**Abstracts**

**FES Presidential Address**

**Rui-de Xue** - Anastasia Mosquito Control District, 120 EOC Drive, Saint Augustine, FL 32092; xueamcd@gmail.com; 904-471-3107

Why have the vector-borne diseases increased recent year? **-** The outbreak and reemerging of vector-borne diseases are one of major problems and challenges for public health. Recently the number and frequency of outbreaks of vector-borne diseases have been increased worldwide. Due to the changes of climate, deforestation, global migration, transportation, urbanization, and globalization, the disease pathogens and vectors have been spread worldwide quickly, such as malaria, chikungunya virus, dengue fever, and Zika virus and one of potential vector mosquitoes, *Aedes albopictus*. Based on the transmission of vector-borne diseases and multiple influencing factors, the potential outbreak of next vector-borne diseases has been discussed and predicted for the nearly future.

**PIONEER LECTURE**

John Ruberson - Department of Entomology, Kansas State University, Manhattan, KS  66506-4004; jruberson@ksu.edu; 785-532-6154

The Wonderfully Weird World of Will Whitcomb - Willard Whitcomb was a memorable character who had a keen eye for arthropods, a penchant for travel, and a deep love for biological control. He also was an old-school explorer and naturalist who loved to discover new creatures and ideas. Will’s lifetime of work contributed significantly to the understanding and implementation of conservation biological control by characterizing the diversity and action of predators in agroecosystems, especially highlighting the value of generalist predators.

**PhD oral paper competition**

1. **Sang-Bin Lee**, Thomas Chouvenc and Nan-Yao Su - Entomology and Nematology Department, Ft. Lauderdale Research and Education Center, University of Florida, FL 33314-3205; lsb5162@ufl.edu; +1-754-465-4019

Individual foraging behavior of the Formosan subterranean termite - The Formosan subterranean termite, *Coptotermes formosanus* Shiraki, is an important structural pest in the temperate and subtropics regions. It is a social insect and may contain millions individuals in a single colony. Studies shown that only a portion of *C. formosanus* workers inthe colony forage out for food. In this study, we measured foraging frequencies, foraging duration and time interval of foraging using 2-yr old *C. formosanus* colony. A container (central nest) was connected to planar arena (foraging site) by an acryl tube and the container was filled with organic soil. At the foraging site, a piece of spruce wood was placed and a camera was mounted on top of the arena in order to record its behavior. A group of worker was collected near the wood and 15 workers were marked externally by different color of paints. Foraging frequencies of individuals varied and some worker exhibited a high frequencies of foraging behavior than the others. A forager spend the majority of their time at the foraging site rather than traveling to central nest.

1. **Christopher S. Bibbs**, Daniel A. Hahn, Phillip E. Kaufman, Rui-De Xue - Anastasia Mosquito Control District of St. Johns County, 120 EOC Drive, Saint Augustine FL, 32092; chrisfish89@ufl.edu; cbibbsamcd@bellsouth.net; (904) 471-3107 x335

Downstream biotic shifts in container-inhabiting mosquitoes after sub-lethal exposure to transfluthrin vapors - It is generally assumed that mosquitoes surviving exposure to spatially repellent volatile pyrethroids when attempting to bite a host will not have significant negative impacts on their downstream biology. To examine this, laboratory reared *Ae. aegypti* and *Ae. albopictus* were exposed to three sub-lethal concentrations of transfluthrin before being offered a blood-meal. After being allowed 72h to oviposit, both species expressed reduced skip-oviposition behavior and a 50% or greater reduction in viable eggs. Egg collapse was observed in *Ae. aegypti* that increased with exposure concentrations. Additionally, dissections of both species showed mosquitoes retained an average of 20% their egg yield, with *Ae. albopictus* retaining a significant proportion of prematurely melanized oocytes following the highest exposure. These results show that volatile pyrethroids can reduce skip-oviposition and fecundity, which improves our confidence in recommending them for urban vector management.

1. **Reina L. Tong** and Nan-Yao Su - Entomology and Nematology Department, Ft. Lauderdale Research and Education Center, University of Florida, FL 33314-3205; reinat@ufl.edu; 808-253-1182

Addition of exuviae to young *Coptotermes gestroi* (Wasmann) colonies increases biomass gained in a nitrogen-poor environment - In light of the observation that all *Coptotermes formosanus* Shiraki termites molt at the central nest (where reproductives, eggs, and larvae are located), it was hypothesized that this behavior is an efficient means to feed exuviae, a possibly nitrogen-rich source, to the queen for more egg production, or to larvae for their growth. An avenue to investigate this is to determine whether young colonies of *C. gestroi* (Wasmann) gain more biomass when fed additional exuviae. Male and female primary reproductives were paired and weighed, and added to a vial with a nitrogen-poor or nitrogen-rich substrate, wood, and agar. At three months, all caste members were counted and weighed, and one of four exuviae addition treatments (0, 1, 5, or 10 exuviae) were added to the vial. After 6.5 months, all caste members were counted and weighed, and the biomass gained (colony weight at 6.5 months minus the colony weight at three months) was square-root transformed and subjected to an analysis of variance. Substrate and exuviae added were significant sources of variation. When analyzed by substrate, exuviae added was not a significant source of variation for the nitrogen-rich substrate, but was a significant source of variation for the nitrogen-poor substrate. In nitrogen-poor environments, feeding on additional exuviae led to greater biomass gained, lending insights into why *Coptotermes* termites molt at the central nest.

1. **Emilie P. Demard** and Jawwad A. Qureshi - University of Florida, Indian River Research and Education Center, 2199 South Rock Road, Fort Pierce, 34945, Florida; edemard@ufl.edu; 772-801-1430

Composition, Abundance and Distribution of Phytophagous Mites in Citrus Under Protective Screens (CUPS) **-** The bacterial disease Huanglongbing (HLB), transmitted by the vector Asian citrus psyllid (ACP) *Diaphorina citri*, is currently devastating the Florida’s citrus industry. Citrus Under Protective Screen (CUPS) exclude ACP and allow to produce HLB-free citrus. However, other pests such as mites, thrips and leafminers are able to enter and infest citrus through the mesh used to construct CUPS. Mites feeding on the foliage and fruit affect quality and marketability of the fruit particularly for fresh fruit markets. The objectives of the study were to determine the composition, abundance and distribution of mite species on ‘Ray Ruby’ grapefruit (*Citrus paradisi*) grown in the CUPS and open-air control. Data were collected from four CUPS at Indian River Research and Education Center, Fort Pierce, FL, planted in Sept 2013 at a density of 1,957 trees/ha each with a total of 128 trees on two rootstocks and planting systems. Each control contained 96 trees. Leaves and fruits were sampled for mites from 20 randomly selected trees in each of the four CUPS houses and respective open-air control during spring and summer 2018. A 10x hand lens was used to observe and count mites. A complex of species from at least three families was identified: Eriophyidae, Tetranynchidae and Tarsonemidae. Findings on composition, abundance and distribution of the species and implications for management will be discussed.

1. **Jayshree Patel,** Thomas Chouvenc and Nan-Yao Su - Entomology and Nematology Department, Ft. Lauderdale Research and Education Center, University of Florida, FL 33314-3205; Jayshree.patel@ufl.edu; 201-993-0727

Colony growth and wood consumption rates of the two invasive *Coptotermes* species and their hybrids over a four-year period - Two invasive subterranean termite species, *Coptotermes formosanus* Shiraki and *C. gestroi* (Wasmann) are now established in South Florida. Recently, it was discovered that they have the ability to hybridize owing to their sympatric distribution and overlapping dispersal flight seasons. This study examined the colony growth of the three and four-year-old colonies established in laboratory with four mating types; ♀*C. gestroi* × ♂*C. gestroi*, ♀*C. formosanus* × ♂*C. formosanus*, ♀*C. gestroi* × ♂*C. formosanus*, and ♀*C. formosanus* × ♂*C. gestroi*. The number of termites per caste were counted and weighed to determine the colony biomass. Before processing the colonies, the termites were allowed to feed on known amount of wood for one week and then the dry weight was taken to calculate the wood consumption rate (WCR) to determine if it can be used to infer colony size. A previous study with limited number of replicates has reported that after one year, the incipient laboratory hybrid colonies showed high vigor by producing double the number of offspring as compared to the parent species. However, at three and four years the hybrid colonies showed less vigor as compared to parental species in terms of colony growth. For each mating type, there was a linear relationship between colony mass and WCR. Thus, WCR can be used for inferring the colony size without counting each individual in a colony.

1. **Ploy Kurdmongkoltham** and Hugh A. Smith – UF/IFAS Gulf Coast Research and Education Center, 14625 CR 672 Wimauma FL 33598; pkurdmongkoltham@ufl.edu; 770-328-2734

Pest management priorities among Florida’s tomato producers **-** Florida fresh-market tomato production ranks first in the U.S. for total value, acreage, and production. In 2017, Florida produced 33,600 pounds per acre and totaled $262 million in production value. Production costs are approximately $7,000 per acre. Pest management expenses accounts for up to 25% of total cost. Growers apply insecticides most frequently for whiteflies (*Bemisia tabaci*) but must also manage other economically important pests including leafminers, thrips, lepidopteran pests, and stink bugs. Due to overlapping cropping season and subtropical conditions, pest pressure in Florida’s tomato production leads to intensive use of insecticide. A survey of Florida’s tomato producers was carried out to collect information on pest management including insecticide use, resistance management, and costs.

1. **Sasha Clarke**. M. Paris, W. B. Hunter, S. E. Brown, and J. A. Qureshi- University of the West Indies, Department of Basic Medical Sciences, Biochemistry Section, Kingston, Jamaica; sashakayclarke@yahoo.com; 561-502-2186

Assessment of Psyllid-dsRNA Off-Target Effects (Predator: Prey) - In agriculture, a dsRNA trigger needs to be species specific so that beneficial insects remain unharmed. Hemipteran pests are a food source for many predatory insects. Assessment of Arginine Kinase (AK) dsRNA made specifically to *Diaphorina citri,* Asian citrus psyllid (Hemiptera: Liviidae) (dsRNA-Dc) was validated as a new strategy to reduce psyllid vectors of citrus greening disease pathogens. Selecting a suitable gene target for RNAi is crucial, Arginine Kinase is an enzyme that plays a critical role in balancing cellular energy in invertebrates. Since AK is not present in vertebrates it provides a good target for insect pest control. Significant mortality was seen in psyllids fed with AK-dsRNA in comparison to the control (water only). To address RNAi and species specificity, treated adult psyllids were provided to lady beetle, *Hippodamia convergens* (Coleoptera: Coccinellidae) and treated nymphs to the parasitoid *Tamarixia radiata* (Hymenoptera: Eulophidae). These two species are important natural biological control agents of *D. citri* and pest control treatments should not negatively impact them. *H. convergens* and *T. radiata* were then processed post ingestion to analyze their AK transcripts for changes in expression. No significant differences in gene expression were observed. Suggesting that properly designed dsRNAs could be used without harming off-target species.

1. **Joseph F. Velenovsky**, Thomas Chouvenc, Francesca De Martini, Gillian H. Gile, and Nan-Yao Su - Entomology and Nematology Department, Ft. Lauderdale Research and Education Center, University of Florida, FL 33314-3205; jvelen10@ufl.edu; 410-726-0560

Quantitative changes in symbiotic parabasalids within *Coptotermes gestroi* (Wasmann) (Insecta: Blattodea: Rhinotermitidae) kings and queens during incipient colony development **-** The obligate mutualistic symbiosis between subterranean termites and their hindgut protozoa is a well-known and well-characterized example of a symbiotic relationship. Despite the characterization of *Coptotermes gestroi* (Wasmann) as a major structural pest, and the ample attention that has been given to protozoa present within other subterranean termites, the parabasalid symbiont community within *C. gestroi* had not been elucidated until recently. Five parabasalids reside within the hindgut of *C. gestroi*: two species within the genus *Holomastigotoides*, two species within the recently reestablished genus *Cononympha*, and a recently described species within the genus *Pseudotrichonympha*, *Pseudotrichonympha leei*. This study estimated the total number of all three protozoan genera combined and *Pseudotrichonympha* individually, present within *C. gestroi* field-collected alates, and kings and queens present within incipient colonies that were 35, 60, 75, 90, 105, and 120 days post colony foundation through utilization of hemocytometer protocols. Differences in protozoan abundance were found between kings and queens as well as over incipient colony development. The dynamic nature of protozoa within the royal pair during incipient colony development may reflect the shift from biparental to alloparental care that occurs once workers are present within a developing colony.

1. **Rafia A. Khan,** D. R. Seal, S. Zhang, O. Liburdand E. G. Evans - Tropical Research and Education Center, University of Florida IFAS, Homestead, FL; rkhan@ufl.edu

Ornamental plants, as hosts of Tomato Chlorotic spot virus and its vector thrips (Thysanoptera: Thripidae) in tomatoes - Tomato chlorotic spot virus (TCSV) is an emerging tospovirus in South Florida causing 20-30% yield loss each year. Thrips are the effective vectors of TCSV. Ornamental plants in South Florida show high abundance of thrips of different species. Western flower thrips (*Frankliniella occidentalis*), common blossom thrips (*F. schultzei*) and melon thrips (*Thrips palmi*) are the most common thrips species among them. In this study we used seven ornamental plants as treatments in a greenhouse situation with tomato as a main crop to observe their effect on TCSV incidence and TCSV vector thrips abundance in tomatoes. We have found western flower thrips as the dominant thrips in all ornamental plants. Incidence of TCSV infected tomato plants was observed with all ornamental treatments. Tomatoes with purslane showed higher number of TCSV infected plants. The above information will be helpful to develop a sustainable management practice against thrips and thrips transmitted tospovirus problem.

1. **De-Fen Mou** and Brian Bahder - Entomology and Nematology Department, Ft. Lauderdale Research and Education Center, University of Florida, FL 33314-3205; defenmou@ufl.edu; 954-240-8372

Population monitoring of Auchenorrhynchan insects associated with lethal bronzing disease (LBD) and potential vectors of LBD - Lethal Bronzing Disease (LBD) is caused by the 16SrIV-D phytoplasma and is known to spread in Florida and Mexico. The disease results in massive economic losses and continues to threaten the sustainability of palm production. Phytoplasmas are a group parasitic bacteria that colonize plant phloem cells. The phloem-limited phytoplasmas are exclusively transmitted by phloem-feeding insects. Therefore, the vector of LBD is undoubtedly one of the critical factors in disease progression. Knowing the vector of the phytoplasma disease is an important aspect of disease management. However, the insect vector of LBD remains unknown. To determine the potential vector candidate of LBD, we investigated the hemipteran population dynamics and screened hemipterans collected on sticky traps for the presence of the phytoplasma at the Fort Lauderdale Research and Education Center where the disease is actively spreading. Two hundred and three individuals of hemipteran were collected and tested. Among them, *Haplaxius crudus* (Cixiidae) and *Idioderma virescens* (Membracidae) were found to carry the phytoplasma by nested PCR. Additionally, *H. crudus* is the most abundant species of the survey. The results suggest that *H. crudus* and *I. virescens* are the potential vectors of LBD. However, the phytoplasmas can be detected due to the residual pathogen from the non-vector insect gut which feeds on the diseased plant. Further research is needed to confirm the transmission ability of the potential vectors. We will investigate the vector of LBD further to provide substantial evidence of insect vector of LBD and contribute to the disease management.

**M.S. oral paper competition**

1. **Arjun Khadka -** Entomology and Nematology Department, University of Florida, Gainesville, FL, 32611; akhadka@ufl.edu; (352) 262-4659

Assessment of Developmental Hosts and Host Preference of *Halyomorpha halys* (Stål) Using Common Plant Species of Florida - Although established populations of *Halyomorpha halys* are not in Florida, interception and detection records exist. For the identification of developmental hosts, plant species such as apple, okra, sunflower, amaranthus, tangerine, olive, plum, pear, pomegranate and satsuma were evaluated in no-choice and choice test. Life cycle completion to adults was reported in apple, satsuma and pear. Mean feeding was high in apple, satsuma, plum, okra and pear. No feeding was observed on olive and pomegranate. Plant species was a significant factor for feeding and survival in choice tests (P<0.001). Mean feeding and survival in choice tests was higher in apple and tangerine.

1. **Eric Roldán Salazar**, J. Beuzelin, M. VanWeelden, R. Cherry, M. Karounos, K. Shaber, L. Baucum- Everglades REC, UF/IFAS, 3200 E. Palm Beach Rd., Belle Glade, FL 33430; erikroldan@ufl.edu; (561) 261-0792

Survey of the sugarcane borer and ants in sugarcane fields across the Everglades Agricultural Area of Florida - Thirty-two sugarcane fields in the Everglades Agricultural Area were selected in areas with shallow organic, deep organic, and mineral soils. Each field was sampled during the 2017 growing season to determine population levels of the sugarcane borer (*Diatraea saccharalis*) and ants. Between July and September, sampling using plastic tubes baited with hot dog sausage showed that seven ant species were actively foraging in sugarcane fields. The red imported fire ant (*Solenopsis invicta*), a predator of the sugarcane borer, was the most abundant ant across the three soil types, representing 48 to 87% of the collected ants on mineral and shallow organic soils, respectively (both observations in early August). Differences in red imported fire ant abundance among the three soil types were not detected. *Pheidole moerens* was 2.4-fold more abundant on deep organic soils than on shallow organic and mineral soils whereas *Nylanderia bourbonica* was 4.8-fold more abundant on mineral soils than on shallow and deep organic soils. In October, sugarcane borer injury was observed in 22% of the fields. However, out of the 1,600 stalks sampled (50 stalks/field), only 0.7% of stalks sustained bored internodes and only one sugarcane borer larva was observed. These results suggest that sugarcane borer infestations were extremely low during the 2017 sugarcane growing season and that the red imported fire ant continues to be a major predator, regardless of soil type. However, soil type can impact the abundance of other ant species.

1. **Edward Traczyk,** Xavier Martini, Joe Funderburk and Heather McAuslane – UF/IFAS North Florida Research and Education Center, Quincy, FL 32351; etraczyk@ufl.edu; 850-866-5714

Behavioral Changes of a Minute Pirate Bug, *Orius insidiosus* (Say) (Hemiptera: Anthocoridae), in Response to Various Contact Cues - The minute pirate bug, *Orius insidiosus* (Say) (Hemiptera: Anthocoridae), is an important natural enemy of a variety of flower thrips species, including the western flower thrips, *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae), which have become a worldwide pest to growers in both fields and greenhouses and are responsible for an estimated $1 billion U.S. dollars in crop damage each year. While the predatory species is commonly exploited in many integrated pest management programs to combat thrips populations, behavioral manipulation at the organismal level is still not fully understood, particularly in response to different contact cues that are commonly experienced in many of their environments. This experiment examined the behavioral changes of adult *O. insidiosus* in the presence and absence of various contact cues to determine if changes in search behaviors exist, and whether those changes were stronger or weaker among different cues. Using Ethovision tracking software, individual starved *O. insidiosus* adults were subjected to motion tracking on filter paper treated with various contact cues provided by western flower thrips larvae and conspecific adults. Velocity, angular velocity, and highly mobile/immobile time were recorded and analyzed. Current data show significant decreases in highly mobile time from wild *Orius* exposed to thrips cues, as well as more intensive search behaviors from reared *Orius* populations in relation to wild populations, regardless of treatment, suggesting the presence of arresting molecules in thrips cues and behavioral adaptations to enclosed environments.

1. **Jessica Awad** and Amanda Hodges - Entomology and Nematology Department, University of Florida, Gainesville, FL, 32611; jess1031@ufl.edu; 802-497-4778

Laboratory rearing and sex ratio of *Apanteles opuntiarum* (Hymenoptera: Braconidae), a potential biocontrol agent of *Cactoblastis cactorum* (Lepidoptera: Pyralidae) - The cactus moth, *Cactoblastis cactorum* (Berg) (Lepidoptera: Pyralidae), is an invasive species in North America, where it poses a threat to *Opuntia* species of economic and ecological importance. The parasitoid *Apanteles opuntiarum* Martinez & Berta (Hymenoptera: Braconidae) is currently under evaluation as a potential biological control agent. This study was conducted to develop a parasitoid rearing protocol, with special attention to laboratory sex ratio and the effects of inbreeding. The parasitoid rearing method utilized a natural cactus host diet. Female wasps were mated with siblings, non-siblings, or a combination. Clutch size, clutch number, and offspring sex ratio were recorded. The effects of sibling mating on these factors were analyzed. Offspring of sibling-mated parasitoids exhibited a significant increase in female sex ratio. The rearing method produced six successive generations in captivity with no additional introductions of genetic material. Hence, the protocol appears suitable for long-term maintenance of quarantine colonies. The effects of inbreeding suggest that natural populations of *A. opuntiarum* are subject to local mate competition. Therefore, some amount of inbreeding is recommended for maintenance of an optimal sex ratio of *A. opuntiarum* in laboratory colonies. Implications for North American host range testing are discussed.

1. **Mike Karounos**, Ron Cherry, Calvin Odero, Hardev Sandhu, and Julien Beuzelin – UF/IFASEverglades Research and Education Center, 3200 E Palm Beach Rd., Belle Glade, FL 33430; wompum@ufl.edu; (859) 312-6450

Laboratory study of host plant preference of *Melanotus communis* (Coleoptera: Elateridae) in Florida Sugarcane **-** Click beetles are major economic pests of southern Florida sugarcane. We surveyed weeds frequently found in agricultural fields as alternative hosts, measuring residency preference of adults using whole plant juices and larval host selection using plant roots. Adults were tested with muck residences while larvae were tested in both muck and sand soils found in the Everglades agricultural area. In these free choice tests, adults and larvae showed preference for sugarcane over grassy and broadleaf weed hosts.

1. **Annie Mills,** J. Beuzelin, D. Seal, and S. Allan - UF/IFASEverglades Research and Education Center, 3200 E Palm Beach Rd., Belle Glade, FL 33430; anne.mills@ufl.edu; 518-573-9224

Testing commercially available chemical lures for corn silk fly (Diptera: Ulidiidae) monitoring in sweet corn of Florida’s Everglades Agricultural Area - Three commercially available lures and two potential chemical attractants were tested in white, yellow, and green universal bucket traps and differences of corn silk fly (Diptera: Ulidiidae) species capture rates were evaluated. Torula Yeast, ammonium carbonate, ammonium acetate, 1,4 dimethoxybenzene (1,4 DMB), putrescine, and an empty control trap were placed in a sweet corn field at first silk at the UF/IFAS Everglades Research and Education Center, Belle Glade, FL in December 2017. Fly samples were collected twice a week for 26 days. In total, 1,290 flies were collected, and the majority of silk flies captured were *Chaetopsis massyla* with a capture percentage of 78.6%, followed by *Euxesta* *eluta* at a rate of 11.6% and *Euxesta* *stigmatias* at a rate of 9.8%. The majority of flies captured were females at a rate of 77.9% and the two ammonium lures proved to be most attractive to corn silk flies. A second trapping study in April 2018 tested the potential synergy of 1,4 DMB and putrescine with the two ammonium lures and measured effects on species composition monitoring. Results are yet to be evaluated, but lure combinations results in this trial will also be discussed. Both studies focus on landscape dynamics and corn silk fly population composition with efforts to improve silk fly population monitoring and insecticide timing decisions for crop consultants, extension agents, and growers.

1. **Austin N. Fife**, Xavier Martini, and Erik J. Wenninger **-** UF/IFAS North Florida Research and Education Center, Quincy, FL 32351; afife@uidaho.edu; 208-874-2283

Settling behaviors of the potato psyllid, *Bactericera cockerelli* (Hemiptera: Triozidae), on different germplasms **-** Zebra chip disease (ZC) in potato is associated with “*Candidatus* Liberibacter solanacearum” (Lso), which is transmitted by the potato psyllid *Bactericera cockerelli* (Šulc) (Hemiptera: Triozidae). ZC can cause large economic losses when disease incidence is high. ZC management is currently focused on managing the psyllid vector with insecticides. Host plant resistance to ZC has been pursued as a possible means of management, but no commercial potato variety has been found to resist the ZC pathogen. Three Lso-resistant breeding clones derived from *Solanum chacoense* L. were selected to screen for antibiotic and antixenotic effects: A07781-10LB (10LB), A07781-3LB (3LB) and A07781-4LB (4LB). ‘Russet Burbank’ (*Solanum tuberosum* L.) was used as a susceptible control. No-choice assays were performed on leaflets of intact plants during which behavior of psyllids was monitored. We observed four classes of behavior: probing/feeding, walking, cleaning and leaving the leaf. Probing incidence and frequency was highest on Russet Burbank. Female psyllids walked more frequently on Russet Burbank than both sexes on 10LB and 3LB. Females walked more on Russet Burbank than males. Male psyllids walked more on 4LB than both males on 10LB and females on 3LB. Our results suggest possible antixenotic effects between germplasms and help elucidate their modality of resistance.

1. **Nicholas Johnston**, Philip A. Stansly, Lukasz L. Stelinski, and Nabil Killiny – UF/IFAS Southwest Florida Research and Education Center, Immokalee, FL 34142; njohnston8979@ufl.edu; 210-788-9326

Behavior and Physiology of the Asian Citrus Psyllid (*Diaphorina citri* Kuwayama) in Response to Secondary Host Feeding - The Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama, remains the most economically important and difficult to manage pest in citrus throughout Florida. To better understand ACP’s physiological response to secondary hosts and how these factors affect dispersal in the absence of a true reproductive host, potential secondary host plants *Bidens alba*, *Ludwigia octovalvis*, and *Eupatorium capillifolium* were investigated. Survivorship under “no choice” conditions was evaluated on secondary hosts compared to a reproductive host as well as fat body content and chemical signature of honeydew using gas chromatography mass spectrometry (GC-MS). To determine behavioral factors relating to dispersal, a series of “choice” trials was also conducted. Both *Bidens alba* and *Eupatorium capillifolium* increased ACP survivorship by 2-fold compared to starvation conditions. Honeydew of ACP feeding on *B. alba* had high amounts of fatty acids indicative of triglyceride breakdown. However, fat body content of ACP feeding on secondary hosts decreased at a slower rate compared with starvation. While secondary hosts were not shown to support reproduction and long-term survival, these findings support the hypothesis that ACP can use secondary hosts such as *B. alba* as temporary reservoirs when ideal host conditions are unfavorable, returning to previous or neighboring groves after dispersal.

**Symposium 1 - Biology and Control of Human and Animal Disease Vectors (12)**

1. **Ulrich R. Bernier** USDA-ARS-ONP, 5601 Sunnyside Ave, Beltsville, MD 20705; uli.bernier@ars.usda.gov; 301 504 4736

Overview of Recent Accomplishments in USDA-ARS National Program 104: Veterinary, Medical, and Urban Entomology - The Agricultural Research Service (ARS) is the in-house research agency of the USDA. The research conducted by the agency is categorized into 16 National Programs. National Program 104 (NP 104) consists of approximately 40 multidisciplinary scientists, who conduct research in seven locations. The goal of the research is the reduction of arthropod damage to animals, humans, and structures. The research in this program targets the vectors that are responsible for pathogen transmission, and ultimately, diseases in humans and animals, as well as invasive and established ants that harm structures, humans, and animals. Some of the most important research accomplishments from the NP 104 program and its predecessors have been Theobald Smith’s discovery of Babesia transmission by Cattle Fever ticks, the discovery of the mosquito repellent, DEET, which present day is still the most used repellent for personal protection from biting arthropods, and sterile insect technology (SIT), the approach used to eradicate the New World Screwworm (NWS) from the United States. Some of the more recent work in NP 104 has focused on improved protection of the U.S. military from mosquitoes and other biting flies, improved protection of livestock from ticks and biting flies, and new and improved control of invasive ants. This presentation will cover some of the recent discoveries and products that have resulted from NP 104 research.

1. **Herbert Nyberg**, and Samuel S.C. Rund - 6 Hawthorne Road, Old Lyme, CT 06371; sales@newmountain.com; (860) 691- 1876

Novel insights of mosquito larvae respiration revealed through acoustical dissection of the tracheal system - Acoustic Larvicide is where acoustic energy is introduced into a mosquito larvae habitat at resonance with the gas within the tracheal system. When the energy is strong enough it ruptures the dorsal tracheal trunk causing mortality or non-flightworthy mosquitoes. This technology has revealed new insights into the tracheal system as well as other internal structures which are critical in enabling effective acoustic larvicide.

1. **Caroline A. Efstathion,** Nathan D. Burkett-Cadena, William H. Kern, Jr. - Florida Department of Agriculture and Consumer Services, 3125 Conner Blvd. Lab 6, Tallahassee, FL 32399; Caroline.Efstathion@FreshFromFlorida.com; 850-879-0431

Mosquito feeding behavior on nestling Barn Owls in South Florida - Birds play an important role in amplification and dissemination of arboviruses. Birds are fed upon heavily by mosquitoes during nesting season, but details regarding age-related mosquito attack of nestlings are few, data that could be important in understanding arbovirus transmission cycles. We studied mosquitoes attacking Barn Owls (*Tyto alba*) nesting in artificial nest boxes in sugarcane fields in Florida. Mosquito suction traps were fixed to the outside of eight nest boxes to collect mosquitoes over a 24-hour period (one trap night) once weekly, from incubation until all nestlings fledged. The dominant mosquito species captured were *Culex* *nigripalpus*, *Mansonia* *dyari* and *Ma. titillans*. The highest total number of mosquitoes and blood fed mosquitoes captured in a suction trap in one trap night was 3,193 and 379 respectively. Nestling age influenced the total number of mosquitoes captured, with the highest numbers between 22 and 42 days of age. The highest numbers of blood fed mosquitoes were captured when nestlings were between 22 and 28 days of age, corresponding to post-brooding period. This temporal window of highest mosquito attack could be important in the amplification of arboviruses that affect human health, such as West Nile virus, St. Louis encephalitis virus, and eastern equine encephalitis virus.

1. **Daniel Dixon,** Dena Autry, Joseph D’Amato, and Rui-de Xue - Anastasia Mosquito Control District, 120 EOC Drive, Saint Augustine, FL 32092; ddixonamcd@gmail.com; 904-484-7336

Arbovirus surveillance at the Anastasia Mosquito Control District of Saint Johns County - The Anastasia Mosquito Control District (AMCD) uses multiple methods for the surveillance of arboviruses in Saint Johns County. The primary method for disease surveillance is the Sentinel Chicken program. Ten sites dispersed throughout the county are monitored weekly and blood samples are submitted for analysis of arboviral titers. To monitor arboviruses vectored by container-inhabiting mosquitoes, 12 Biogents Sentinel Traps are dispersed throughout urban areas. Any *Aedes aegypti* or *Aedes albopictus* collected in these traps are tested for the presence of Dengue, Chickungunya, and Zika viruses via PCR at the Bronson Animal Disease Diagnostics Laboratory. Last, gravid traps are set to collect Culex mosquitoes for in-house West Nile Virus testing via endpoint PCR, the RAMP assay, and LAMP assay using the Genie III. Ultimately, these methods are used collectively to monitor for the presence of arboviruses and protect the citizens of Saint Johns County.

1. **H. Chen**, M. Tressler, S Bartlett, B Morgan, J Gamble - Volusia County Mosquito Control, 801 South St., New Smyrna Beach, FL 32168; hchen@volusia.org; (386) 424-2920

The vector mosquitoes of eastern equine encephalitis virus captured in the light traps in Volusia County, Florida - *Culiseta melanura* is a primary EEEV vector between birds, and *Coquillettidia perturbans* is known as a ‘bridge’ vector transmitting EEEV between birds and mammals. Both species are frequently captured on light traps in Volusia. In this presentation, the trap data in the past few years are summarized, and management of these mosquitoes and EEE prevention via vector control are discussed.

1. **Mohamed F. Sallam,** Sarah R. Michaels, Brendan Carter, and Claudia Riegel - New Orleans Mosquito, Termite, and Rodent Control Board, 2100 Leon C Simon Dr. New Orleans, LA 70122; mfsallam@nola.gov; (504) 607-2362

Aedes Density or Vector-Host Contact (VHC) Ratios: Ecological Niche Modeling Approach in Understanding Spatio Distribution of Aedes vectors in the City of New Orleans, LA, USA - Asian tiger and yellow fever mosquitoes (Aedes albopictus and Ae. aegypti) are global nuisances and are competent vectors for viruses such as Chikungunya (CHIKV), Dengue (DV), and Zika (ZIKV). Few studies adopted a comprehensive system approach to model spatial-temporal distribution pattern of both Aedes vectors highlighting the interaction between environmental, socioeconomic, meteorological and topographic subsystems. In our study, we utilized two ecological niche modeling approaches encompassing density and vector-host contact ratios to predict the spatial distribution of Aedes vectors in response to the biophysical systems in the city of New Orleans, LA (NOLA). We used regression analysis to select the influential factors that significantly predicts both Aedes density and vector-host contact ratios. The selected influential factors were eventually used in generating risk maps by MaxEnt. We examined the reliability of both approaches in predicting areas under risk of increased biting rate within active flight range of Aedes vectors. A 30 m distribution risk maps were generated to improve routine mosquito surveillance and control activities in NOLA, especially during outbreaks. The magnitude of spatial distribution of both mosquito vectors and response to their predicting variables are discussed.

1. **Jerome Hogsette** - USDA-ARS-CMAVE, 1600 S. W. 23rd Drive, Gainesville, FL 32608; jerry.hogsette@ars.usda.gov; 352-328-6839.

Stable fly trapping studies at the Smithsonian National Zoo **-** Stable flies, *Stomoxys calcitrans*, are a major problem at the Smithsonian National Zoo (SNZ) and at other zoos as well. Fly breeding possibly occurs at the WNZ but we have never been able to locate breeding sites. Thus, the management strategy has been to capture the adult flies faster than they are arriving at the zoo. Originally trapping was done by placing traps around the perimeter of animal exhibits, but fly numbers were usually low because these we not ideal trap sites. In 2006 we were allowed to place traps within two selected exhibits and protect the traps from the resident animals with electric fences, commonly used at zoos. This increased the number of flies captured significantly. During the summer of 2017, we expanded our trapping to three exhibits and surrounded some traps with hot grass instead of fencing. Results were similar and both protection methods prevented animal contact with the traps.

1. **Daniel L. Kline** - USDA-ARS, CMAVE Gainesville, FL 32608; Dan.kline@ars.usda.gov

Spatial repellents: what is their future in vector management? - Vector-borne diseases is an on-going challenge that agencies responsible for public health ARE FACED WITH. Recent outbreaks of chikungunya and Zika have highlighted the need for new tools to complement the limited number of traditional approaches, such as ground and aerial applications of chemical insecticides, used to manage vector populations. Recent studies have demonstrated the ability of spatial repellents to interfere with vector-human contact. Thus, spatial repellents seem to be a potential tool to positively impact human health. In this presentation the current status and potential future use of spatial repellents as a tool for improving public health will be discussed.

1. **Phillip E. Kaufman**, Nicholas Tucker and Emma N.I. Weeks **-** Entomology and Nematology Department, University of Florida, Gainesville, FL, 32611; pkaufman@ufl.edu; 352-273-3975

Prevalence and Distribution of Pathogen Infection and Permethrin Resistance in Tropical and Temperate Brown Dog Tick Populations - The brown dog tick, *Rhipicephalus sanguineus*, has been the focus of research in our program for the past 10 years. This species is the only tick capable of developing indoors, and as such, can build to exceptionally high levels, making residents quite upset. We have documented extreme levels of permethrin resistance in all Florida-collected tick populations. This tick is capable of transmitting several disease-causing pathogens in canines, and more recently, an extremely dangerous Rocky Mountain spotted fever-causing *Rickettsia,* to humans. This presentation covers our efforts to develop PCRs to detect a sodium channel mutation that confers permethrin resistance, and to test for the presence of *Ehrlichia*, *Rickettsia*, and *Babesia* pathogens in brown dog ticks from North and South America, Europe, Asia and Africa.

1. **Patrick Kelly** - MosquitoMate Inc., 3430 Oak Avenue, Miami, FL 33133; pkelly@mosquitomate.com; 517-410-0856

Autocidal approaches to control *Aedes* mosquitoes **-** *Aedes aegypti* (Yellow Fever Mosquito) and *Aedes albopictus* (Asian Tiger Mosquito) are invasive mosquito species and vectors of Zika, Dengue, and Chikungunya virus. Traditional methods of mosquito control have been insufficient to reduce overall *Aedes* populations because of *Aedes* cryptic breeding habits and close proximity with humans. Recently, several autocidal control techniques have been developed and introduced in field settings. One of these approaches utilizes the release of *Aedes* *spp.* male mosquitoes, either infected with the *Wolbachia* bacterium, which serves as a microbial pesticide via cytoplasmic incompatibility (CI), or the “self-delivery” of larval pesticides to female breeding sites. In previous and ongoing projects, we present data that show the reduction of eggs, egg hatch rate, and adult female populations via these techniques. The results demonstrate the release of male *Aedes albopictus* and *Aedes aegypti* mosquitoes are a highly effective autocidal control technique to suppress field populations.

1. **Adriane Rogers** - Florida Department of Agriculture and Consumer Services, 3125 Conner Blvd. Lab 6, Tallahassee, FL 32399; Adriane.Rogers@FreshFromFlorida.com; 850-617-7929

Hurricane Irma: State of Florida Mosquito Control Incident Response Team Deployment - Since the introduction of West Nile Virus in Florida in 2001, the Florida Department of Agriculture and Consumer Services (FDACS) has been involved in wide-area emergency mosquito control activities. The Mosquito Control Incident Response Team (MCIRT) has been deployed 8 times since 2001 and has organized the treatment of over 11 million acres throughout the state. MCIRT deployment begins at the local level as a request for assistance from local jurisdictions and is modeled after the national incident management system. The Federal Emergency Management Agency provides cost-sharing reimbursement for emergency mosquito control operations following major tropical storms and hurricanes that hamper recovery efforts. The MCIRT works in close coordination with local jurisdictions as well as federal partners, such as the Centers for Disease Control and Prevention and the United States Fish and Wildlife Service to obtain concurrencies for treatment based on the details described in a national policy document. In order for this process to be initialed, the Governor of Florida must declare a state of emergency and the President of the United States must declare a major disaster for the impacted region. The MCIRT was deployed in response to Hurricane Irma’s impact in September of 2017 and performed mosquito control activities in 25 counties. FDACS staff performed mosquito surveillance activities in 18 counties and 49 individuals were involved in the deployment.

1. **James Clauson -** Beach Mosquito Control District, 1016 Cox Grade Rd., Panama City Beach, Fl. 32407; jamesclauson@comcast.net; 850-233-5030

Mosquito Surveillance at Beach Mosquito Control District - Beach Mosquito Control District utilizes several methods to survey the mosquito population within its boundaries.  This talk will outline what methods we use.

**Symposium 2 – Regulatory Aspects of Invasive Pest Management (10)**

1. **Trevor Smith** - Florida Department of Agriculture and Consumer Services, Division of Plant Industry, 1911 SW 34th Street, Gainesville, FL 32608; trevor.smith@freshfromflorida.com; (352) 395-4628

Regulating Invasive Species from North America’s Front Lines **-** Florida averages 2.5 new exotic arthropod species establishments a month. The Division of Plant Industry, the plant and apiary protection branch of the Florida Department of Agriculture and Consumer Services, is responsible for responding to these threats to the state and nations agricultural and natural resources. This response can take the form of eradication, chemical and/or biological control, development of best management practices, overseas outreach and many other creative ways to try to stem the tide of invasive pests entering North America through the state of Florida. Developing regulatory measures to eliminate or stop the spread of these many pest and disease issues are a challenge due to Florida’s 28 international air and seaports and the over 100 million visitors who come to this state each year. Through science-based regulatory policies and strong partnerships with federal, state, university and grower partners the Division has been protecting Florida for over 100 years.

1. **Eric Rohrig** - Florida Department of Agriculture and Consumer Services, Division of Plant Industry, 1911 SW 34th Street, Gainesville, FL 32608; Eric.Rohrig@FreshfromFlorida.com; 352-395-4744

Non-Native Species Planting Permits in Florida **-** The Florida Department of Agriculture and Consumer Services, Division of Plant Industry issues Non-Native Species Planting Permits in an effort to control the introduction into, or movement within Florida of non-native plant species intended for plantings greater than two contiguous acres. This permitting process establishes measures which ensure production activities are conducted in a manner which provides for public and environmental protection, particularly inadvertent spread of invasive, exotic plant species. No permits shall be issued for any planting of species on the state or federal noxious weed list. The general permitting process as well as exemptions are detailed in the Florida Administrative Code: Rule 5B-57.011.

1. **Leroy Whilby** - Florida Department of Agriculture and Consumer Services, Division of Plant Industry, 1911 SW 34th Street, Gainesville, FL 32608; Leroy.Whilby@FreshFromFlorida.com; (352) 395-4661

Surveying for Pests of Regulatory Significance in Florida – Cooperative Agricultural Pest Survey (CAPS) Program **-** The Florida Cooperative Agricultural Pest Survey (CAPS) program is a combined effort by state and federal agricultural agencies to conduct surveillance, early detection, and rapid response to exotic plant pests of agricultural and natural plant resources. Florida serves as the principle port of entry into the United States for nearly all imported plant material and is at an elevated risk year-round for invasion by exotic species. Pest surveys are conducted using approved survey methods such as visual techniques, and/or lures and trapping developed by the USDA APHIS PPQ CPHST and include pest such as Giant African Land Snail, Emerald Ash Borer, Old World Bollworm and Cotton Seed Bug. Surveys are conducted by the CAPS team and several cooperators throughout the state including University extension specialists, scientist, industry personnel, Customs and Border Protection, and Parks and Recreation personnel. The CAPS program surveyed for more than 62 pest species of regulatory significance, reported over 17,665 negative data, five (5) US records and 3 State records in 2017. The program continues to survey for pests of regulatory significance on a yearly basis.

1. **Craig H. Welch** - FDACS-DPI, 923 10th Street East, Palmetto, FL 34221; Craig.welch@freshfromflorida.com; (941) 721-6655

Florida’s Fruit Fly Detection Program: Trapping and Identification - Florida’s fruit fly detection program is a collaboration between the United States Department of Agriculture and the Florida Department of Agriculture and Consumer Services. Between the two agencies, the program runs approximately 55,000 fruit fly detection traps that are rotated through different locations year-round throughout the state. These traps are of varying types and employ different attractants for specific genera of fruit flies deemed most threatening to the state’s agricultural industries. In addition, the program utilizes a sterile release program for the Mediterranean fruit fly (*Ceratitis capitata*). The sterile flies released are marked with a florescent dye that can be detected with a black light and microscope. The Fruit Fly Identification Laboratory in Palmetto, FL is set up to review the contents of any fruit fly positive trap in the state and verify the sterility of any *C. capitata* captured. When visual detection of the dye is not possible, dissection and staining of the testes is required to verify sterility. All data collected is entered into the eTrap database and correlated with the data entered by the fruit fly trappers in the field.

1. **Jason Stanley**, Julio Rodriguez, Rusty Noah and Sherry Steel - Florida Department of Agriculture and Consumer Services, Division of Plant Industry, 1911 SW 34th Street, Gainesville, FL 32608; Jason.stanley@freshfromflorida.com; (352) 395-4759

The Giant African Land Snail program: an ongoing seven-year eradication program - In September of 2011, the Giant African Land Snail (GALS), *Lissachatina fulica* was observed in Florida for the first time since its complete eradication following an introduction in 1966. Upon this recent find, a joint eradication program sponsored by FDACS and USDA was established. Currently, the snail has been found in Miami Dade and Broward County where there have been a maximum 32 cores established. Cores consist of an initial detection site with a 1-mile diameter circular buffer. Program methodology includes, intensive surveys, hand collection of snails, collection and disposal of yard debris and treatment with molluscicides. To date, approximately 200,000 surveys have been conducted and over 168,000 GALS have been collected and destroyed from over 700 positive properties. In October of 2012, scientists from FDACS confirmed the presence of the rat lungworm (*Angiostrongylus cantonensis*) in samples of *L. fulica* collected during the ongoing eradication program. This nematode has the ability to infect humans and cause eosinophilic meningitis. In 2016 a decommission plan was initiated for positive, adjoining and adjacent properties after the last live GALS detection. The plan includes seventeen months of surveys with a minimum of twenty-six treatments, nineteen months of survey with no treatment and a minimum of one detector dog survey and one nighttime survey without finding any live GALS. Currently 15 cores have been decommissioned and another 8 are anticipated for decommission in 2018.

1. **Michelle DaCosta** - USDA APHIS PPQ, Miami Inspection Station, P.O. Box 660520, Miami, FL 33266; Michelle.DaCosta@aphis.usda.gov; 305-492-1860

Taxonomic Identification and Regulatory Entomology - The taxonomic service provided by USDA Identifiers – Botanists, Entomologists, Malacologists, and Plant Pathologists is a key component of the Plant Protection and Quarantine Program (PPQ) achieving its mission of protecting U.S. agriculture and natural resources against the entry, establishment, and spread of economically and environmentally significant pests, while facilitating the safe trade of agricultural products. Botanists identify host material, weed seeds, and endangered plants. Entomologists identify all insect groups, Acari and, in some cases mollusks. Plant Pathologists, like Entomologists perform identifications for multiple groups, pathogens and nematodes. Accurate, timely identifications affect the regulations imposed and any costs associated with quarantine action which may be required based on the identifications. Potential pest species in permit cargo, passenger baggage, mail, or those found at large in or on conveyances are submitted to the USDA for identification, phytosanitary and treatment recommendations. Once received by the Identifier(s) specimens are identified to the lowest taxonomic level using keys, specimen collections and on-line resources developed by and for PPQ Identifiers. In the instances when port Identifiers do not have authority to make the final determination, specimens are forwarded, overnight, to National Specialists who will make the final identification. Regulatory action is dependent on precise identification of the specimen and determined only after final identification is made. Commodities may be released without further action, may require treatment before being released, or may be re-exported or destroyed when dictated by policy.

1. **Georgia Keene** - USDA APHIS PPQ Field Operations, Fruit Fly Exclusion and Detection, 915 10th Street East, Palmetto, FL 34221; Georgia.r.keene@aphis.usda.gov; (941) 723-8912

Florida Sterile Medfly Preventive Release Program - Since 1998, the United States Department of Agriculture, in cooperation with the Florida Department of Agriculture and Consumer Services, has operated a preventive release program (PRP) of sterile male Mediterranean fruit flies (*Ceratitis capitata*) in high-risk areas of the state. This program employs the Sterile Insect Technique (SIT), a biologically-based birth control method in which fluorescent-dyed, sterilized insects are released over an area to over-flood an area in case a wild fly is introduced. Dyed flies can be inspected under an ultraviolet light-equipped microscope to verify sterility. Egg through pupal life stages are reared and irradiated at the Moscamed facility in Guatemala, and 100 million dyed pupae are shipped to Florida each week for eclosion at the Sterile Insect Release Facility (SIRF) in Sarasota. This facility contains specialized equipment designed to optimize the eclosion, chilldown and release processes. The facility conducts quality control testing to ensure the sexual competitiveness of sterile flies. Flies are released from airplanes and, less frequently, a specialized ground-release truck. Target coverage of the PRP areas in four high-risk counties is 125,000 flies per square mile per month, for a target sterile:wild fly over-flooding ratio of 100:1. Flies are recaptured in traps routinely serviced by Fruit Fly Exclusion and Detection Program personnel and screened by the Fruit Fly Identification Laboratory in Palmetto. PPQ Florida will open its brand new, state-of-the-art SIRF later this year, which will serve as a flagship facility for those planned in other states with PRP including Texas.

1. **John M. Leavengood, Jr**. and Kevin Johns **-** United States Department of Agriculture (APHIS, PPQ), 9325 Bay Plaza Blvd, Suite 206, Tampa, FL 33619; John.M.Leavengood@aphis.usda.gov; (813) 868-1703

The Role and Responsibility of PPQ in Safeguarding Florida’s Agriculture, and the Significance of a Pest **-** Within the United States Department of Agriculture, Plant Protection and Quarantine (PPQ) safeguards the nation’s agricultural interests with various programs along trade routes and commodity pathways from international origins to domestic soil. We review the safeguarding phases implemented from the perspective of a PPQ Identifier (Entomologist) which include, but are not limited to, 1) overseas and across-borders prevention, 2) port of entry measures, 3) domestic detection and surveillance of potential and introduced threats, 4) eradication and 5) control.

1. **Shweta Sharma**, James Snyder, Stefanie Dowling, Amy Howe and Eric Rohrig - Florida Department of Agriculture and Consumer Services, Division of Plant Industry, 1911 SW 34th Street, Gainesville, FL 32608; shweta.sharma@freshfromflorida.com; (352) 395-4749

Use of 3D Technology in advancement of Asian Citrus Psyllid Trapping - The Florida Department of Agriculture and Consumer Services, Division of Plant Industry operates a 3D printing laboratory in support of invasive pest detection and management programs. Current projects include the development and testing of traps targeting giant African land snail (*Achatina fulica*), Asian citrus psyllid (*Diaphorina citri*) and potato psyllid (*Bactericera cockerelli*). The 3D printed traps are tested in laboratory cages and in the field. Promising traps are then sent for further testing by collaborators in Florida, California, Hawaii, Texas and Washington.

1. **Dwight E. Robinson** and Nadia McDonald - Department of Life Sciences, 4 Anguilla Close, The University of the West Indies, Mona Campus, Kingston 7, Jamaica; dwight.robinson@uwimona.edu.jm; +1 (876) 927-1202

Invasive Pests and their Management: The Jamaican Perspective - As an island nation Jamaica was considered as being at a relatively lower risk for the introduction of Invasive Pest Species (IPS). However, due to increases in the volume of international traffic, the risk has significantly increased and this has necessitated focused and sustained action relating to the threat posed by IPS. During the last 20 years several IPS have been observed in Jamaica. These include the Chilli Thrips (*Scirtothrips dorsalis*), Ensign Scale (*Orthezia insignis*), False Colorado Potato Beetle (*Leptinotarsa juncta*), Lime Swallow Tail Butterfly (*Papilio demoleus*), Papaya Mealy Bug (*Paracoccus marginatus*), Pink Hibiscus Mealy Bug (*Maconellicoccus hirsutus*) and Red Palm Mites (*Raoiella indica*). In response to the threat, Jamaica has partnered with members of the international community to develop appropriate strategies for the monitoring and management of these potential pests. While the effort is led by the Ministry of Agriculture it is supported by multidisciplinary teams from government and non-governmental organizations, which are represented on the National Plant Health Coordinating Committee and the Invasive Alien Species Working Group. Activities to determine the distribution and ecological impact of the IPS in Jamaica remain inadequate and there is limited data on the current and potential economic impact of these pests. The response to IPS has been primarily based on an integrated management model focused on ecological management and biological control. This approach has yielded some success with several of the populations, and the related economic impact, of recently introduced IPS being contained at tolerable or manageable levels.

**Symposium 3 - Integrated Pest Management of Invasive Pest Species (11)**

1. **Amy Roda**, Ronald Weeks, Philip Stansly, Jose Castillo, and Carina Allen **-** USDA-APHIS-PPQ-S&T, Center for Plant Health Science and Technology, 13601 Old Cutler Rd.,Miami, FL 33158; Amy.L.Roda@aphis.usda.gov; 305-278-4900

Evaluation of Whitefly (*Bemisia tabaci*) Control and Tomato Damage by Three Established Zoophytophagous Mirid Predators **-** Miridae of the tribe Dicyphini are important plant-feeding predators used to control pest arthropods such as whiteflies, leafminers, aphids and spider mites in vegetable crops. The pests they control include some not established in Florida like the tomato leafminer, *Tuta absoluta* and the old world bollworm, *Helicoverpa armigera*. However, the risk that their feeding on crop plants may cause economic damage at times hinders their acceptance as useful biological control agents and may limit the likelihood they would meet regulatory requirements for importation to new areas. We conducted studies to assess the predation capacity and tomato plant damage of three mirid species established in south Florida, one exotic (*Nesidiocoris tenuis*)*,* and two native (*Macrolophus praeclarus and Engytatus modestus*)*.* All three species populations increased when provided moth eggs (*Ephestia kuehniella*) compared to tomatoes with no prey, thus verifying their zoophytophagus habits. Similarly, all three species significantly reduced the number of whiteflies on tomatoes compared tomato plants without mirids. More damage, evaluated as the number of feeding rings, was observed on tomatoes with *E. modestus* and *N. tenuis* compared to *M. praeclarus.*  Experiments that included sesame plants with tomatoes plants had increased number of mirids when prey was scarce and allowed sustained whitefly control, thus showing a benefit of the plant-feeding habit of these predators. Florida’s native and fortuitously established mirids may prove to be immediately available biological agents for the management of present and future tomato pests.

1. **Amanda C. Hodges**, Norman C. Leppla, Morgan G. Pinkerton, Sage M. Thompson, and Alexander M. Gannon - Entomology and Nematology Department, 1881 Natural Area Dr., Gainesville, FL 32611-0620; achodges@ufl.edu; 352-273-3957

Systems Approach to Excluding Invasive Species - The systems approach to excluding invasive species encompasses a set of integrated pest management tactics implemented during production, pre-harvest, post-harvest, inspection, shipping, and distribution. This approach has been employed successfully in preventing the introduction and establishment of tephritid fruit flies and has potential for more broad application. It has resulted in eradication of several species of tephritids, including the Mediterranean fruit fly, oriental fruit fly, Caribbean fruit fly, Mexican fruit fly, guava fruit fly, Natal fruit fly, and peach fruit fly. Florida is considered a primary pathway for entry of these and other alien invasive species of arthropods. The range of annual detection extended from four species in 1987 to 21 in 1997 but currently is about an average of two per month. Immigrant taxa detected during 1987-1997 included mostly Hemiptera (55 species) and Coleoptera (38) but there were 13 additional taxa: Thysanoptera (19), Acari (10), Blattodea (7), Hymenoptera (6) Araneae (5), Diptera (5), Isoptera (3), Lepidoptera (4), Odonata (1), Orthoptera (2), and Psocoptera (1). Species of Hemiptera and Coleoptera remained the most commonly detected in subsequent years but others varied widely based primarily on the locations and intensity of collection. From 1986 to 2011, 305 alien invasive species were discovered, 49% of them from the high international traffic area of southeast Florida, specifically Miami-Dade County and Palm Beach County. The origins of these arthropods have shifted from primarily the Neotropical Region to about an equal number from Asia.

1. **Oscar E. Liburd**, Lindsy Iglesias, Janine Spies and Elena Rhodes - Entomology & Nematology Dept., 1881 Natural Area Dr., Steinmetz Hall, University of Florida, Gainesville, FL. 32611; oeliburd@ufl.edu; (352) 273-3918

Monitoring, Ecology and Management of the Invasive Spotted-wing drosophila, *Drosophila suzukii*, Diptera: Drosophilidae - *Drosophila suzukii* (Matsumura), spotted-wing drosophila (SWD), is an invasive pest of thin-skinned fruits. Eggs are deposited under the fruit skin and larvae develop inside the fruit, resulting in significant yield losses. To improve SWD trapping specificity and attractiveness, we evaluated SWD lures with fermenting liquid baits. Overall, yeast and sugar-based attractants were the most effective with moderate specificity. To investigate SWD populations in the natural landscape, we evaluated adult SWD captures in five habitats: blueberry, pine, deciduous, swamp/riparian, and mixed orchard. During the season, SWD captures were lowest in pine; however, post-season, captures were higher in pine and deciduous than blueberry and swamp/riparian habitats. When we examined the spatio-temporal distribution of SWD adults and fruit infestation in a blueberry field, we found that SWD adults were aggregated along adjacent margins and field edges during the production season. We implemented border sprays (pyrethrins + azadirachtin) and soil tillage as management tactics for SWD in organic blackberries and found that border sprays reduced adult SWD and fruit infestation compared to plots without border sprays. Soil tillage further reduced SWD numbers numerically. Finally, we evaluated a new attract-and-kill Specialized Pheromone Lure Application Technology (SPLAT) product for SWD control in blackberries. We tested 3 treatments (Entrust/Grandevo, Grandevo, untreated), and 3 SPLAT (7-d, 14-d, no SPLAT) treatments in a 3 x 3 factorial, RCBD. Adult SWD and fruit infestation were higher in the control than in both insecticide treatments. SPLAT further reduced adults and fruit infestation in all insecticide treatments, with no differences among application intervals.

1. **Jawwad Qureshi** and Phil Stansly - University of Florida/IFAS, Indian River Research & Education Center, 2199 South Rock Road, Fort Pierce, FL 34945; jawwadq@ufl.edu; 772-577-7339

Biological control of Asian citrus psyllid *Diaphorina citri* ***-*** The Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama is an invasive insect pest vector of huanglongbing (HLB) or citrus greening disease. Both pest and disease are now well established in Florida. Vector control is critical to slow the spread of HLB. Biological control is an important component of the management program for this pest disease complex. Field studies in 2006-2007 showed 5-27 fold reduction in psyllid populations mainly by predacious insects and spiders. Ladybeetles declined significantly due to the increased use of insecticides in citrus groves to control ACP during the past decade. Most naturally occurring species of ladybeetles are not available commercially. Some commercially available species of ladybeetles and lacewings show promise under controlled conditions. *Tamarixia radiata* Waterston, a species-specific ectoparasitoid of *D. citri* nymphs, was imported from Taiwan and South Vietnam and limited releases made from 1999-2001. Our investigation during 2006-2007 showed that the parasitoid was established throughout the citrus growing region of the state, although parasitism rates were variable, averaging <20% and lowest during spring and summer when psyllid populations are high. New strains of *T. radiata* from Pakistan, South China and North Vietnam were brought in and a mass rearing and release program started in 2008. We have observed significant increases in parasitism rates during spring and summer compared to pre-release levels or non-release sites. Also more Tamarixia were recovered from organic blocks compared with conventional blocks. Our findings suggest that mass release of *T. radiata* can potentially increase incidence of parasitism in the field.

1. **Xavier Martini**, Kirsten Pelz-Stelinski, and Lukasz Stelinski - University of Florida North Florida Research and Education Center, 155 Research Road Quincy, FL, 32351; xmartini@ufl.edu; (850) 875-7160

Non-insecticidal methods to reduce Asian citrus psyllid densities - The Asian citrus psyllid, *Diaphorina citri* Kuwayama, is the vector of the bacteria responsible for Huanglongbing (HLB), a deadly plant disease affecting citrus worldwide. Currently, the primary tool for control of *D. citri* spread is intensive insecticide use. However, implementation of other strategies that lead to decreased insecticide use should be considered. Landscape management including windbreaks, row orientation and reset planting contributes to the control of the psyllid in citrus groves. Windbreaks reduce *D. citri* densities on border rows, and resetting protects new planting compared to solid block planting. Other landscape features such as row orientation and urban expansion can also impact *D. citri* population densities. Semiochemicals could also be used to manage *D. citri*, either as repellents, attractants, or disruptants. Attractants can be used to better manage the pests, while repellents can significantly disrupt host selection behavior of *D. citri*. None of these measures will totally prevent psyllid arrival to a new grove, but they can be incorporated in the context of a larger IPM program integrating insecticides and replanting of uninfected trees.

1. **Hugh A. Smith** - University of Florida, Gulf Coast Research and Education Center,14625 CR 672, Wimauma, FL, 33598; hughasmith@ufl.edu; 813 419 6588

Managing *Bemisia tabaci* in Florida vegetables - The sweetpotato whitefly, *Bemisia tabaci*, is one of the most damaging pests of horticultural, agronomic and ornamental crops globally. In Florida, *Bemisia tabaci* MEAM1, also known as the B biotype, transmits *Tomato yellow leaf curl virus* (TYLCV) and induces irregular ripening in tomato; it also transmits three viruses impacting cucurbits, including *Squash vein yellowing virus*, the cause of watermelon vine decline. Growers manage *B. tabaci* and the viruses it transmits with a combination of cultural and chemical controls, and in the case of TYLCV, host plant resistance. Because of the *B. tabaci*’s tendency to develop resistance to insecticides, non-chemical approaches and biopesticides play an important role in the management of the pest. Challenges to managing *B. tabaci* under Florida’s subtropical conditions will be discussed.

1. **Jesusa C. Legaspi**, Muhammad Haseeb, and Lambert Kanga - USDA-ARS-CMAVE, 6383 Mahan Dr., Tallahassee, FL 32308; Jesusa.Legaspi@ars.usda.gov; 850-656-9870 ext. 10

Conservation Biological Control of Invasive Whiteflies **-** The sweetpotato whitefly, *Bemisia tabaci* is a major pest of vegetable crops in the southeast U.S.A. The use of companion plants (ex.” insectary” plants) that provide nectar or pollen to beneficial insects (ex. syrphids or hoverflies) is one way to use the conservation biological control method. Syrphids are important predators of the sweetpotato whitefly. Plant products such as methyl salicylate (MESA) have been reported to attract natural enemies. We conducted a field study in fall 2014 and spring 2015 to evaluate attractiveness of sweet alyssum *(Lobularia maritima)* and methyl salicylate to hoverflies. Malaise traps were used to capture hoverflies at field plots in Tallahassee, FL. In spring 2014, we evaluated attractiveness of sweet alyssum to predatory hoverflies in kale (*Brassica oleracea*) crops. Sweet alyssum were planted in pots and placed under the malaise traps according to the treatments. In general, sweet alyssum with and without MESA attracted significantly more hoverflies compared to controls and MESA alone. Kale plots with sweet alyssum had more hoverflies than control plots. *Toxomerus marginatus* was the most abundant hoverfly species among at least 7 species of hoverflies sampled. Our results indicate that sweet alyssum is an attractive companion and refuge plant of predatory hoverflies. The use of companion and natural enemy refuge plants are promising conservation biological control methods in an integrated pest management program to control insect pests such as whiteflies.

1. E. Inyang, R. L. Hix,V. Colova, B. Rohde, O. Dosunmu, and **R. W. Mankin** - USDA ARS CMAVE, 1700 SW 23rd Dr, Gainesville, FL 32608; Richard.Mankin@ars.usda.gov; 352-374-5774

Grape root borer management revisited: Potential use of seasonal acoustic monitoring of root-feeding activity to predict optimal timing of biological control efforts - Grape root borer (GRB), *Vitacea polistiformis* (Lepidoptera: Sesiidae), is a major pest in Florida vineyards. It is difficult to optimize timing and targeting of management treatments against GRB because the decreases in grape yield and vine health caused by GRB root damage do not appear until subsequent seasons. Consequently, we considered whether monitoring of seasonal and diel patterns of GRB subterranean acoustic activity across a vineyard could inform efforts to time and target control treatments. A 269-d study was begun in early fall to record sounds from root systems at 31 spatially distributed sites at different times of day. Characteristic spectral and temporal patterns in the recorded trains (bursts) of GRB movement and feeding sound impulses enabled them to be discriminated from background noise. The GRB infestation likelihood at each site was estimated from previous studies relating insect presence to sound burst rate. Sites with high burst rates and high infestation likelihoods were confined within a small section of the vineyard, and 39% of recording sites were rated at low infestation likelihood. This suggests that acoustic monitoring could facilitate reductions in GRB treatment coverage. Sound burst rates were greatest in fall, suggesting that springtime reductions in GRB activity may occur just before larvae pupate and adults emerge. Monitoring of springtime activity thus may enable improved predictions about the timing of neonate emergence. Neonates, the stage most vulnerable to pesticides, are preferred targets for treatment.

1. **Rammohan R. Balusu**, Blessing F. Ademokoya, and Henry Y. Fadamiro - Department of Entomology and Plant Pathology, 301 Funchess Hall, Auburn University, Auburn, AL 36849; balusrr@auburn.edu; 248-701-3305

Integrated Pest Management of Kudzu Bug with an Emphasis on Trap Cropping and Biological Control - *Megacopta cribraria* (F.) (Hemiptera: Plataspidae), commonly known as kudzu bug, is a serious invasive pest of soybean (*Glycine max*)Merrill. Soybean is the second most planted field crop in the United States with an estimated annual market value of about $39 billion. Nymphs and adults of *M. cribraria* aggregate in large numbers on tender stems and leaves of soybean where they suck sap, resulting in significant yield loss of up to 60%. As the threat posed by this invasive insect pest increases, no effective control strategies other than chemical insecticides are currently available to help soybean farmers. The results of research on the evaluation of alternative management strategies for kudzu bug such as semiochemical attractants, trap cropping, and biological control will be discussed.

1. **Muhammad Haseeb,** Tavia L. Gordon, Albertha J. Parkins, Jesusa C. Legaspi, Oscar E. Liburd, and Lambert H.B Kanga- Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307; muhammad.haseeb@famu.edu; 850-412-7060

Plant Mediated Pest Management Strategies for Invasive Pest Insects in Small Fruit and Vegetable Crops in North Florida - Invasive pest insects cause serious challenges to small fruit and vegetable crops in north Florida. Growers and industry need effective pest management solutions to control serious pest insects in conventional and organic crops. Plant mediated pest management strategies can provide sustainable solutions to conventional and organic growers. FAMU’s IPM Program has been developing and implementing effective IPM strategies for small farm growers since 2010. For example, to manage *Nezara viridula* (Hemiptera: Pentatomidae) in tomatoes, the use of trap crops (sorghum, sunflower and millet) and refuge crops (three varieties of sweet alyssum) were evaluated during 2014-2015 for their potential use in a ‘push-pull’ strategy to manage this pest effectively. Sorghum was found to be effective in attracting *N. viridula* adults and reducing their numbers in tomato crop. *Geocoris punctipes* (Hemiptera: Lygaeidae) was the most abundant natural enemy of *N. viridula* found on all three varieties of sweet alyssum. In addition to *G. punctipes, Orius insidiosus* (Hemiptera: Anthocoridae) and other parasitoids and predators were recorded from all three varieties of sweet alyssum. For small fruit crop protection (blueberries and blackberries), we evaluated several traps and bait systems in 2016 and 2017 to properly monitor and manage *Drosophila suzukii* (Diptera: Drosophilidae). Based on the preliminary findings of this study, the use of pine bark mulch maybe a possibility to manage *D. suzukii* in open field conditions. Other pest insects are being monitored and managed using effective IPM strategies to sustain crop productivity and profitability of small fruit and vegetable growers in north Florida.

**Symposium 4 - New and Invasive Urban Pests**

1. **Phil Koehler**, Entomology & Nematology Department, University of Florida, Gainesville, FL 32611-0620, pgk@ufl.edu

Overview of the Urban Pest Situation - Almost all of the most important urban pests have been introduced from other parts of the world. These pests were easily transported along with humans and commerce. Some pests like the American cockroach and house fly were probably introduced into the U.S. by the earliest explorers. All cockroach pest species in Florida are not native to North America. In the past 40 years, the numbers of termite species in Florida have doubled and some of the introduced species are the Formosan termite, Asian subterranean termite, Western drywood termite, among others. The most important ant pest species (imported fire ants, tawny crazy ant, whitefooted ant, bigheaded ant) are also not native to the U.S. Bed bugs were introduced centuries ago, were controlled with modern insecticides, and made a return to prominence around the year 2000. The tropical bed bug was recently found in the U.S. and was either never eradicated or was recently reintroduced to the U.S. Filth breeding flies have been transported around the world, and the house fly remains a serious pest by entering structures and transmitting food poisoning bacteria. These pests all affect humans, structures, public health, and quality of life for everyone in Florida.

1. **Rudolf H. Scheffrahn -** University of Florida, Fort Lauderdale Research & Education Center, 3205 College Avenue, Davie, Florida 33314, rhsc@ufl.edu, 954-577-6312

Asian Subterranean Termite Introduction and Spread - An established population of the Asian subterranean termite (*Coptotermes gestroi*, AST) was discovered near the Port of Miami in 1996 and was probably introduced to the area around 1990. This species, endemic to Southeast Asia, was already established in the West Indies and Brazil at that time. By 2005, the AST achieved an established range of over 300 km (Jupiter to Key West). The AST is characterized by its high damage potential, robust early spring dispersal flights, and its affinity for infesting boats and trees. The AST is likely to saturate most of tropical Florida within another 25 years. Area-wide eradication of the AST is not feasible; therefore, control treatments will continue on a building-by-building basis.

1. **Thomas Chouvenc** - University of Florida, Fort Lauderdale Research & Education Center, 3205 College Avenue, Davie, Florida 33314,

Colony-level effects of non-repellent liquid termiticides and CSI baits on subterranean termites **-** This study addresses the impact of the two primary control methods for subterranean termites on whole *Coptotermes* colonies (Blattodea, Isoptera: Rhinotermitidae). Baits and liquid termiticides have two distinct modes of action on subterranean termites and because of the extended nest structure of the *Coptotermes* genus, the impact of such treatments on whole colonies may differ. Owing to the difficulty to monitor whole subterranean termite colonies in the field, *C. gestroi* colonies where established in the laboratory, until they reached ≈60,000 individuals after three years of colony growth. These colonies where established in a complex system of galleries and planar arenas so as to simulate their field foraging and feeding behaviors. Some of these feeding sites represented a wood structure, 15 m away from the termite colony central nests. Either Chitin Synthesis Inhibitor baits were implemented around the structure, or liquid termiticides perimeter treatment was applied. After 90 days, all colonies exposed to baits were eliminated. Colonies exposed to liquid termiticides survived, as they avoided the treated area resulting from the initial secondary repellency. Long term consequences of each treatment on termite colonies and their potential damage will be discussed.

1. **Roberto Pereira -** Entomology & Nematology Department, University of Florida, Gainesville, FL 32611-0620,

Tawny Crazy Ant Introduction and Spread **-** The tawny crazy ant is an invasive species from the central South America region that has invaded the US and has spread along the Gulf of Mexico costal states. Initially this ant was misidentified as being the ant known as Caribbean crazy ant (*Nylanderia pubens*) but further taxonomic and genetic work determined that the invasive ant was in fact a sister species *Nylanderia fulva.* Infestations occurred initially both in Florida and Texas, but due to confusion on the taxonomic status of this pest ant, the infestations in the two states were treated as separate problems. The infestations quickly spread over Texas and Florida and later over the Gulf of Mexico States and into other SE USA states. The tawny crazy ants form enormous populations that are a threat to native wildlife, structures and residences, electrical components, and others. Although this ant will not sting, other damages and the extent of the infestations are similar to that observed for fire ants. Several efforts on controlling these ants have produced some partial solutions that at least are adequate to maintain control of ants for some time in limited areas. A more permanent solution for elimination of these invasive ants is still needed.

1. **Michael T. Riles** - John P. Smith, Nathan Burkett-Cadena, Roxanne Connelly, Gary W. Morse Jr., and Brian D. Byrd - Beach Mosquito Control District,1016 Cox Grade Road, Panama City Beach, FL 32407; Michael.riles@comcast.net; 850.233.5030

First record of *Aedes japonicus* in Florida **-** The presence of *Aedes j. japonicus* in Florida is reported for the first time. Four adult females were collected by a Mosquito Magnet® X trap baited with pressurized CO2 in Okaloosa County, Florida in August, 2012 and later identified as *Ae. japonicus* in 2014. Additional adult and larval specimens were collected during 2014-2017 from Bay, Leon, Okaloosa, Santa Rosa, or Walton Counties, Florida. Notes are provided on the location, general habitats, and mosquito associates that may be found with *Ae. japonicus* in northwestern Florida. The role of *Ae. japonicus* in arbovirus transmission within Florida is currently unknown and should be further explored.

1. **Nan-Yao Su -** University of Florida, Fort Lauderdale Research & Education Center, 3205 College Avenue, Davie, Florida 33314; nysu@ufl.edu; 954-577-6339

Formosan subterranean termite in Florida and its control - The Formosan subterranean termite (FST) was first reported in Florida in early 1980s in Hallandale, Broward County, and by 2010 it was found in almost all major urban areas of Florida, including Orlando, Jacksonville, Tampa, St. Petersburg, North Palm Beach, Jupiter, Jensen Beach, Pensacola, Tallahassee, Ft. Lauderdale, Hollywood and Miami. One factor contributing to the spread of FST is the inability of traditional soil termiticide treatments to kill the colonies. The first termite bait product with a chitin synthesis inhibitor (CSI), hexaflumuron, became commercially available in 1995, and numerous studies have confirmed eliminations of FST colonies by CSI baits. The potentials of CSI baits for population management of FST, especially in the context of area-wide projects will be discussed.

**Symposium 5 – The Diamides: A new class of chemistry with a wide, and interesting, range of activity**

1. **Scott Ferguson** - Atlantic Turf & Ornamental Consulting, 2940 3rd Street SW, Vero Beach, FL 32968; Scott@atoconsult.com (772) 643-5658

Mainspring® 1.67SC: Drench applications for long term residual control of aphids, thrips and leafminers in greenhouse ornamentals - Mainspring® 1.67SC (Syngenta Crop Protection, Greensboro, NC) contains the active ingredient cyantraniliprole, a member of the anthranilic diamide class of chemistry. It is registered on many ornamental crops as a foliar and drench for the control of a wide range of pests. In a series of greenhouse trials, a single drench application Mainspring 1.67SC at rates of 4-8 fl oz/100 gal provided 30-60 days control of Western flower thrips (*Frankliniella occidentalis*), Chili thrips (*Scirtothrips* *dorsalis*), American serpentine leafminer (*Liriomyza trifolii*) and the Green peach aphid (*Myzus persicae*).

1. **Hector E. Portillo**, Brent Johnson, Craig Heim, John Andaloro and Billy Annan - FMC Agricultural Solutions, Stine Research Center, 1090 Elkton Rd, Newark DE 19711, Email address: Hector.Portillo@FMC.com Office 302-366-6485 Mobile 302-650-2294

Rynaxypyr® and Cyazypyr®: Two Potent Anthranilic Diamide Insecticides with Distinct Chemical and Biological Attributes - The anthranilic diamide insecticides were discovered in 1999 by a research team at DuPont. Chlorantraniliprole (Rynaxypyr®) was discovered in 2001, while cyantraniliprole (Cyazypyr®) was discovered in 2003. Both compounds control insect pests through activation of the insect ryanodine receptors (RyRs), which represents a novel mode of action for insect control, classified in the IRAC Group 28 mode of action (MOA). Chlorantraniliprole is a potent insecticide against Lepidoptera, being one to two orders of magnitude more potent than other insecticides. Additionally, chlorantraniliprole is effective on certain Diptera (leafminers, fruit flies), Coleoptera (some beetles and weevils), Orthoptera (grasshoppers, katydids) and whitefly nymphs. Cyantraniliprole controls a broader pest spectrum, including those of the orders Hemiptera, Thysanoptera, Lepidoptera.and Coleoptera. The expanded pest spectrum of cyantraniliprole is a result of a modification of its physical properties, specifically a reduction in log P which increased solubility. These products differ only in the 4-substituent of the anthranilic core, which are chloro and cyano, respectively. Plant protection occurs as a result of rapid cessation of pest feeding; the affected insects are unable to feed within minutes to hours following exposure. This results in outstanding protection against crop damage as well as a reduction in the transmission of certain pest vectored diseases with cyantraniliprole. The fit of these two compounds in key crops grown in Florida and other parts of the US and recommended positioning to reduce insect resistance to group 28 insecticides will be discussed.

1. **Lane P. Tredway -** PO Box 68, Zebulon NC 27597, lane.tredway@syngenta.com, 919-917-3669

Novel approaches to turfgrass and landscape pest management with anthranilic diamides - The anthranilic diamides, chlorantraniliprole (CTPR) and cyantraniliprole (CYNT), selectively activate ryanodine receptors in insect muscle tissues and lead to eventual paralysis of target pests. Although sharing the same mode of action, CTPR and CYNT have distinct physiochemical properties lending to unique targets and use patterns. In some cases, this new chemistry enables novel approaches to insect pest management that were not possible with traditional chemistries. The current status of CTPR and CYNT use in turfgrasses and landscapes will be reviewed. Recent research results will be presented with a focus on new opportunities for anthranilic diamide use in the turfgrass and landscape markets.

1. **Nancy Rechcigl** - Syngenta Technical Manager – Ornamentals, 10606 Riverbank Terrace, Bradenton, FL 34212, Nancy.rechcigl@syngenta.com, 941-238-7413

Systemic Control of Bemisia Whitefly with Mainspring® GNL - Whiteflies (*Bemisia spp*.) continue to be a challenging pest in ornamental production systems. The introduction of new biotypes, insecticide resistance and the restriction of neonicotinoid insecticides by retail stores has made control strategies more difficult to implement successfully. In 2013, Syngenta launched Mainspring Insecticide for the ornamental market. Mainspring contains the active ingredient Cyantraniliprole, a member of the Diamide class of chemistry in IRAC group 28. Insect control occurs primarily through ingestion. Cyantraniliprole selectively activates the ryanodine receptor in the insect’s muscles causing the release and depletion of intracellular stores of calcium ions. This results in paralysis, rapid cessation of feeding, with insect mortality occurring within 2-7 days. Mainspring has demonstrated broad activity across key ornamental chewing and sucking pests with both foliar and soil applications. This presentation will review the characteristics of Mainspring Insecticide, its compatibility with beneficials and use in whitefly control strategies.

1. **Chris Keefer** – Syngenta, 15755 Timber Creek Lane, College Station, TX 77845 979.219.4905, chris.keefer@syngenta.com

Anthranilic Diamides in Urban Pest Management **-** A new class of commercial chemistry was initiated in the early 2000’s called anthranilic diamides. This insecticide class is highly potent on several orders of insects in agriculture and urban pest management including coleoptera, lepidoptera, hemiptera, isoptera, and diptera. The mode of action for diamides on insects is that it selectively activates ryanodine receptors causing mortality from uncontrolled release of calcium in muscle cells. Two active ingredients from this class of chemistry that are currently available in the urban pest management market are chlorantraniliprole and cyantraniliprole.

**Submitted papers**

1. **Jennifer Gillett-Kaufman** and Phillip Kaufman **-** Entomology and Nematology Department, University of Florida, Gainesville, FL, 32611; gillett@ufl.edu; 352-273-3950

Feast or Famine in Florence– Introducing Non-Majors to Entomology through Study Abroad - Presentation will provide an overview on the development and delivery of the courses *Insects in Italy and Feast and Famine in Florence*, taught in Florence, Italy through the University of Florida’s Study Abroad program. Through this course, non-majors were introduced to the impacts that insects have had and currently have on Italian culture, history and food production. Students learned about the historical impacts of bubonic plague and its redirection of European history through the emergence of the Renaissance in Florence. The class visited a livestock farms to introduce students to the animal industries of Italy. In Italy, agro-tourism is a growing industry, with much governmental support – in fact, the Italian government is selling 100 castles to elicit a similar tourism effect on that underutilized feature. For this class, students visited a legacy farm to learn about olive, grape and honey production that also has begun to increase revenue through agro-tourism. To highlight current challenges, the class learned about a deadly insect-vectored pathogen that the southern olive industry faces. This introduced pathogen is killing large numbers of 300- to 1,000-year-old trees and unfortunately, blame has been attributed to scientists studying the problem. Being in Florence, the class also included many museum and garden trips, including those of the Medici family in the Uffizi Gallery and Pitti Palace to search for insects and agriculture in art. This experiential learning program has been used to enhance our Florida-taught courses with an added international flavor.

1. **Meredith A. Krause**, Bryan N. MacNeill, Nicholas T. Ogburn, Robert Shell, and Marc J. Lajeunesse - University of South Florida, 4202 E. Fowler Ave, Tampa FL 33620; Meredithk@mail.usf.edu; 850-380-4701

Assemblages of Odonates and their intraspecific variability in Tampa Bay - Communities of dragonflies and damselflies can be used to assess ecosystem change and health; however, little is known about the community composition of odonates in Tampa Bay, Florida.  Here we report two field surveys that assess the richness and abundance of odonates found at University of South Florida’s Riverfront Park, as well as intraspecific variability in abundance of sexes, body size, wing-cell asymmetry, and water mite ectoparasitism. Our first weekly survey (from Oct. 2013 to Oct. 2014) captured 327 individuals (230 female and 97 male) from eight dragonfly species, with *Erythemis simplicicollis*(eastern pondhawk)representing 79% of captures, followed by the second most abundant species (14% of captures), the Florida non-native and invasive *Miathyria marcella* (hyacinth glider). Most species captured were monomorphic and symmetric; however, *E. simplicicollis* had larger females, and *M. marcella* tended to be more asymmetric. Our second weekly survey (from Sept. 2017 to Dec. 2017), which focused more on damselflies, captured 149 individuals of three species, with *Ischnura posita* (fragile forktail) being the most common (97% of captures). There were no significant water mite infections found in either survey. We aim to continue these surveys to track seasonal and climate-driven changes in dragonfly diversity and phenology of the area.

1. **Muhammad “Zee” Ahmed** - Florida State Collection of Arthropods, Division of Plant Industry/Entomology, Florida Department of Agriculture and Consumer Services, 1911 SW 34th Street, Gainesville, Florida 32608; muhammad.ahmed@freshfromflorida.com; (352) 395-4677

Species Assemblage and Diversity of Scale Insects in Florida - Predicting the threats of pest species from within national boundaries have been studied frequently in the past. However, predicting it from within the state especially for a state like Florida where we receive two pest species from out of the continent and one from out of state each month, presents a significant challenge to researchers and state agencies. The scale insects contain many pest species which transport frequently with plant materials within the state. I applied a self-organizing map (SOM) on scale insects of Florida to predict the threat of invasive scale species among counties within Florida. Initial analyses reveal an interesting pattern of scale insect diversity and their species assemblages in Florida and may help predict the threat of insect pests from within Florida.

1. **Marina S. Ascunce**, Henri W. Hererra, Robert K. Vander Meer, and Sanford D. Porter - Emerging Pathogens Institute, Department of Plant Pathology, University of Florida, Gainesville, FL 32611; ascunce@ufl.edu; 352-273-8463

Fire ants, another invader to the enchanted Islands: The Galapagos **-** Invasive species pose major threats to public health, natural and agriculture environments resulting in billions of dollars in economic losses annually and are a major concern for oceanic archipelagos, such as the Galapagos. This world heritage site has been affected by >1,579 alien terrestrial and marine species, including 545 terrestrial insects. The tropical fire ant (*Solenopsis geminata*), one of the most invasive insects, has reached these enchanted Islands. Thus, in our study the goal was to determine the putative source population(s) of four nests found in the Galapagos. First we determined the microsatellite genotype based on 43 loci of one worker from each nest. Then we sampled 45 *S. geminata* nests from several sites in Ecuador and obtained their genotypic profile. We combined this newly generated data with a database previously obtained in our lab that includes genotypic information from almost 200 tropical fire ants from around the world. Preliminary analysis suggests that Ecuador is source of the nests found in the Galapagos. The port city of Guayaquil (Ecuador) is the closest continental site to the islands and would be a likely source, it is part of the main transport routes with most flights originating in Quito with a stopover in Guayaquil, and cargo boats travel monthly from Guayaquil to the Galapagos. More detailed analyses are needed to confirm these results and narrow the geographic origin of the tropical fire ants from the Galapagos within Ecuador. This information could be used to improve quarantine efforts in the future.

1. **Johnalyn Gordon** and Thomas Chouvenc – UF/IFAS Ft. Lauderdale Research and Education Center, 3205 College Ave, Davie, FL 33314; johnalynmgordon@ufl.edu; (727) 417-1905

Establishment of a new invasive ant species, *Plagiolepis alluaudi*, in Florida - Florida is in a latitudinally temperate zone yet includes both subtropical and tropical climates. With numerous shipping ports and high urban activity, new species are frequently introduced to South Florida. There are currently over 230 ant species in Florida, approximately one quarter of which are classified as exotic, and most of the household pest ant species are considered invasive. In 2017, a newly invasive species was discovered in South Florida as its first New World continental record. *Plagiolepis alluaudi* (Emery) (Formicinae), the little yellow ant, is native to the Madagascar area, and has spread to many tropical islands around the world. It presumably arrived in South Florida via the robust boating industry throughout the West Indies to ports in South Florida. *Plagiolepis alluaudi* is extremely small (<1 .5 mm), with an entirely yellow body, and has the ability to form large polydomial, polygynous supercolonies. It primarily nests in rotten twigs on trees or on the ground, and tends to aphids, mealybugs and scale insects, feeding on their honeydew. It has apparently displaced a long-established population of *Pheidole megacephala*. As it nests in “yard waste” material, it has strong dispersal capability via local waste management services, and is expected to rapidly spread throughout South Florida. In high densities, it can infest structures, and is commonly found in bathrooms and kitchens. It also potentially can an agricultural pest. The use of liquid bait may temporarily reduce the ant activity in households, but recurrent re-infestations from surrounding landscapes are inevitable.

1. **Daniel Aguilera-Olivares** and Nan-Yao Su – UF/IFAS Ft. Lauderdale Research and Education Center, 3205 College Ave., Davie, FL 33314; daguilera@ufl.edu; (863) 210-3781

Nitrogen enrichment in masticated wood fragments stored in tunnels of *Coptotermes formosanus* Shiraki (Blattodea: Rhinotermitidae) - Nitrogen is one of the most important elements to living organisms. Termites are eusocial insects that live in colonies composed of hundreds to millions of individuals. Due to the low nitrogen content of a wood diet, nitrogen procurement may be supplemented through endosymbiotic association with nitrogen-fixing bacteria or through ectosymbiotic association with fungus. *Coptotermes formosanus* Shiraki is one of the most economically important termite species due to their damaging potential to wooden structures and worldwide distribution. Recent evidence has shown that symbiotic means of nitrogen procurement for this species is insufficient to account for colony growth, and that dietary nitrogen from sources other than sound wood are crucial. Due to the large discrepancy in nitrogen content of wood (0.03-0.15%N) and termites (~6% N), a diet based on wood alone is not enough to explain the high nitrogen content in *C. formosanus*. In the present study, we observed that workers of *C. formosanus* stored masticated wood fragments in tunnels and after one month their nitrogen content is significantly higher than the source wood. Thus, the storage behavior of masticated wood may promote the growth of nitrogen-fixing ectosymbionts and improve the incorporation of nitrogen to the colony. Additionally, this behavior could have been a precursor of farming behavior observed in fungus-growing termites belonging to the family Termitidae.

1. **Deepak Shrestha** and Hugh A. Smith **-** UF/IFAS Gulf Coast Research and Education Center, 14625 CR 672 Wimauma FL 33598; dshrestha@ufl.edu; 352-281-1834

Assessing life history parameters and competition between *Bemisia tabaci* (Gennadius) MEAM1 and MED on tomato cv. Florida 91 - Sweetpotato whitefly [*Bemisia tabaci* (Gennadius)Middle East-Asia Minor 1] (Hemiptera: Aleyrodidae), also known as biotype B,is one of the damaging pests of tomato and other horticultural crops in Florida. The establishment of *B*. *tabaci* Mediterranean, also known as *B*. *tabaci* biotype Q, in residential landscapes in Florida could potentially add more problems for tomato growers. Both species have the tendency to develop high levels of resistance to insecticides; however resistance among populations of *B. tabaci* MED has reached higher levels than MEAM1 in other countries, and MED may retain resistance longer than MEAM1. Our aim is to evaluate the competitive potential between *B*. *tabaci* MED and MEAM1 on common cultivars of Florida tomato. We compared life history parameters and competition of both species on tomato cv. Florida 91 under growth room conditions.

1. **Elena M. Rhodes,** Carlene A. Chase, Xin Zhao, and Oscar E. Liburd - Entomology and Nematology Department, University of Florida, Gainesville, FL, 32611; erhodes@ufl.edu; (352) 273-3925

Ecology and management of the twospotted spider mite, *Tetranychus urticae*, in organic strawberries in Florida - The twospotted spider mite (TSM), *Tetranychus urticae* Koch, is a major pest of a wide range of agricultural and ornamental plants, including strawberries. The release of predatory mites is one of the few options available to organic strawberry growers. *Neoseiulus californicus* McGregor prefers tetranychid mites and can persist in the field by feeding on small insects and pollen. Planting tolerant or resistant strawberry varieties is also an option for organic growers. The specific objectives of this study were to 1) assess the effect of strawberry variety and cover crop on TSM and its predators, 2) to compare preliminary, whole plot, and spot treatment applications of *N. californicus* for control of TSM. In the first experiment, four varieties, ‘Beauty’, Radiance’, ‘Sensation’, and ‘Winterstar’ (sub plot treatments), and four cover crop treatments, hairy indigo, sun hemp, mixed, and weedy control (main plot treatments) were examined in a split plot design. In the second experiment, conducted in a separate plot, treatments included, a preliminary release, whole plot release, spot release, and untreated control.There was no interaction between cover crop and treatment and no significant differences among TSM, predatory mite, and sixspotted thrips numbers among cover crop treatments. Significantly higher numbers of TSM, TSM eggs, predatory mites, predatory mite eggs, and six spotted thrips were found in ‘Beauty’ compared with the other three varieties. The preventative release treatment had significantly fewer TSM compared with all the other treatments. The whole and spot treatments had significantly fewer TSM compared with the control.

1. **Janine Spies** and Oscar Liburd - Entomology and Nematology Department, University of Florida, Gainesville, FL, 32611; jrazze@ufl.edu; 352-231-6330

Monitoring and evaluation of insecticides for management of blueberry gall midge populations in Florida blueberries - The blueberry gall midge (BGM), *Dasineura oxycoccana* (Johnson), is a pest of blueberries in the major blueberry-growing regions throughout the United States. The gall midge larvae feed on developing floral and vegetative buds in southern highbush and rabbiteye blueberries, and severe gall midge infestations can cause major crop loss. Reports of BGM infestations in blueberries in the southeast have become more common over the last couple of years. The objectives of this study were to 1) monitor BGM populations in southern highbush blueberries in Florida and 2) evaluate the effectiveness of three conventional insecticides for management of BGM. Monitoring of BGM was conducted in three varieties of southern highbush blueberries including Farthing, Sweet Crisp and an experimental research variety R0619. Adult BGM were monitored by deploying bucket emergence traps and larvae were sampled by collecting flower and/or leaf buds. An efficacy trial was conducted in Farthing and three insecticide treatments were evaluated: 1) Delegate, 2) Exirel, and 3) Movento. Sampling was conducted weekly for three weeks after the insecticides were applied, and adult and larval BGM were monitored as described above. Farthing had higher populations of BGM and our findings suggest this variety is susceptible to BGM damage. Movento demonstrated increased efficacy against BGM activity in buds when compared to the standard insecticide for BGM management, Delegate. Exirel also demonstrated moderate control to reduce BGM activity in buds and should be considered in a rotational program to manage BGM.

1. **Nupur Sarkar,** Zulaikha Mazlan and Oscar E. Liburd - Entomology and Nematology Department, University of Florida, Gainesville, FL, 32611; nupur.sarkar@ufl.edu; 352-745-5735

Evaluation of companion planting and plant extracts for sustainable management of *Plutella xylostella*, in organic cabbage production **-** Diamondback moth (DBM) *Plutella xylostella* (L), a major insect pest of cabbage has been shown to accrue resistance against many major insecticides. To develop alternative strategies for sustainable management of DBM we evaluated three companion plants in a cabbage system. Bravo Cabbage (*Brassica oleracea* var. *capitata*) was the main crop, whereas Roselle (*Hibiscus sabdariffa* Herb.), lemon star marigolds (*Tagetes tenuifolia* Cav.), and collards (*Brassica oleracea* var. *acephala*) were used as the companion plants. Five treatments (roselle, marigolds, collards, Entrust®, and control-untreated plot) with four replications were arranged in a randomized complete block design (RCBD). Roselle as a companion plant was the second-best treatment after Entrust® in reducing the population of DBM. Cabbage intercropped with the roselle had significantly higher number of predator populations captured from pitfall traps. To evaluate the effect of roselle plant extracts on DBM larval feeding and female oviposition behavior, laboratory and greenhouse-based choice tests were conducted. Laboratory data from the larval feeding choice tests suggested that both third and fourth instar larvae were highly oriented and more likely to settle on untreated cabbage compared with treated cabbage (dipped in roselle extract). In oviposition deterrence study DBM females were found to oviposit significantly less on roselle extract treated cabbage plant compared with untreated cabbage. Findings from these studies will be useful for providing information on alternative strategies that can be incorporated into an IPM program to manage DBM in organic or conventional cabbage crop production.

1. **Joe Patt** and Arty Makagon - USDA-Agricultural Research Service, U.S. Horticultural Research Laboratory Subtropical Insects and Horticulture Research Unit, 2001 S. Rock Rd., Fort Pierce, FL 34950; jmpatt52@gmail.com; 956-854-5234

Capability of Photonic Fence technology to detect, track, and kill flying Asian citrus psyllids and yellow fever mosquitoes - We present screen house test results of a novel technology, called the ‘Photonic Fence’, that is capable of flying vector control. It utilizes a combination of light modalities, precision optics, detectors, and software to detect, identify, track, and kill target insect species as they fly across a photonic ‘fence line’. A silhouette of an insect is generated as it crosses a plane of infrared light; the system then uses the silhouette’s outline, velocity, and wingbeat frequency to generate a species-specific spectral signature. The system compares the insect’s spectral signature with those of reference species to positively determine whether or not it is a target species. If it is determined to be a target species, then an eye-safe laser can be rapidly pulsed (< 25 ms) to kill it. The Photonic Fence can provide real time surveillance and control of ≤ 40 insects/second. Field-testing a 30 m long x 3 m high Photonic Fence began in October 2017 at the USDA-ARS Research Farm in Fort Pierce, FL. During releases of ≈ 1000 yellow fever mosquitoes (*Aedes aegypti*), the system successfully detected and tracked the mosquitoes across the entire active range for six hours. The system quantified periods of mosquito activity and inactivity and measured the decline of the numbers of mosquitoes as a consequence of laser-induced mortality. The system also successfully tracked releases of Asian citrus psyllid (*Diaphorina citri*). Lethal system testing on *A*. *aegypti* and *D*. *citri* is currently underway.

1. **Monica Triana**, Barry Kostyk, Lukas Stelinski and Phil Stansly - UF/IFAS Southwest Florida Research and Education Center, Immokalee, FL 34142; mtriana@ufl.edu; 239-658-3400

Monitoring for insecticide resistance in *Diaphorina citri* (Hemiptera: Liviidae) populations, using Topical bioassay- The Asian citrus psyllid (ACP), vector of Candidatus liberibacter asiaticus is the causal agent of huanglongbing (HLB), disease that is decimating the Florida citrus industry. The frequent use of insecticides causes resistance issues. Our objective was to evaluate field populations to three of the most commonly used chemicals using topical bioassay. Susceptible laboratory colony of Southwest Florida was used to compare susceptibility from 10 different commercial groves. The technical grade imidacloprid (99.9%), fenpropathrin (99.1%) or dimethoathe (99.8%) were applied to ACP adult as a 0.2 µl droplet using a 10 µl Hamilton needle. The ACP were placed in a 35 x 10 mm Petri dish on a 35 mm disc of orange leaf kept moist with 1.5% agar. Insects held for 24 hours in growth chambers at 26 °C with average relative humidity of 50% and photoperiod 14:10 L:D. Insects were rated dead when motionless and/or prone. The results showed evidence of tolerance to the three insecticides in the 10 field populations compared to the susceptible laboratory population, especially to imidacloprid. Mortality of field populations in response to the diagnostic 10 ng/ µl rate of this insecticide ranged from 2 to 57% compared to 95% of the susceptible reference colony. Resistance group 4A (neonicotinoid) products is concern because of their importance as soil applied for ACP control in young trees.

1. **Justin George**, Lukasz L. Stelinski and Stephen L. Lapointe – UF/IFAS **C**itrus Research and Education Center, Lake Alfred, FL 33850; georgejustine@gmail.com; 215-359-7247

An attract-and-kill trap device for Asian citrus psyllids - Phytophagous insects including Asian citrus psyllids (*Diaphorina citri* Kuwayama) (ACP) use multiple sensory modalities [vision, olfaction, contact chemoreception, gustation (taste), perception of auditory or vibrational stimuli] to locate host plants or conspecifics. We incorporated a number of these sensory stimuli (cues) into an attract-and-kill device to optimize attraction of ACP and mortality after psyllids land on the device. This new attract-and-kill device attracts flighted adults using color, UV reflectance, odor and a combination of phagostimulant and toxicant to kill them. Attraction to the color yellow by ACP is well documented, and our addition a UV reflectant compound significantly increases UV reflectance from the trap surface and thereby improve the attraction to the trap. Visual attraction will be augmented by olfactory orientation to a 3-odorant blend of citrus semichemicals identified in our studies. In addition to vision and olfaction, we have demonstrated that ACP orients to its host plant by gustatory perception (contact chemoreception) of host plant suitability. We have incorporated all these sensory cues together with a knock down insecticide into an attract-and kill trap device. Our attract-and-kill trap device will have practical applications in monitoring psyllid populations and making psyllid management decisions including pesticide applications and release of biocontrol agents. Data on prototype trap testing and preliminary field experiments using the device will be presented.

1. **Stephen L. Lapointe**, Justin George and Sana Shareef **-** USDA-ARS, U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945; Stephen.lapointe@ars.usda.gov; 772-216-1242

An attractant for the Sri Lankan weevil, *Myllocerus undecimpustulatus undatus* Marshall **-** *Myllocerus undecimpustulatus undatus* Marshall (Coleoptera: Curculionidae: Entiminae) also known as Sri Lankan weevil, has become an incidental and sometimes significant pest of ornamentals and tropical fruit trees in the southeastern states, especially Florida. The weevil seems especially fond of peach, a crop being developed for the Florida climate. Adult weevils have been observed causing a high level of leaf notching on leaves of peach. We studied the response of adult weevils to host plant volatiles using electroantennography and olfactometers. Headspace volatiles were collected from peach foliage. Putative attractants were identified as those compounds that elicited consistent antennal responses from field-collected male and/or female weevils. The results of olfactometer assays and field validation trials will be presented.

1. **Dakshina R. Seal** – UF/IFAS, Tropical Research and Education Center, Homestead, FL 33031; dseal3@ufl.edu; 305-246-7001 Ext. 368

Management of pepper weevil (Anthonomus eugenii Cano) using reduced risk insecticides in combination with sex-pheromone - Pepper weevil (PW), *Anthonomus eugenii* Cano, is an economic pest of pepper. In the present study, we attempted to attract pepper weevil adults using the Pherocon PEW trap and control them by using insecticides including Xpectro OD (Pyrethrin + *Beauveria bassiana* GHA, Spear-C (spider venom), and Venerate XC (Heat-killed *Burkholderia rinojensis*). Spear-C provided significant reduction of pepper weevil as compared to the nontreated control when applied in a pheromone treated pepper field. Conventional insecticides, except thiamethoxam, did not differ from the nontreated control in reducing PW.

1. **Jean Willy Nduwimana,** Ze Sun, Liu Hao and Man-Qun Wang- Hubei Insect Resources Utilization and Sustainable Pest Management Key Laboratory, College of Plant Science and Technology, Huazhong Agricultural University, Wuhan 430070, P.R. China; jeanwillynduwimana@yahoo.fr

Metabolites changes in Rice (9Y6H and 5ARX49) with nitrogen fertilizer, herbivores pest (*Nilaparvata lugens*) damage and natural enemy (*Anagrus nilaparvatae*) - In response to insect attack, plants release complex blends of volatile compounds. These volatiles serve as foraging cues for herbivores, predators and parasitoids, leading to plant mediated interactions within and between trophic levels. Hence, plant volatiles may be important determinants of insect community composition. To test the effect of Nitrogen fertilizer application and insect pest and their natural enemies to volatiles, both Volatiles organics compound (VOCs) and herbivores induced plants volatiles (HIPVs), and phytohormones (JA/SA), we conducted a series of experiments to apply Nitrogen fertilizer, to collect VOCs and HIPVs, Phytohormones(JA/SA) then we analyses using GC-MS, LC-MS and did Y-tube bioassay for attracting test. We fund that there is a difference between VOCs and HIPVs composition due to the different nitrogen doses applications and due to the damaged plants rice with insect pests (*Nilaparvata lugens*) and his parasitoid (*Anagrus nilaparvatae*). The results show also that volatiles (VOCs, HIPVs) and phytohormones (JA/SA) play an important role as attractants or repellents for insect pest and parasitoids. Moreover, the results imply that the manipulation of volatiles and phytohormones emissions in crops has great potential for the control of pest populations.

1. **El-Desouky Ammar,** David G. Hall and Michelle Heck **-** ARS-USDA, USHRL, 2001 S. Rock Rd., Fort Pierce, FL, 34945; desoukyammar@gmail.com; 772-462-5899

Effect of host-plant switching on acquisition and transmission of huanglongbing bacterium by the Asian citrus psyllid *Diaphorina citri* (Hemiptera: Liviidae) **-** Huanglongbing (citrus greening), the most devastating citrus disease worldwide, is associated in Asia and the USA with *Candidatus* Liberibacter asiaticus (CLas) transmitted by the Asian citrus psyllid (ACP, *Diaphorina citri*). *Murraya paniculata* and *Bergera koenigii* plants are known to be good hosts of ACP, but both are more resistant to CLas than all tested citrus species/varieties. We are studying the effects of host-plant switching of ACP between citron (*Citrus medica*) and *Murraya* on the acquisition and transmission of CLas. We started our experiments with ACP adults of a laboratory colony that has been reared on CLas-infected citron for many generations; qPCR tests indicated that 95% of these adults were CLas-infected (mean Ct value = 27.6). In the first three generations after transferring these adults to healthy *Murraya* plants, percentage of CLas-infected psyllids went down to 16.5, 3.9 and 2.5% respectively (mean Ct values =36.2-37.8). After being reared on *Murraya* for 6 months, some of these psyllids were switched back to infected citron. After 1-2 generations, percentage of infected psyllids was 70.5% with mean Ct value of 33.7 (both values are significantly different from those mentioned above for ACP reared longer on infected citron). We are continuing these experiments to study the effects of rearing ACP on *Murraya* and/or *Bergera* plants for longer periods on both acquisition and transmission of CLas. This study elucidates further the complex interactions between this serious bacterial pathogen, its psyllid vector and host plants, as well as various factors affecting ACP vector competence.

**Submitted Posters**

1. **Iris Strzyzewski**, Justin Renkema, Joseph Funderburk, and Xavier Martini - UF/IFAS North Florida Research and Education Center, Quincy, FL 32351; istrz228@ufl.edu; (352) 316-2033

Adding Flowering Plants on Strawberry Field Edges to Enhance Natural Enemies and Pollinators and Improve Pest Control and Fruit Quality - Flower thrips (Thysanoptera:Thripidae) are a pest of strawberry (*Fragaria × ananassa*) in central Florida and are known to cause injury and yield loss by feeding on flowers and fruits. Minute pirate bugs, *Orius* spp. (Hemiptera:Anthocoridae), are efficient predators of thrips, and multiple flowering plant species are known to provide resources and refuge for *Orius*. Despite these known associations among flowering plants, flower thrips, and *Orius*, the use of non-crop habitat in strawberry for in-field pest control has not been studied. Resource plantings may also impact abundance and diversity of multiple beneficial insects, including pollinators. In this study, we evaluated the potential of plantings of sweet alyssum (*Lobularia maritima*) andSpanish needles (*Bidens alba*) on the edge of a strawberry fieldto increase populations of *Orius* and other predators and decrease flower thrips numbers and related strawberry injury and loss. We also evaluated effects of adding these hedgerows on pollinator abundance and diversity and visitation rate on strawberry flowers. Thrips populations were significantly reduced in plots with flowering plants, and there was a seven-fold increase in the overall number of beneficial insects including pollinators and natural enemies in rows adjacent to flowering plants. These results highlight the potential of these flowering plants to serve as a resource for conserving natural enemies and other beneficial insects while reducing thrips numbers in Florida strawberry.

1. **Dong H. Cha**, Dominick Skabeikis, Man-Yeon Choi, and Robert K. Vander Meer - USDA-ARS DKI US Pacific Basin Agricultural Research Center, 64 Nowelo St., Hilo, HI 96720; dong.cha@ars.usda.gov; 808-932-2115

Behavioral response of *Wasmannia auropunctata* to chemical trails laid on epiphytic moss - The little fire ant (LFA), *Wasmannia auropunctata* Roger (Hymenoptera: Formicidae), is native to the neotropics, but has become one of the world's most widespread and destructive invasive ants. In Hawaii, LFA was first discovered in 1999 on the Big Island and since then it has rapidly spread to neighboring islands, causing ecological and economic damage. LFA can develop fully functional nests on the ground and arboreally. Foraging and retrieval of food resources is facilitated by a well-developed recruitment system. LFA were found to form recruitment trails on epiphytic moss growing on Macadamia nut trees. As a first step to identify LFA recruitment pheromone components, we tested the LFA worker trail-following response to naturally marked epiphytic moss trails and to experimental epiphytic moss trails made with a hexane extract of epiphytic moss trails. LFA workers followed the artificial hexane/moss trail, as they did on the natural trail. In laboratory choice assays, LFA workers preferred to follow a trail drawn with a hexane extract of moss that had a recruitment trail over a trail drawn with a hexane extract of moss only. Our results confirm that LFA workers readily follow a trail marking substance(s) laid down on epiphytic moss.

1. **Juliana Altafin Galli**, Marcos Doniseti Michelotto, Ivan Herman Fischer, and Antonio Lucio Mello Martins - Apta Regional Center North, P. O. Box 24, Zip Code: 15830-000, Pindorama-SP, Brazil; julianagalli@apta.sp.gov.br; 55 16 997385291

Infestation of Fruit Flies in Guava Genotypes Cultivated in Organic System -Fruit flies are the main pest of guava causing 100% of fruit loss without control measures. Plant resistance to insects is considered an ideal tool of control. Thus, the resistance of guava fruits to fruit fly was evaluated at 74 genotypes, grown in organic system. Five mature fruits of each genotype, not bagged, were individually weighed and placed in plastic containers containing vermiculite and covered with tulle. After 15 days the substrate was sifted, and were accounted the larvae, puparia and subsequently the adults. For each genotype, were determined the intensity of infestation (I.I.) and the viability of the pupae through the percentage of emergence of adults. The data were subjected to analysis of variance and averages compared by Scott-Knott test, at 5% probability. Also was examined the Silicon (Si) content of the fruit for genotypes more and less infested by the insect. All genotypes showed infestation by fruit flies, and all individuals recovered belonged to the genus *Anastrepha*. High pupal viability was observed, with 47 genotypes showing more than 70% viability. Already the I.I. varied from 44.4 for genotype more attacked (L6P22) to 5.6 less attacked (Monte Alto white). Stood out for the lesser I.I. the genotypes Monte Alto white, Campos, L3P11, IAC 4 UNESP and L2P6; and for greater susceptibility, L6P22, EEFT-1, L5P18 and L1P2. The Silicon content of the fruits of genotype Monte Alto white was 10.63% higher than L6P22, being the use of sources of this micro-nutrient an important tool in the suppression of this pest.

1. **Jermaine D. Perier**, Muhammad Haseeb, Jesusa C. Legaspi, Lambert H.B Kanga, Daniel A. Solis, and Alejandro Bolques- Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307; jermaine1.perier@famu.edu; 850-412-7060

Integration of Predators and Parasitoids to Manage Fall Armyworm (Lepidoptera: Noctuidae) in Florida - The fall armyworm, *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae) is widely distributed to the tropical regions of the western hemisphere from the United States to Argentina. Larvae cause damage by consuming foliage and often produces a characteristic row of punctures in the leaves. Larvae can also burrow into the growing point, destroying the growth potential of plants, or clipping the leaves. The species has a host range of over 80 different plants and displays a behavioral resistance, northern migratory pattern that limits the effectiveness of biological control on the species. Previous work did not clearly explained the effect of intraguild relationships on the efficiency of biological control at different temperature ranges. Numerous species of biological control agents affect the fall armyworm. Analyzing the intraguild relationship between the predators and the parasitoids on *S. frugiperda* will determine the influence of parasitism on other predation efforts. Two Florida’s native Pentatomid predators capable of surviving a range of temperatures (25-31°C), and a known parasitoid of the species are being evaluated via several experiments for prey preference, and efficiency of control on both parasitized and healthy caterpillars after different time periods of parasitism and various numbers of predators under the laboratory conditions. The results of this research will highlight the need for other intraguild research for biological control on other species, as well as provide an alternative methods of control to mitigate against the migration of *S. frugiperda* to different parts of Florida, thereby reducing the economic impact of pest through increased control efficiency.

1. **Paul E. Kendra**, David Owens, Nurhayat Tabanca, Wayne S. Montgomery, Teresa I. Narvaez, Elena Q. Schnell, and Daniel Carrillo - USDA-ARS, Subtropical Horticulture Research Station, 13601 Old Cutler Road, Miami, FL 33158; paul.kendra@ars.usda.gov; 786-573-7090

Field longevity of α-copaene and quercivorol lures for detection of *Euwallacea* nr. *fornicatus* in Florida avocado groves - Ambrosia beetles in the *Euwallacea* nr. *fornicatus* complex vector a fungal pathogen that causes *Fusarium* dieback, a disease that impacts avocado (*Persea americana*), woody ornamentals, and native trees in Florida and California. Currently, these pests are detected with quercivorol lures (containing *p*-menth-2-en-1-ol isomers), but recent research identified an essential oil enriched in α-copaene as a new attractant. In this study, lure efficacy and longevity were evaluated in several 12-wk field tests conducted in Florida avocado groves (Miami-Dade County) using traps baited with quercivorol, α-copaene, and a combination of the two. In conjunction, gas chromatographic analyses were conducted to quantify lure contents as well as volatile emissions from lures field-aged for 12 wks. In all tests, the lure combination captured significantly more *E.* nr. *fornicatus* than the individual lures. Field life of the combination lure was 12 wk; longevity of single lures varied from 9-12 wk. The essential oil lure contained >50% α-copaene, of which 99.9% was the negative enantiomer. Analysis of the quercivorol lure showed it contained 4 isomers, with 88% *trans*- and 9% *cis*- *p*-menth-2-en-1-ol. Results indicate that the combination of α-copaene and *p*-menth-2-en-1-ol provides a long lasting, effective lure for early pest detection in Florida. Further research is needed to determine which isomer of *p*-menth-2-en-1-ol is attractive to Florida *E.* nr. *fornicatus*, and if other members of the species complex are attracted to (-)-α-copaene.

1. **Cindy L. McKenzie**, Alton N. Sparks, Phillip Roberts, and Lance S. Osborne - USDA-ARS, U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945 cindy.mckenzie@ars.usda.gov**:** 772.462.5917

Survey of *Bemisia tabaci* (Hemiptera: Aleyrodidae) in agricultural ecosystems in Georgia - *Bemisia tabaci* samples were collected from 19 crops across 23 counties in Georgia since 2011 with the bulk of the samples taken in 2016 and 2017. Cotton was the most heavily sampled commodity (26) followed by six samples each of poinsettia, peanut, pepper, and squash. Other crops sampled included soybean, cowpea, corn, snap bean, verbena/lantana, cucumber, zucchini, kale, tomato, sweet potato, eggplant, melon, ornamental pepper, and chrysanthemums. MED (Q) whitefly was detected on verbena/lantana in 2011 and on poinsettia in 2012 at commercial greenhouses. Only MEAM1 (B) were detected in all the field grown commodities sampled. This survey serves as a baseline for Georgia in the event that MED whitefly are eventually detected in the field.

1. Teresa I. Narvaez, **Wayne S. Montgomery**, Daniel Carrillo, and Paul E. Kendra - USDA-ARS, Subtropical Horticulture Research Station, 13601 Old Cutler Road, Miami, FL 33158; wayne.montgomery@ars.usda.gov; 786-573-7067

Community of bark and ambrosia beetles (Coleoptera: Curculionidae: Scolytinae and Platypodinae) in a Florida avocado grove with laurel wilt - A trapping study was conducted in Miami-Dade County to assess the diversity and relative abundance of bark and ambrosia beetles in an avocado grove affected by laurel wilt. In addition, four commercial traps were evaluated for efficacy of detecting these taxa. Traps included a white sticky panel, black 8-funnel Lindgren, black 3-vane Multitrap, green 3-vane Multitrap, and an unbaited sticky panel control. The test followed a randomized complete block design, with five replicate blocks. Each trap was baited with a low-dose ethanol lure and captures were monitored for a six-week period (March – May 2018). Sticky traps caught the highest number of beetles, and green 3-vane traps captured the least. The majority of beetles were scolytine species within the tribe Xyleborini, but captures also included members within the tribes Corthylini, Cryphalini, and Dryocoetini, as well as one platypodine species. Redbay ambrosia beetle, the primary vector of the laurel wilt pathogen, was not detected in this grove.

1. David Owens, **Paul E. Kendra**, Wayne S. Montgomery, Teresa I Narvaez, and Daniel Carrillo - USDA-ARS, Subtropical Horticulture Research Station, 13601 Old Cutler Road, Miami, FL 33158; paul.kendra@ars.usda.gov; 786 573-7090

Dispersion of marked *Euwallacea* nr. *fornicatus* in Florida avocado groves, and estimation of lure sampling range - The shot hole borer, *Euwallacea* nr. *fornicatus* Eichhoff (Coleoptera: Curculionidae: Scolytinae), is a significant invasive pest of avocado. Females introduce pathogenic *Fusarium* fungus into galleries, resulting in a disease called *Fusarium* die-back. Lures containing either quercivorol or α-copaene are commercially available for monitoring this and other morphologically similar species affecting avocado in other regions. We conducted a series of mark-release-recapture experiments to investigate beetle dispersive behavior in a grove and to determine effective sampling range of lures. On separate days, sticky panel traps baited with quercivorol, α-copaene, or a combination of both lures were deployed in a grid in an avocado grove. In the morning of a release date, a minimum of 150 recently emerged females ready for their dispersal flight were lightly coated with fluorescent powder and released from a central release point. Traps were evaluated after 24 hours. The two component lure recaptured a greater percentage of released beetles than either component individually, and traps located 60 m from the release point routinely recaptured beetles. The farthest distance a trap recaptured a beetle was 157 m, and wind speed and direction greatly influenced beetle dispersal patterns. The combination of lures is currently the best trap bait for monitoring and delimiting *Euwallacea* nr. *fornicatus* in Florida.

1. **Sasha V. Clarke**, T.M. Paris, W.B. Hunter, S.E. Brown, and J.A. Qureshi - University of the West Indies, Department of Basic Medical Sciences, Biochemistry Section, Kingston, Jamaica; sashakayclarke@yahoo.com; 561-502-2186

Examination of dsRNA Absorption in Citrus Plants and Delivery to Psyllids **-** RNA interference has become a leading tool in the management of various plant pathogens. The capability of regulating any gene of choice provides valuable information for the development of solutions to many problems in clinical and agricultural sectors. Delivery and screening of dsRNA to the Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Liviidae), used the *in planta* feeding system (iPS). Questions still surround efficient plant delivery of dsRNA, and the systemic movement in treated plants, which may affect ingestion by psyllids. A control dsRNA from the capsid of Chinese Sacbrood Virus (CSBV) was used as the test molecule. Young and mature shoots of Root Stock (*Carrizo*) and Sweet Orange (*Madam vinous*) and three concentrations of Silwet L77 as a surfactant were evaluated for absorbance and systemic movement of dsRNA in plant. Plant uptake of dsRNA through soil was evaluated in a glasshouse experiment. The amount of dsRNA acquired by *Diaphorina citri* (both adults and nymphs) feeding on the dsRNA treated plants was quantified. Results highlighted young shoots absorbing more dsRNA than its mature counterpart with the surfactant not enhancing quantity of dsRNA uptake. A greater concentration of dsRNA was detected in psyllid nymphs than in the adults.

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CRISPR-Cas9 Gene-Knock OUT: Asian Citrus Psyllid - Report the first psyllid gene Knock-Out using CRISPR-Cas9, Clustered Regularly Interspaced Short Palindromic Repeats, and CAS protein 9. The KO was 269 nt from the transcript and a 550 nucleotide deletion in the gDNA in the psyllid’s thioredoxin gene, TXT, Diaphorina citri. (Hemiptera: Liviidae). Strategies to alter the psyllid population into a non-vector of Liberibacter asiaticus, CLas have been proposed, but could not perform psyllid transformations. To bypass the problem we conducted gene knock-outs by injecting the 3rd to 5th instars, and adult females near ovaries (within 3-4 days post eclosion). Thioredoxins function to reduce oxidative stress, promotes development. When absent the result is slow development, reduced lifespan as observed in TXT knock-out psyllids. Adult females showed reduce fecundity. These traits would result in a slow growth psyllid population taking 2 to 3 weeks longer to go from egg to adult, with adults having a reduced lifespan. The extended time as a nymph would also produce greater opportunity for predators and parasitoids to find, parasitize, or eat the psyllids. Lower fecundity, fewer eggs laid by females would also help to reduce population growth, driving the overall population downward. Psyllid TXT-knock-outs combined with IPM strategies, could produce long-term population suppression without increasing chances of population resurgence. CRISPR/Cas9 provides genome editing in Psyllids and will revolutionize development of strategies to protect citrus trees from the vector and the pathogen. [citrusgreening.org]. The Pipeline to Citrus Greening Solutions Project (USDA-NIFA 2014-70016-23028).

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Effects of Three Mulching Practices on the Density of Spotted-wing Drosophila (Diptera: Drosophilidae) on Blueberries in North Florida - Spotted-wing Drosophila (SWD), *Drosophila suzukii* Matsumura (Diptera: Drosophilidae), is a native species from the Southeast Asia. The insect is a serious pest of soft-skinned fruits in Florida. Larvae of *D. suzukii* develop within the fruit making it unmarketable as fresh berries and causing great economic losses. Currently, there are limited options available for growers to control SWD. This study focuses on developing strategies to manage SWD effectively using cultural practices. The study was conducted at the University of Florida, North Florida Research and Education Center, in the summer of 2017. The experimental design was a randomized complete block with two plant-based mulches [pine bark (PB) and shortleaf pine needles (SPN)] and one weed fabric mulch (WF); in the control no mulch was applied. Adult flies were collected weekly (May-July) using ‘Scentry Traps’ and ‘Suzukii Bait Traps’. Two blueberry cultivars (Climax and Powderblue) were utilized in the experiment. For Climax and Scentry traps, mean density of SWD ranged from 7 per plant in the PB mulch to 34 per plant in PN mulch, whereas for Powderblue and Suzukii bait traps, mean SWD density ranged from 11 (in control) to 31 in PN mulch. In both cases, PN mulch accounted for significantly highest number of SWD flies. In contrast, the PB mulch showed significantly lower number of SWD flies. These results indicate that mulch type affects the density of SWD. The study is currently being repeated in 2018 to determine the best recommended mulch for blueberry growers to effectively control the SWD.

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Neonic stewardship program for the management of the invasive *Bemisia tabaci* (MED) whitefly - *Bemisia tabaci* is a polyphagous pest known to attack over 600 plant taxa and is an effective vector of more than 100 plant damaging viruses. Among different biotypes of this cryptic species complex, MEAM1 and MED whitefly are the two most destructive members posing threats of several crops of economic importance. With the overall goal to improve existing management strategies for MED whitefly and stewardship of neonicotinoid class of insecticide, greenhouse trials were conducted to evaluate available chemistries for whitefly control, and assess their compatibility with commercially available predator *Amblyseius swirskii* and parasitic wasp *Eretmocerus eremicus*. In our studies, eight different chemistries were evaluated including dinotefuran, a neonic insecticide considered growers’ standard for whitefly control. Results indicate that certain insecticides including cyantraniliprole, flupyradifurone, pyrifluquinazon, afidopyropen, and a premix- formulation of spinetoram and sulfoxaflor were effective against MED whitefly, and suppressed pest population for over 5 weeks compared to control. In addition, some of these chemistries were compatible with *A. swirskii* and *E. eremicus* which could be integrated in the whitefly management program.

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Thrips-transmitted tobacco streak virus in green bean fields in south Florida - Thrips-transmitted viruses pose significant limitations for production of several economic crops in Florida. One such virus is tobacco streak virus (TSV), a member of the genus *Ilarvirus*, which causes bean red node disease in green bean. Severe losses have resulted from high incidences of bean red node during several recent growing seasons. Our knowledge of thrips vector species and potential reservoir hosts is limited. Thus, we surveyed TSV-infected green bean fields in south Florida. Florida flower thrips (*Frankliniella bispinosa*) was identified as the predominant thrips species. Interestingly, *F. bispinosa* has never been associated with TSV transmission. Controlled transmission studies used pollen from TSV-infected lambsquarters (*Chenopodium quinoa* Willd.), a common weed and virology indicator host, and *F. bispinosa* adults. Parallel experiments used western flower thrips (*F. occidentalis*) adults, a known vector of TSV. This is the first report of *F. bispinosa* transmission of TSV. Considering the high populations of *F. bispinosa* and the widespread nature of TSV that can make bean red node disease a serious problem for green bean growers in the region, the development of new *F. bispinosa* management plans will be the cornerstone for reducing grower losses.

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*Bacillus thuringiensis* Cry1Ac interacts with its toxin-binding region of cadherin-like receptor in *Cnaphalocrocis medinali*s - The rice leaffolder *Cnaphalocrocis medinalis* is a major destructive agricultural of rice in Asia. *Bacillus thuringiensis* (Bt) is the most widely used biopesticide and was recommended to control *C*. *medinalis*. The insect midgut cadherin has been identified as the major receptor for insecticidal toxins for the Bt Cry toxins. We reported here, for the first time, partial of the cadherin-like protein in *C. medinalis* (NCBI accession number KY230167) by alignment of homologous sequences, degenerate primer design and PCR amplification. We used sequence alignment, homology modelling, molecular docking, and KFC2 hot spot prediction to gain the binding contacts between the partial (Glu 230-Vla620) and Cry1Ac (Phe280-Arg590). Moreover, The Glu230-Vla620 of the partial was cloned into pET26b expression vector in BL21 (DE3) and then induced and purified. The expressed Glu230-Vla620 of the partial showed binding specifically to Cry1Ac toxin by Western blotting analysis. The results suggest that the first fragment of the cadherin-like protein receptor identified acts as functional binding sites of Cry1Ac in *C*. *medinalis*.

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Examining the prevalence of *Solenopsis invicta* virus 3 in *Solenopsis invicta* alates collected in North Florida - Red imported fire ants*, Solenopsis invicta* Buren (Hymenoptera: Formicidae), are originally from South America but now infest over 128 million hectares in the United States. Their presence has caused social, environmental, and economic impacts. Over the decades, chemical control has successfully controlled these pests; however, this method is costly and red imported fire ants establish colonies quickly after chemical application. Because of this, it is important to create additional strategies for managing fire ants. Surveys are being conducted to determine the prevalence of the *Solenopsis invicta* virus 3 (SINV-3) in alates of *S. invicta* collected in five different North Florida cities. The quantity of SINV-3 in the alates is established using RT-PCR techniques. *Solenopsis invicta* populations can be managed by self-sustaining biological controls agents if the known natural enemies are analysed.

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Effect of the host and parasitoid densities on the mass production of the larval parasitoid *Apanteles opuntiarum* (Hymenoptera: Braconidae) on *Cactoblastis cactorum* (Lepidoptera: Pyralidae) - *Cactoblastis cactorum* Berg causes severe damage to *Opuntia* cactus in North America. This may be due, in part, to the absence of specialized natural enemies that suppress the population in its natural habitat. An outbreak of this moth in the southwestern US has the potential to affect entire desert ecosystems, because wild *Opuntia* species in these regions provide habitat for wildlife as well as contribute to soil stability. *Apanteles opuntiarum* Martínez & Bertha, a parasitoidwith a limited host range, has been shown to control *C*. *cactorum* in Argentina. To combat the US outbreak, the parasitoid was imported from Argentina and reared in the containment facility at the Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville, FL, to assess its risk to native cactophagous insects. The present study was conducted to understand the effect of host and parasitoid densities on the parasitism rate, emergence, and sex ratio of the parasitoid reared under laboratory conditions for efficient production of healthy *A*. *opuntiarum*. For the host larval density, when exposing 20, 30, or 50 larvae, respectively, the highest success was recorded with 30 host larvae, but the differences were not significant. However, for the parasitoid densities, parasitism rate and female: male sex ratio were highest using a 3:3 male to female sex ratio as compared to 2:4 and 4:2 male to female sex ratios. The results show promise for efficiently mass rearing *A*. *opuntiarum* for use as a biological control agent of the cactus moth.

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Antimicrobial peptide that blocks ‘*Candidatus*’ Liberibacter asiaticus acquisition by *Diaphorina citri* (Asian citrus psyllid) in citrus leaves - ‘*Candidatus*’ Liberibacter asiaticus is a phloem-limited bacterium in citrus that causes citrus Huanglongbing (HLB or citrus greening disease). This bacterium is transmitted by *Diaphorina citri* (Asian citrus psyllid, ACP). There is no known cure for this disease and since its discovery in Florida in 2005, it has reduced commercial citrus production by greater than 70%. This bacterium cannot be cultured outside of citrus or the psyllid, thus, limiting research on development of new control strategies. We have developed a screening bioassay to test effectiveness of various antimicrobial compounds using a detached leaf assay. With this assay we have identified several compounds that can move into the phloem of detached leaves and kill up to 90% of CLas. Using a modification of this assay, we have also shown that psyllid acquisition of CLas feeding on leaves that have been treated with one specific antimicrobial peptide was greatly inhibited. In fact, we have been unable to detect CLas in the salivary glands of these psyllids and have yet to observe successful transmission to healthy citrus leaves. We are now evaluating various topical application strategies that can be used to deliver this peptide to plants in commercial groves.