altering the way farmers in Florida plant, maintain, and harvest their fruit. Many fields are now solely dedicated to harvest of baby and green mangoes to fulfill the demand of various ethnic communities across the US.

[K-29 (MS-4)] Mango Anthracnose Management: From Field Resistance to Cold Storage Solutions

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Controlling anthracnose is very important since this pathogen can rot mangoes within 8 days of shipment. The objective of this study was to discover possible sources of resistance to anthracnose in different mango species and to test if low temperatures help in reducing disease severity and prolong shelf life for mango exportation. Eight species of mango (*Mangifera casturi*, *M. indica*, *M. lalijiwa*, *M. laurina*, *M. odorata*, *M. rubropetala*, *M. sylvatica*, *M. zeylanica*) and seven *M. indica* cultivars (Irwin, Keitt, Kensington Pride, Maha Chanok, Nam Doc Mai, Sunny and Totapuri) were inoculated with a solution of 4 x 106 conidia/ml of pure culture of *Colletotrichum* sp. Mangoes were stored at 11° C (simulating an international shipment) and 25°C (simulating local market) for 15 days and then transferred to 25°C for 10 days. Anthracnose was evaluated at 15 and 25 days after inoculations (DAI). A wild *Mangifera* sp. and two *M. indica* varieties had significantly less anthracnose severity than other species and cultivars evaluated at 25 DAI. Mango fruit kept at 11°C had less anthracnose severity than fruits kept at 25°C. These findings are important because crosses of these species/varieties may be used in mango improvement programs to obtain resistance or tolerance to anthracnose. Shipping temperatures of 11°C can reduce disease severity and prolong shelf life of mango for export markets.

[K-30 (MS-5)] Mango Propagation in South Florida

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Successful mango production in South Florida and throughout the world depends on clonal propagation of the planting stock. The most economical and reliable method of mango propagation is graftage. Research into rootstocks for South Florida conditions is limited and the standard remains 'Turpentine'. Keys to grafting success depend on rootstocks adapted to our oolitic limestone or sandy soils, and high pH ground water. The most reliable grafting techniques are veneer or cleft grafts in smaller scale operations and chip budding under controlled conditions. The best results are obtained when night temperatures are consistently above 65 ^{o}F and daytime temperatures are from 85 to 90 ^{o}F. Considerable attention needs to be paid to disease and pest control and proper watering for good success. Grafted trees can be obtained for field planting in 2 years under most conditions and fruiting should be expected in year 4. Research into rootstocks and rootstock/scion combination is needed to move the industry into modern production systems.

[K-31 (MS-6)] Mango Nutritional Regimen for Florida Grower

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The rapid expansion of mango (Mangifera indica L.) cultivation in Florida has presented growers with a range of agronomic challenges, particularly those related to the state's distinctive soil composition and subtropical climate. A critical factor in achieving sustainable yields and high fruit quality is the proper understanding and management of mango tree nutrition under Florida-specific conditions. This report, presented by Alexander Salazar, synthesizes current knowledge and field observations to identify common nutritional deficiencies and imbalances observed in

Florida-grown mango orchards. Additionally, it proposes a practical, stage-specific fertilization regimen—from establishment through fruiting—aimed at optimizing tree health and productivity. The findings are intended to support both scientific understanding and practical decision-making for commercial mango producers in Florida.

[K-32 (MS-7)] Mango Fruit Drop

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Mango fruit drop is a common and normal occurrence in mango production, marked by the premature dropping of immature fruits at various stages of development. Factors that contribute to mango fruit drop include nutrient deficiencies, environmental stress, pest and disease pressure, and insufficient pollination. While extreme weather events such as hurricanes and cold temperatures are beyond growers' control, there are targeted methods growers can utilize to manage fruit drop. This presentation explores the best management practices to help reduce fruit drop including irrigation, proper fertilization, and disease management. It also shares insights from three experienced commercial mango growers in Southwest Florida, highlighting challenges posed by extreme weather events and localized microclimates as underlying contributing factors. While the complexity of mango fruit drop may prevent a one-size-fits-all solution, combining research-based approaches coupled with practical, grower-informed strategies may support a better understanding of the issue. This integrated perspective may help enhance fruit retention, improve yields, and promote the sustainability of mango production in Florida's subtropical climate.

[K-33 (MS-8)] Marketing Considerations for Farmers' Markets in Northwest Florida

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Marketing is a critical factor in the long-term success of small fruit and vegetable farms. While many producers are drawn to the production side of farming, effective marketing strategies are necessary for profitability and sustainability. Farmers' markets offer a valuable platform for direct-to-consumer sales and brand building. By addressing legal, logistical, and promotional aspects of market participation, the resource supports the growth of local agriculture and helps build resilient farm businesses across Florida.