**BOOK OF ABSTRACTS**

**97th ANNUAL MEETING of the**

**FLORIDA ENTOMOLOGICAL SOCIETY**

**August 3 - 6, 2014 - Jupiter, FL**

[**President's Address**] **How does the Florida Entomological Society Measure Up to other State/Regional Entomological Societies in the US?** Nan-Yao Su**,** Ft. Lauderdale Research and Education Center, IFAS, University of Florida, 3205 College Ave., Davie, FL 33314. [nysu@ufl.edu](mailto:nysu@ufl.edu)

The introduction of FES on our web site states that “….The Florida Entomological Society with approximately 700 members is the largest state entomological society in the USA….” Are we really the largest? And if so, in what aspect? By comparing the membership, publication, annual activity, and the national and international reputation, the current state of our society will be assessed.

[**FES Pioneer Lecture Honoring Anthony C. Bellotti**]

**A Tribute to Dr. Anthony C. Bellotti and His Contributions to Worldwide Classical Biological Control for Cassava.** Stephen Lapointe. USHRL ARS USDA, 2001 South Rock Road, Fort Pierce, FL 34945. [stephen.lapointe@ars.usda.gov](mailto:stephen.lapointe@ars.usda.gov)

Anthony (Tony) Bellotti’s career as a humanitarian and entomologist followed a trajectory that took him to El Salvador with the Peace Corps in 1962, New Mexico State for a Masters, Paraguay (again with the Peace Corps), Cornell University for a PhD, and Colombia where he worked for the *Centro Internacional de Agricultura Tropical* (CIAT) from 1974 until his passing in March, 2013 in Naples, Florida. Tony became a passionate advocate of cassava and one of the world’s pre-eminent authorities on the entomology of that orphan crop that sustains millions of the world’s poorest populations. Tony played a crucial role in one of the most often cited and successful examples of classical biological control, the introduction of a parasitoid wasp from Paraguay to control the cassava mealybug throughout a broad area of Africa known as the Cassava Belt. His career spanned a period of time that might be referred to as a golden age of commodity programs at the international “CG centers” organized under the Consultative Group on International Agricultural Research (CGIAR) that followed in the footsteps of Norman Borlaug and Robert McNamara, the unlikely alliance that led to the Green Revolution. Among Tony’s lesser accomplishments was his recruitment of the author to CIAT in 1986 where I worked on pests of tropical forages and then on cassava IPM in northeastern Brazil and West Africa. Tony was a mentor and a friend whose career offers a chance to look at a unique life and his contributions to international agriculture.

**Poster Displays**

[**DSP 1**] **Comparison of clear plastic sheets and panel traps for monitoring blueberry gall midge (*Dasineura oxycoccana* Johnson in rabbiteye blueberries in Florida.** Elena M. Rhodes and Oscar E. Liburd. University of Florida, Entomology and Nematology Department, Bldg. 970 Natural Area Dr., Gainesville, FL 32611. [erhodes@ufl.edu](mailto:erhodes@ufl.edu)

Blueberry gall midge (BGM), *Dasineura oxycoccana* Johnson, injury can cause yield losses of up to 80% in rabbiteye blueberry plantings. Larvae develop in leaf and flower buds and pupate in the soil. Therefore, monitoring for adult emergence is critical for timing insecticide applications. Emergence and panel traps are both effective monitoring tools for BGM in Florida and Canada, respectively. Panel traps are not as effective in Florida and would be awkward for growers to use. The objective of this study was to determine if clear sticky sheets were at least as effective as panel traps in monitoring BGM adults. A randomized complete block design with four replicates of four treatments was set up at an organic rabbiteye blueberry farm in Gainesville, FL. Treatments included the clear sticky sheet, panel trap, bucket emergence trap, and an unfolded yellow sticky trap (control). Panel traps and clear sticky sheets caught similar numbers of midges. Bucket traps caught the highest numbers of midges and yellow sticky traps caught no midges. The BGM population was too small for any of the differences to be statistically significant.

[**DSP 2**] **Phonoresponses of females of an Erebid moth to conspecific acoustic signals and to bat echolocation calls.** Raquel Casado, Orlando Benavides, Rosario Rodriguez, Gretert Montano, and Frank Coro. Natural and Social Sciences Department, InterAmerican Campus, Miami Dade College, 627 S.W. 27th Avenue, Miami, FL 33135. [raquel.casado001@mymdc.net](mailto:raquel.casado001@mymdc.net)

Several erebid moth species with two-celled ears also have acoustic emission organs used to interact with their main predators, insectivorous bats. Some of these moth species also use acoustic signals during their mating behavior. *Syntomeida epilais*, the polka-dot wasp moth, is the object of our study and one of the erebid moths in which acoustic communication is essential for their successful mating behavior. During their mating behavior both sexes emit ultrasonic signals, named modulation cycles. Our aim is to analyze if during their mating behavior hours *S. epilais* perched females could discriminate among acoustic signals present in their natural environment. We stimulated virgin females with playback recordings from conspecific male and female emissions and from echolocation calls emitted by *Tadarida brasiliensis*, the most abundant insectivorous bat in Florida. The bat calls applied included search calls and an approach and buzz series. Phonoresponses from these females were recorded outdoors during the hours of *S. epilais* mating behavior (3:30 – 6:30 AM). The responses were quantified by counting the number of modulation cycles produced by the female in response to the applied stimuli and by measuring the latency to the first stimulus of the series. All females phonoresponded to their conspecific male emissions, while not all responded to the other ultrasonic signals present in their environment. Our results demonstrate that these females phonorespond preferentially to their conspecific male emissions during the hours of their mating behavior, thus suggesting adaptations for intraspecific acoustic communication in a moth species with two-celled ears.

[**DSP 3**] **Phonoresponses of females of a moth with two-celled ears to ultrasonic signals present in their environment and applied at the same repetition rate.** Gretert Montano, Rosario Rodriguez, Orlando Benavides, Raquel Casado, and Frank Coro. Natural and Social Sciences Department, InterAmerican Campus, Miami Dade College, 627 S.W. 27th Avenue, Miami, FL 33135. [gretert.montano001@mymdc.net](mailto:gretert.montano001@mymdc.net)

*Syntomeida epilais*, the polka-dot wasp moth, is the object of our study and one of the erebid moths in which acoustic communication is essential for their successful mating behavior. During their mating behavior both sexes emit ultrasonic signals, named modulation cycles (MCs). Erebid moths with acoustic emission organs have been studied mainly with respect to their acoustic interaction with insectivorous bats. Our aim is to analyze if during their mating behavior hours *S. epilais* virgin perched females could discriminate among three different acoustic signals present in their natural environment and applied at the same repetition rate. With a playback recording of a male modulation cycle, a female MC, and a bat pulse we constructed series with 10 of these signals each and with the same interval between consecutive signals. We used intervals that ranged between 200 ms (5 Hz) and 45 ms (22 Hz). Phonoresponses from these females were recorded outdoors during the hours of *S. epilais* mating behavior (3:30 – 6:30 AM). The responses were quantified by counting the number of MCs emitted by the female in response to each series. Females responded with more MCs to the series formed by the male MC in the range between 140 ms (7 Hz) and 50 ms (20 Hz) than to the other two stimulation series. Females phonoresponded better to the male MC series with intervals between 105 ms (9.5 Hz) and 70 ms (14.3 Hz), which correspond to interval values present in male spontaneous emissions during mating behavior.

[**DSP 4**] **Ambrosia beetles associated with laurel wilt-affected avocado orchards in south Florida.** Teresa Narvaez, Daniel Carrillo, Rita E. Duncan, Jorge E. Peña. University of Florida, Tropical Research and Education Center, Homestead, FL 33031. [tnarvaez1@ufl.edu](mailto:tnarvaez1@ufl.edu)

Laurel wilt is rapidly spreading in south Florida avocado orchards. The key vector of this disease is the redbay ambrosia beetle RAB (Xyleborus glabratus). However, while RAB is easily detected infecting native Lauraceae trees, it is seldom detected in avocado orchards. Several other ‘resident’ species of ambrosia beetles appear to have become vectors of the disease in south Florida avocados, and some of these (i.e, Xyleborus ferrugineus and Xyleborus volvulus) have shown experimentally to be capable of transmitting laurel wilt to avocado. The goal of this study is to establish an efficient trapping system for ambrosia beetles in south Florida avocado orchards . The specific objectives are to evaluate commercially available lures for their ability to attract various ambrosia beetles to multifunnel traps, and to determine the seasonality of ambrosia beetles inhabiting these avocado agrosystems. Seven multifunnel traps were placed in each of eleven laurel wilt-affected avocado orchards in south Florida. Different lures and lure combinations were tested in several trials. Sixteen species of ambrosia beetles were captured in the traps. The most abundant species of ambrosia beetles were Xyleborinus saxeseni, Xyleborus affinis, Xylosandrus crassiusculus, Xyleborus volvulus, X. ferrugineus and X. bispinatus (Coleoptera: Curculionidae: Scolytinae). The seasonality of these species and their attractiveness to multiple commercially available lures is presented.

[**DSP 5**] **The prevalence of the cordovan phenotype in the African-derived honey bee (*Apis mellifera scutellata*) population in the Southeastern United States.** Ashley N. Mortensen and James D. Ellis. University of Florida, 970 Natural Area Drive, Gainesville, FL 32601. [mortensena@ufl.edu](mailto:mortensena@ufl.edu)

Cordovan (*cd*) is a recessive phenotype of the western honey bee (*Apis mellifera* L.) where all black cuticular regions appear brown. Historically, this color variant has been used as an indicator of European decent in comparative studies between African-, *A.m. scutellata* Lepeletier,and European-derived honey bees, *A.mellifera* sspp, in the United States. However, our observations in central Florida have lead us to believe that the *cd* phenotype may be present in both populations. To test this hypothesis, 2,400 drones were analyzed from 6 drone congregation areas (400 drones per area) in Orange and Osceola counties, Florida. Drones were confirmed as cordovan or wild-type via visual inspection, and evaluated for European or African mtDNA using the PCR-RFLP technique on a diagnostic region of the cytochrome *b* gene. Our results demonstrated that the *cd* phenotype is present in feral populations and is associated with both African and European matrilines. Therefore, we recommend the *cd* phenotype only be used as an indication of European decent in carefully designed experiments that eliminate the risk of misinterpreting the identity of feral *cd* individuals.

[**DSP 6**] **Attraction of insects to incandescent, compact fluorescent, halogen, and LED lamps in a light trap: Implications for light pollution and urban ecologies**. Michael J. Justice, Teresa C. Justice, Elizabeth A. Main. Unaffiliated. 265 Harrell Street, Appomattox, VA 24522. [arenivaga@att.net](mailto:arenivaga@att.net)

The widespread use of electric lamps has changed the intensity and spectral distribution of the light environment, creating "ecological light pollution" and “artificial light ecology.” Given the important role of insects in ecosystems, how they are affected by light pollution deserves attention. Studies specifically examining residential area lights are scarce, and no ecological research has yet examined the attractiveness of "white" LED lamps to insects. This study used a light trap to capture insects for 60 summer nights in a suburban town in Virginia, USA. During each night of trapping, one of five different light bulbs was used in the trap (incandescent, compact fluorescent, halogen, warm LED, and cool LED). Significantly more insects were captured by the incandescent lamp than the cool LED lamp. This difference was also observed in two insect Orders: Lepidoptera and Diptera. These data suggest that a widespread shift from incandescent to LED lamps could greatly reduce insect attraction to and mortality around residential lamps. Unfortunately, the rapidity of change in the light quality of retail lamps may outpace the rate at which their ecological impacts can be studied.

El uso extenso de lámparas eléctricas recientemente ha cambiado la intensidad y la distribución espectral de la luz ambiente, y ha resultado en la creación de "contaminación lumínica ecológica" y una "ecología de luz artificial." Dado la importancia de los insectos en los ecosistemas, la forma en que son afectados por la contaminación lumínica merece atención. Los estudios que examinan específicamente las luces de la zona residencial son escasos, y ninguna investigación ecológica aún ha examinado la capacidad de la atracción de las lámparas LED "blancas" a los insectos. Este estudio utilizó una trampa de luz para capturar insectos por 60 noches durante el verano en un pueblo suburbano en Virginia, EE.UU.. Durante cada noche de la captura, una de las cinco lámparas diferentes se utilizó en la trampa (incandescentes, fluorescentes compactas, halógenas, LED cálida, y LED fria). Significativamente más insectos fueron capturados por la lámpara incandescente que la lámpara LED fria. Esta diferencia también se observó en dos órdenes de insectos: Lepidoptera y Diptera. Estos datos sugieren que un cambio generalizado de lámparas incandescentes a lámparas LED podría reducir en gran medida la atracción de insectos para y la mortalidad cerca lámparas residenciales. Desafortunadamente, es posible que la rapidez de cambio en la calidad de la luz de las lámparas comerciales excederá la habilidad de poder estudiar sus impactos ecológicos.

[**DSP 7**] **Correlation between Color Ingestion Indicator and Virus Acquisition.** Sana Shareef1 and Wayne Hunter2.1St Edward’s School, 1895 St. Edward’s Drive, Vero Beach, FL 32963; 2 USDA, ARS, U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945. [sanas@steds.org](mailto:sanas@steds.org)

Problem: a bioassay used to study insect virus acquisition takes approximately 10 days, which is time consuming. This study examined shortening the bioassay by correlating virus acquisition with an ingestion color indicator. Null Hypothesis 1: all food dyes/ histological stains are suitable for use as an indicator of insect ingestion, and Null Hypothesis 2: there is no correlation between the dye ingested and virus acquisition. Four different stain solutions were compared for detection, visibility, and nontoxicity to the plants and insects. The treatment containing 0.29 mL blue food dye, 1.5 mL Surfactant (10%), in 13.21 mL water was the most visible, detectable, and nontoxic treatment to the plants and insects. The treatment was, on average, two days faster in detection and visibility compared to the other treatments. The virus stock used was propagated in *Diaprepes abbreviatus* L., larvae. The IIV-6 was absorbed by the plant; and ingested by GWSS which then fed on the treated plants. Virus analyses using PCR was used to validate the presence of viral DNA, IIV-6, in the glassy winged sharpshooters. The alternate hypotheses were accepted! Ha 1) there is a difference in the utility and toxicity of the different dye formulations in plant toxicity, and in the detection of feeding/ingestion by glassy-winged sharpshooters; and Ha 2) there is a correlation between color ingestion and virus acquisition. The treatment developed significantly reduced bioassay time by approximately 7 days for virus acquisition studies, which saves the researcher/laboratory a significant amount of time and money.

[**DSP 8**] **Cubeb oil lures: Sesquiterpene emissions and efficacy for attraction of redbay ambrosia beetle, *Xyleborus glabratus* (Coleoptera: Curculionidae: Scolytinae).** Paul E. Kendra, Wayne S. Montgomery, Jerome Niogret, Mark A. Deyrup, and Nancy D. Epsky. USDA-ARS, Subtropical Horticulture Research Station, 13601 Old Cutler Rd., Miami, FL 33158. [paul.kendra@ars.usda.gov](mailto:paul.kendra@ars.usda.gov)

The redbay ambrosia beetle (RAB), *Xyleborus glabratus*, is an exotic wood-boring pest that vectors *Raffaelea lauricola*, a symbiotic fungus that causes laurel wilt. This lethal disease has decimated native redbay (*Persea borbonia*) and swampbay (*P. palustris*) trees throughout the southeastern U.S., and currently threatens avocado (*P. americana*) in south Florida. To curtail the spread of laurel wilt, effective attractants are needed for early detection of RAB. Phoebe oil lures were the best known attractant for RAB, but they are no longer available. The current approved detection system uses manuka oil lures, but our previous research indicated that manuka lures have a short field life in Florida. Recently, cubeb oil was identified as a new attractant for RAB, and cubeb bubble lures are now available commercially. This study compared the trapping efficacy and field longevity of cubeb, manuka, and phoebe lures (material in storage since 2010) over a 12 week period in south Florida. In addition, terpene emissions were quantified from cubeb and manuka lures. RAB captures were comparable with cubeb and phoebe lures for ~7 weeks, but captures with cubeb were significantly greater from weeks 8-12. Overall captures with manuka lures were lower, and manuka lures lost attraction after 5 weeks. Our results indicate that cubeb bubble lures are the most effective lure currently available for detection of RAB, and their long field life is due to an extended, low release of attractive sesquiterpenes.

[**DSP 9**] **Wine and vinegar-based attractants for the African fig fly (Diptera: Drosophilidae)**. Nancy D. Epsky, Micah A. Gill, C. Teri Allen, Dong H. Cha, and Peter J. Landolt. USDA/ARS, SHRS, 13601 Old Cutler Rd., Miami, FL 33158. [Nancy.Epsky@ars.usda.gov](mailto:Nancy.Epsky@ars.usda.gov)

The African fig fly (AFF), *Zaprionus indianus* Gupta (Diptera: Drosophilidae), is an invasive fruit pest that has spread rapidly through much of the eastern United States after first being detected in Florida in 2005. This drosophilid is a primary pest of figs in Brazil, so there were initial concerns that it would be a primary pest of small fruit in the US. Although it has a wide host range in Africa, it has been found primarily in damaged fruit in Florida to date. With the appearance of the spotted wing drosophila (SWD), *Drosophila suzukii* (Matsumura), there is a greater interest in pest drosophilid trapping systems and the development of a trapping system to monitor distribution of AFF. Initial field tests found low capture of this fly in traps baited with apple cider vinegar, a standard bait for SWD. Studies were initiated in 2012 to evaluate capture of AFF in traps baited with combinations of wine and vinegar, which is an improved bait developed for SWD. Subsequent studies evaluated combinations of chemicals that are emitted by this bait. Captures of AFF and non-target drosophilids were quantified, and results were compared to responses of SWD in similar tests.

[**DSP 10**] **Dioecy affects the performance of *Apocnemidophorus pipitzi* (Coleoptera: Curculionidae), a stem boring weevil of Brazilian Peppertree, *Schinus terebinthifolia*.** J.P. Cuda, J.L. Gillmore, B. F. Garcete-Barrett, J.C. Medal, and W.A. Overholt. UF/IFAS Entomology & Nematology Dept., Charles Steinmetz Hall Bldg. 970, Natural Area Drive, PO Box 110620, Gainesville, FL 32611-0620. [jcuda@ufl.edu](mailto:jcuda@ufl.edu)

Interactions between plants and insects are highly dynamic and may be beneficial to both organisms, or only to one, as in the case of herbivores. A variety of insect feeding guilds, e.g., chewers, sap suckers, miners, and borers injure plants in various ways. In order to endure injury from herbivory and ensure survival and production of progeny, plants have evolved various response mechanisms to deter herbivores; however, insect herbivores have subsequently evolved ways to overcome plant defenses. Plants and insects that compete in this manner subsequently co-evolve and maintain tight relationships, which have contributed to the evolution of complex plant chemistry, or co-evolutionary arms race. Brazilian peppertree, *Schinus terebinthifolia* Raddi (Anacardiaceae), is a woody shrub that has become one of the most invasive weeds in Florida. Brazilian peppertree also is a dioecious species, which means there are separate male and female plants. There is anecdotoal evidence that crushed leaves from female plants produce a more pungent aroma, indicating the plants may be better defended chemically than their male counterparts. To test this hypothesis, we compared the performance (adult feeding and survival) of the South American stem boring weevil *Apocnemidophorus piptzi* (Faust), a potential biological control agent, on foliage collected from both male and female Brazilian peppertree plants.

[**DSP 11**] **Management of American serpentine leafminer, *Liriomyza trifolii* (Burgess) ((Insecta: Diptera: Agromyzidae).** D. R. Seal, C. M. Sabines and S. Devkota. University of Florida, Tropical Research and Education Center, Homestead, FL 33031. [dseal3@ufl.edu](mailto:dseal3@ufl.edu)

The American serpentine leafminer, *Liriomyza trifolii* (Burgess) is a common pest of all vegetable crops in the South Florida. Population abundance of the American serpentine leafminer is high during the vegetable growing season extending from October to May, although this pest occurs in all seasons when host plants are available. In the present poster, information on the control of the American serpentine leafminer in beans by using diamide insecticides will be presented. Effectiveness of diamide insecticides in controlling American serpentine leafminers will be compared with other commonly used insecticides. This information will be useful to manage American serpentine leafminers using proper insecticides on other host crops.

[**DSP 12**] **Effects of barometric pressure on acoustic behavior of the Asian citrus psyllid, *Diaphorina citri*.** Nina Zagvazdina and Richard Mankin. USDA, ARS, Center for Medical, Agricultural, and Veterinary Entomology, 1700 SW 23rd Dr, Gainesville, FL 32608. [Nina.Zagvazdina@ars.usda.gov](mailto:Nina.Zagvazdina@ars.usda.gov)

The effects of barometric pressure on insects have been an area of interest for researchers since the early 20th century. Correlational studies have suggested that insects in more than 10 families as well as mites, bats, and fish may be affected by pressure changes. Tests conducted in experimental chambers that can carefully control pressure are rarer, but to date at least 8 insect families and one bird species have been looked at. Our study addresses the effects of barometric pressure on the acoustic behavior of the Asian citrus psyllid, *Diaphorina citri*. Correlational and direct study data will be presented.

[**DSP 13**] **Susceptibility of strawberry varieties to** [***Tetranychus urticae* Koch**](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&cad=rja&uact=8&sqi=2&ved=0CC4QFjAA&url=http%3A%2F%2Fentnemdept.ufl.edu%2Fcreatures%2Forn%2Ftwospotted_mite.htm&ei=m-CRU9jTE4nf8gGB6IFA&usg=AFQjCNEJpRXotC-sFzPSVLXPAhMRQLQh8w) **and abundance of *Neoseiulus californicus* within varieties.** Omotola G. Dosunmu, Annika T. Minott and Oscar E. Liburd. University of Florida, Entomology and Nematology Department, Building 970 Natural Area Drive, University of Florida, Gainesville, Florida 32611. [toladosunmu@ufl.edu](mailto:toladosunmu@ufl.edu)

Strawberry is a major small fruit crop in Florida. In order to provide impetus for the expansion of organic strawberry production in Florida and other Southeastern states, a study was conducted to determine the susceptibility of strawberry varieties, grown organically, to twospotted spider mites (TSSM), [*Tetranychus urticae* Koch](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&cad=rja&uact=8&sqi=2&ved=0CC4QFjAA&url=http%3A%2F%2Fentnemdept.ufl.edu%2Fcreatures%2Forn%2Ftwospotted_mite.htm&ei=m-CRU9jTE4nf8gGB6IFA&usg=AFQjCNEJpRXotC-sFzPSVLXPAhMRQLQh8w) and other insect pests. In addition, the efficacy of the predatory mite, *Neoseiulus californicus* as a biological control agent on *T*. *urticae* in strawberry varieties was evaluated. Eight varieties were planted in a randomized complete block with 4 replicates, and sampling was done weekly. Albion, Proprietary1 and Camarosa had numerically higher population of TSSM, but there was no significant difference among strawberry varieties. With regards to *N. californicus*, Albion had significantly more predatory mites on all varieties except Proprietary1, and Camarosa. Radiance and Festival had significantly fewer predatory mites than Proprietary1 and Camarosa. Integrated tactics are needed to suppress TSSM population in organic strawberries.

[**DSP 14**] **Effects of RNAi treated plants on psyllid host preference.** Hava Stern, Wayne Hunter, and Eduardo Andrade. USDA, ARS, 2001 South Rock Road, Fort Pierce, FL 34945. [Wayne.hunter@ars.usda.gov](mailto:Wayne.hunter@ars.usda.gov)

Huanglongbing, HLB, is a bacterial caused disease in citrus plants which causes loss yield, and tree death. Florida is the 2nd largest citrus juice industry in the world, with Brazil and the USA producing 90% of orange juice. HLB is the biggest threat for the citrus industry which is transmitted by the Asian Citrus psyllid. Currently no cure exists. Management has multiple targets with reduction of psyllid populations, reliant upon heavy amounts of insecticides. RNA interference (RNAi), is a natural biological process that selectively shuts down the expression of specific genes is being developed as a more environmentally friendly approach. This experiment examined psyllid response, to dsRNA treated plants versus non treated plants. RNAi-based strategies are being developed for highly specific psyllid population reduction. A total of 20 plants treated with dsRNA to psyllid, and 20 control plants treated with dsRNA, green fluorescent protein, GFP, and an untreated control of 30 plants were used in this experiment. They were observed for 15 days in a choice test for host preference, and the location recorded daily. A significant difference, using t-test analyses, showed more psyllids on the dsRNA treated plants than on untreated controls ( p > 0.05). Preliminary results suggest that Psyllids were not sensitive to dsRNA treated plants from which they fed, unlike responses to some traditional chemical insecticides.

**Symposium: Biology, Ecology, and Management of Asian Citrus Psyllid**

**Organizer**:Dr.Philip A. Stansly.University of Florida, IFAS/SWFREC, Immokalee, FL 34142. [pstansly@ufl.edu](mailto:pstansly@ufl.edu)

[**1**] **Factors influencing transmission of the huanglongbing pathogen by the Asian citrus psyllid and methods for interrupting the transmission process.** Kirsten Pelz-Stelinski, Calum Russell, Mark Hoffman, and Heather Gibbard Kingdom. University of Florida – IFAS, Citrus Research and Education Center, 700 Experiment Station Rd Lake Alfred, FL 33850-2243.

The Asian Citrus Psyllid (ACP), *Diaphorina citri*, a phloem feeding citrus pest, transmits *Candidatus* Liberibacter asiaticus(Las),the causal agent of citrus Huanglongbing (HLB) disease found in Florida and increasingly throughout all citrus growing areas of the United States. Understanding the biological and environmental factors, including age, temperature exposure, and host preference, that influence the vector capacity of *D. citri* is critical for the development of effective pest and disease management strategies. Currently, microbial-mediated disruption of Las transmission is one such strategy under investigation. Our findings suggest that Las transmission is influenced by the native microbial community present in ACP, and these communities differ among populations of *D. citri.* In particular, infections with the endosymbiont *Wolbachia* vary significantly among *D. citri*, which may indicate spatial differences in host-endosymbiont interactions between *D. citri* and *Wolbachia*. Here, we discuss manipulations of *Wolbachia* strains within *D. citri* as a novel tool for disruption of Las transmission.

[**2**] **Detecting and monitoring populations of Asian citrus psyllid.** David G. Hall. U. S. Horticultural Research Laboratory, USDA-ARS, 2001 South Rock Road, Fort Pierce, FL 34945. [David.Hall@ars.usda.gov](mailto:David.Hall@ars.usda.gov)

Citrus growers, researchers, and regulatory personnel need methods for detecting and monitoring populations of the Asian citrus psyllid. Presence and relative abundance of adults can be ascertained using stem tap samples, yellow sticky traps, vacuum samples, suction traps, sweep net samples, and visual searches. The choice of a sampling method for adult psyllids in-part depends on the age of plants being sampled as well as the reason for sampling. For immatures, young leaves can be visually inspected to detect and count eggs and nymphs. This presentation will provide an overview of these sampling methods with respect to detecting the presence of psyllid populations and estimating psyllid densities.

[**3**] **Citrus health management areas: An area-wide approach to psyllid management**. Michael E. Rogers and Brandon M. Page. University of Florida – IFAS Citrus Research & Education Center, Lake Alfred, FL 33850.

Following the discovery of the citrus greening pathogen in Florida, citrus pest management programs have shifted from an IPM focus, based primarily on the use of oil sprays, to the extensive use of broad-spectrum insecticides. Despite the increased use of insecticides, managing psyllid populations on a grove-by-grove basis continued to be a challenge for Florida growers. Following several successful large-scale psyllid control pilot studies conducted from 2007-2009, the Citrus Health Management Area (CHMA) program was initiated in 2010 to provide a framework for growers to coordinate their spray programs in order to improve psyllid control efforts. The program began by working with growers to establish 7 CHMAs in different regions of the state. The results obtained from these initial CHMAs were documented and delivered to growers through the efforts of the Citrus Extension/Outreach program to encourage increased participation in the CHMA program. As a result of this effort, to date, there are currently 52 CHMAs statewide encompassing more than 486,000 acres of commercial citrus groves. When psyllid populations are compared pre- and post-CHMA adoption, populations have been reduced by nearly 60% on average for those CHMAs where grower participation is greatest. This presentation will highlight the benefits of area-wide psyllid control, examples of success and failures that have occurred in the CHMA program, and the current obstacles hindering participation of some growers in the area-wide psyllid control efforts.

[**4**] **Insecticide resistance in Asian citrus psyllid: Scouting populations, changes in tolerance, and possible methods/tools to prevent resistance**. LL. Stelinski, M. Coy, N. Killiny, and S. Tiwari. University of Florida – IFAS Citrus Research and Education Center, 700 Experiment Station Rd Lake Alfred, FL 33850-2243.

Management of Asian citrus psyllid (ACP), *Diaphorina citri*, has required significant input of insecticides of various modes of action in Florida over the past five years. Changes in insecticide susceptibility have been documented throughout the state during annual surveys. However, these changes are dynamic and have tended to fluctuate to greater susceptibility recently. We continue to scout populations across Florida to determine how things are changing. We also continue to investigate the mechanisms of resistance in ACP. Thus far, we have found that changes in susceptibility are mainly explained by increase of detoxifying enzyme activity. The underlying genes for this increase of detoxifying enzymes have been elucidated in some cases. Target site resistance for organophosphates or carbamates has not been found to significantly contribute to changes in ACP insecticide susceptibility thus far. We have recently cloned the ACP sodium channel and are investigating the possible mechanisms of pyrethroid resistance. We have been also investigating RNAi as a possible tool to reverse insecticide resistance in field populations of ACP and have considered optimizing rotation schedules to mitigate resistance development.

[**5**] **Economic Injury levels for Asian citrus psyllid control in a citrus groves with high incidence of HLB**. Phil Stansly and Cesar Monzó, University of Florida- IFAS, Southwest Florida Research and Education Center, Immokalee, FL 34142. [pstansly@ufl.edu](mailto:pstansly@ufl.edu)

We are only just beginning to comprehend the full economic impact of HLB and therefore the value of protecting trees from this disease. However, the question remains: what is the value in ACP control once HLB incidence is high? We documented increased yields from HLB positive orange trees every year for 6 years in response to insecticides applied based on an arbitrary threshold in replicated blocks. We were also able to document increased yields that correlated with spray frequency over 4 years in 2 additional replicated experiments under high HLB incidence. Nevertheless, profit margins were greatest when sprays were applied twice during winter and then at a 0.2/tap threshold, compared to either a higher threshold or monthly sprays. Thus, both costs and benefits of vector control need to be considered when planning strategies for HLB management

[**6**] **Mass production and release of *Tamarixia radiata* to augment control of Asian citrus psyllid (ACP), *Diaphorina citri* (Hemiptera:  Liviidae), in Florida.** Eric Rohrig1, Jawwad Qureshi2, Robin Stuart1 and Phil Stansly2; 1Florida Department of Agriculture and Consumer Services- Division of Plant Industry; 2University of Florida- IFAS, Southwest Florida Research and Education Center, Immokalee 34142.

Biological control is a crucial component for sustainable pest management any pest, presumably even ACP.  *Tamarixia radiata* (Waterston) is credited with significantly reducing ACP populations in several areas of the world where it was released or introduced accidently.  It quickly established and spread across Florida following importation from Taiwan and Viet Nam soon after detection of ACP in 1998.  However, intensive pesticide programs aiming to control ACP following detection of HLB in 2005 led to a major reduction of natural enemies in Florida citrus and a need to augment populations of *T. radiata*.  Thus, mass rearing and release programs using the original strain plus wasps from China, Viet Nam and Pakistan were started by our two institutions. Approximately 250,000 parasitoids are being released monthly in strategic Florida locations to reduce ACP populations in both managed and unmanaged citrus and Murraya sp. High parasitism rates observed in some show that augmentative release can contribute significantly ACP mortality, particularly in areas receiving little to no chemical sprays that serve as reservoirs for ACP reproduction and HLB inoculum.  In this way, biological control can reduce ACP and HLB pressure on surrounding managed areas.

[**7**] **Novel Asian citrus psyllid control strategies through targeted Interdiction of specific molecular processes**. Robert. G Shatters, Jr.1 J . Kent Morgan1; John Ramos1; Evelien Van Ekert2; Dov Borovsky3; and Charles Powell2; 1USDA, ARS, USHRL, Fort Pierce, FL; 2University of Florida, IRREC, Fort Pierce, FL 3Borovsky Consulting, Vero Beach, FL. [Robert.shatters@ars.usda.gov](mailto:Robert.shatters@ars.usda.gov)

By mining the accumulated molecular, genomic and proteomic data on *Diaphorina citri* (the Asian citrus psyllid, ACP) in combination with whole organism behavioral and physiological studies, we have identified new strategies that are being tested to control the impact this insect has in citrus production in the U.S. and worldwide. Research is being conducted in three main areas of psyllid biology to interfere with the ability of the insect to vector the *Candidatus* Liberibacter asiaticus (CLas), the bacterial pathogen associated with Citrus greening disease. These areas include: (i) blocking the ability of the insect to develop a successful feeding site though inhibition of essential feeding processes; (ii) discover small peptides that can be used to block the ACP membrane receptor – CLas bacterial surface ligand interactions. These are essential for the bacterium to move circulatively through the insect and thereby be transmitted following acquisition; and (iii) a new strategy for specific gene knock-out termed RNA inhibition (RNAi) to block ACP biological processes essential for insect survival. Inhibitors of feeding that block the insect’s ability to successfully probe the plant tissue with their piercing mouthparts have been identified and are being tested in greenhouse studies. Initial work has demonstrated inhibition of feeding on artificial diets and subsequently shown to function when applied to leaf surfaces. Because the inhibitors function by blocking feeding processes that are essential for many of the hemipteran plant vascular feeding plant pests (aphids, whiteflies, scales, leafhoppers, planthoppers, mealybugs etc.), the research has potential in being adaptable for control of numerous insects within this group. In research designed to block ACP’s ability to acquire/transmit the CLas bacterium, collaboration with Torrey Pines Institute for Molecular Studies was initiated to screen a large number of small peptides for their ability to bind with digestive tract membranes of the Asian citrus psyllid and thus block this critical CLas interaction ACP. Finally, RNAi has been shown to be effective in shutting down important metabolic pathways in the ACP resulting in increased ACP mortality. Effective oral delivery of the dsRNA molecules that induce the RNAi response was observed either by feeding in artificial diets or through engineering a citrus tristeza virus (CTV) vector to produce the dsRNA molecules in citrus. The CTV vector work was accomplished through collaboration with Drs. William Dawson and Siddarame Gowda at the University of Florida, CREC.

**Master's Student Competition**

**Organizer**: Dr. Dan Hahn, Student Activities Committee Chair, Department of Entomology and Nematology**,** College of Agriculture and Life Sciences**.** [dahahn@ufl.edu](mailto:dahahn@ufl.edu).

[**8**] **From pavement to population genetics: Using citizen science data and ddRADseq to characterize the long-established pavement ant, *Tetramorium caespitum*, in North America.** Tyler Vitone, Rob Dunn, Andrea Lucky. Entomology and Nematology Department, University of Florida, 1881 Natural Area Dr., Steinmetz Hall, Gainesville, FL 32611. [tvitone@ufl.edu](mailto:tvitone@ufl.edu)

The pavement ant, *Tetramorium caespitum*, has been established in human-modified environments in the United States since the mid-19th century, but little is known of its introduction history and subsequent population dynamics. Recent discovery of multiple cryptic species in the native range of *T. caespitum* suggested the possibility that pavement ants in North America were comprised of multiple species in the complex. This study used ants collected through the School of Ants citizen science project to 1) determine that ant DNA from citizen science collections is appropriately preserved for molecular genetic research and 2) confirm that introduced pavement ants in North America comprise a single European species (aside from the Asian *T. tsushimae*). Further, we find that the range of the pavement ant in North America is significantly larger than previously recorded – present in at least 7 additional U.S. states. Population genetic analysis of *T. sp. E* using double-digest Restriction-site Associated DNA sequencing (ddRADseq) suggests that this species may be an appropriate model organism demonstrating how metropolitan species have spread and established as a result of the urbanization of North America.

[**9**] **An evaluation of environmental and community factors on seasonal abundance of *Diaphorina citri* (Hemiptera: Liviidae).** Bradley Udell, Cesar Ferrer, Thomson Paris, Philip Stansly, Sandra Allan. USDA, ARS, CMAVE and the University of Florida, Department of Entomology, 1600 SE 23rd Dr, Gainesville, FL 32608. [bradjudell@ufl.edu](mailto:bradjudell@ufl.edu)

Asian citrus psyllids (ACP) are the most serious pest of citrus worldwide. This invasive pest is the vector of *Candidatus* Liberbacter asiaticus (Las), which causes citrus greening. As rates of inoculation of Las by ACP increase proportionally to the number of infected ACP feeding on a plant, study of the ecology of ACP is crucial to management ACP populations in citrus groves. Little is known of the population dynamics of ACP in the grove, which can undergo violent fluctuations in abundance by rapidly exploiting their environment when limiting factors are relaxed, due to their high fecundity and short life cycle. Furthermore, ACP population dynamics have not been related to both community and environmental factors in multiple groves. The purpose of this study was: 1) to identify compare seasonal trends in adult population density in two citrus groves in south west Florida; 2) determine the degree to which environmental and community factors correlate with adult ACP density and nymph infestation within the same groves. Data obtained over a 3 year long term monitoring program in Immokalee, FL was utilized to provide estimates for seasonal trends accounting for multi-year variability.

[**10**] **Parasitoids of *Bemisia tabaci* in southwest Florida: Faunal composition, host plant associations, and non-target hosts.** Z. J. Lahey and P. A. Stansly University of Florida, Southwest Florida Research and Education Center, 2685 State Road 29 North, Immokalee, Florida 34142. [zjlahey@ufl.edu](mailto:zjlahey@ufl.edu)

Whiteflies in the *Bemisia tabaci* species complex (Hemiptera: Aleyrodidae) are some of the world’s most invasive and destructive plant pests. Following the Florida invasion of one such species, *Bemisia tabaci* Middle East-Asia Minor 1, a classical biological control program was initiated centered on parasitoid wasps. The establishment status and control potential of these economically important insects are lacking despite ~25 years since their introduction. Here, we document the parasitoid species attacking the whitefly, their associated host plants, and rearings from non-target host whiteflies. Crop and uncultivated host plant surveys were conducted in Immokalee and other Florida locales. In total, 15 species of parasitoid Hymenoptera were reared from the whitefly, including two exotic parasitoids released in the 1990’s and several undescribed species. Rates of parasitism were generated from the emerged material allowing for the identification of valuable plant refuges. Rearings of parasitoids from non-target whiteflies revealed significant variability in the host-specificity of certain taxa. The implications of these findings will be discussed in the context of *Bemisia* IPM.

[**11**]**Evaluating bio-rational insecticides against chilli thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) in KnockOut® rose production.** Luis F. Aristizábal, Yan Chen, Ronald H. Cherry, Ronald D. Cave, and Steven P. Arthurs. University of Florida, IFAS, Mid-Florida Research and Education Center, 2725 Binion Road, Apopka, FL 32703. [larist@ufl.edu](mailto:larist@ufl.edu)

The ornamental plant industry in Florida and Louisiana plays a significant role in the economy. The production of KnockOut® roses, which are the most important landscape ornamental plant sold in the USA, is being affected by chilli thrips, Scirtothrips *dorsalis* Hood (Thysanoptera: Thripidae), an invasive insect pest in North America. Due to the risk for developing resistance, chemical control is not a sole option for controlling chilli thrips populations. Evaluations of the alternative bio-rational insecticides such as entomopathogenic fungi (*Beauveria bassiana* and *Metarhizium brunneum*), botanical materials (azadirachtin), horticultural oils, and their rotations options are been conducted for controlling chilli thrips under field conditions. In addition, a monitoring plan for chilli thrips on roses is being tested. Preliminary results about this project will be discussed in this oral presentation.

[**12**] **Alternative preservatives of insect DNA for citizen science and other low-cost applications**. Sedonia Steininger, Jiri Hulcr, Caroline Storer, Andrea Lucky. University of Florida, Dept. of Entomology and Nematology, Steinmetz Hall 970 Natural Area Drive, PO Box 110620, Gainesville, FL 32611-0620. [m.sedonia@ufl.edu](mailto:m.sedonia@ufl.edu)

The prevention of DNA degradation is an important consideration for researchers intending to conduct molecular analyses of specimens captured in the field. This is especially true for projects that utilize public participation in science, also known as citizen science, where standard methods of preservation may be inaccessible to those who are collecting specimens. This study examines the efficacy of alternative “household” products, specifically alcohol based instant hand sanitizer and both propylene glycol and ethylene glycol based automobile antifreeze as compared to 95% ethyl alcohol and pure propylene glycol, at maintaining the integrity of usable genetic material in field captured insect specimens. Xylosandrus crassiusculus ambrosia beetles underwent short term exposures (two or seven days) to each preservative. DNA was then extracted and a real-time qPCR was performed. Amplification was observed in all treatment groups. Electrophoresis of the amplified product indicated successful amplification of the target gene (arginine kinase), which was verified via sequencing of the amplified control. No statistically significant differences were found among the cycle threshold values of any treatment. These results suggest that alternative preservatives, such as alcohol based instant hand sanitizer and automobile antifreeze, can successfully preserve DNA for short-term storage and indicates that these “household” products may serve as effective substitutes for traditional, high concentration preservatives for use in citizen science projects or by professionals who do not have access to traditional means of preservation in the field.

[**13**] **Seasonal abundance and distribution of melonworm, *Diaphania hyalinata* L. (Lepidoptera: Pyralidae) in cucurbits in south Florida.** Babu Panthi, D.R. Seal, J.L. Capinera, G. Nuessly. University of Florida, Tropical Research and Education Center, 18905 SW 280th St, Homestead, FL-33031. [panthibabu@ufl.edu](mailto:panthibabu@ufl.edu)

Seasonal abundance and distribution of Melonworm, Diaphania hyalinata L. (Lepidoptera: Pyralidae) were studied in a squash field in Tropical Research and Education Center, Homestead, Florida during three seasons of 2013 and 2014. Taylor’s power law and Iwoa’s regression statistics were used in describing abundance and distribution of melonworms. For this purpose, five plants were chosen randomly from each plot of a field where two leaves from each plant were collected and checked carefully to record numbers of small, medium and large larvae. To study within plant distribution, each plant was divided into three parts- (top, middle and bottom and number of melonworm larvae on each part was recorded. In the present study, melonworm population was highest in the spring and lowest in the summer. The spatial distribution of melonworm was found to be random and scattered all over the field during all seasons of a year. Highest number of melonworm population was found on the top part of a plant and melonworm damage was also high on the crown part of a plant. The information of distribution of melonworm in the field and within plant would be very useful in implementing management practices of melonworm.

[**14**] **Abundance and spatial distribution of the American serpentine leafminer, *Liriomyza trifolii* (Diptera: Agromyzidae) on snap bean and squash in southern Florida.** Shashan Devkota, D. R. Seal, C. Waddil, O. E. Liburd, and J. Scott Ferguson. University of Florida, Tropical Research and Education Center, 18905 SW 280th St, Homestead, FL-33031. [devkotasashan@ufl.edu](mailto:devkotasashan@ufl.edu)

Liriomyza trifolii is one of the most serious insect pests of vegetable crop in Florida. Adult female punctures the leaf with the help of ovipositor and feeds on plant sap. Female lays eggs in these punctures. An adult female can lay 35-39 eggs per day, a total of 200-400 in lifetime. Immediately after hatching, larva starts mining the leaf and feeds on mesophyll layer of the leaf until the larva emerges from the leaf. L. trifolii infests host crops at the beginning of germination until harvest.  In both bean (Phaseolus vulgaris) and squash (Cucurbita pepo), in the early stage of germination, population abundance was commonly low and the distribution pattern of adults and feeding mines were regular (β < 1).  With the passing of time, distribution patterns of L. trifolii adults and feeding mines become aggregated (β >1).   In the instance of high abundance, L. trifolii larvae showed aggregated distribution pattern. When bean (P. vulgaris) and squash (C. pepo) were at flowering and fruiting stage, population abundance of L. trifolii decreased significantly and adult distribution was observed aggregated (β >1) and regular (β < 1).  In general, the abundance of L. trifolii was higher in bean (P. vulgaris) than in squash (C. pepo).  This information of the present research studies carries great value in developing a pest management decision. Based on this information growers will be able to develop a site selective insecticide management program.

[**15**]**Evaluation of novel detection methods for twospotted spider mite (*Tetranychus urticae* Koch) on strawberries, using imaging techniques.** Christopher D. Crockett, Oscar E. Liburd, and Amr Abd-Elrahman. University of Florida,Bldg. 970 Natural Area Drive, Gainesville, FL 32611. [crockettcd@ufl.edu](mailto:crockettcd@ufl.edu)

The twospotted spider mite (TSSM), *Tetranychus Urticae* Koch, is the most prominent and economically damaging mite pest that affects field-grown and greenhouse strawberries. At high infestation levels, early on in plant development, TSSM can significantly affect plant growth and markedly reduce fruit yield. Traditional monitoring techniques can be labor intensive, expensive to implement in large scale production, and ineffective due to the highly clustered distribution patterns of TSSM in strawberry fields. Visual imaging technologies could potentially improve TSSM monitoring and assessment strategies in strawberries, by creating a real-time detection and treatment system. The potential for this image based detection of TSSM is possible due to the observable change in leaf color and texture associated with mite feeding. We are currently examining the feasibility of simple visual imagery techniques, coupled with post-processing analysis, to correlate RGB band reflectance values to mite infestation levels. Color images were obtained for two different varieties of strawberries (Albion and Festival) located on a strawberry farm in Floral City, FL. Six imaging sites were chosen for each variety representing a wide range of mite infestation levels. Images were taken at three different times throughout the day to account for differences in solar angle. Images were calibrated and analyzed using ENVI 5.1 remote sensing software and SPSS statistical software. Current preliminary data suggests that single band and normalized band difference models may be able to predict mite infestation levels.

[**16**] **Investigating the effect of humidity on the reproductive capacity of *Frankliniella bispinosa* and *Frankliniella occidentalis* (Thysanoptera:Thripidae).** Tamika Garrick, Oscar E. Liburd, J. Funderburk.University of Florida,Bldg. 970 Natural Area Drive, Gainesville, FL 32611. [tgarrick09@ufl.edu](mailto:tgarrick09@ufl.edu)

Environmental factors were long theorized to account for the spatial differences in the geographic range of two economically important pest thrips species in Florida, the native *Frankliniella bispinosa* (Morgan) and the invasive *Frankliniella occidentalis* (Pergande). The objective of this study was to compare the two flower thrips species to determine if relative humidity influences the distribution patterns of *F. bispinosa* and *F. occidentalis* that are currently observed. Laboratory experiments were carried out at a set temperature of 23 ± 1˚C and at varying humidities ranging from 40% RH to 80% RH with a photoperiod of 14L: 10D. Data were recorded every 12 hours on the reproductive capacity of each species and the time taken for the larvae to emerge. The results demonstrated that the fecundity of both species was affected by changes in humidity. Results confirmed that the native *F. bispinosa* was more fecund at higher humidities than *F. occidentalis*. The time taken to emerge was also affected by changes in relative humidity as both species generally took a longer time to emerge at lower humidities. The results of this study have broadened our understanding of one of the factors that influence the distribution of two thrips species in Florida and may extend to other thrips species in the state.

**Ph.D. Student Competition**

**Organizer**: Dr. Dan Hahn, Student Activities Committee Chair, Department of Entomology and Nematology**,** College of Agriculture and Life Sciences**.** [dahahn@ufl.edu](mailto:dahahn@ufl.edu).

[**17**] **Biology of rugose spiraling whitefly: Fecundity, survival, and parthenogenesis on *Strelitzia nicolai.*** Siavash Taravati and Catharine Mannion. University of Florida, Tropical Research and Education Center, 18905 SW 280th St., Homestead, FL 33031. [siavashtaravati@ufl.edu](mailto:siavashtaravati@ufl.edu)

Rugose spiraling whitefly (*Aleurodicus rugioperculatus*) is an invasive pest in the southern half of Florida. In this study, the fecundity and egg laying behavior of this whitefly was studied on giant white bird of paradise (*Strelitzia nicolai*). The pre-oviposition time was 2.7 days and the average interval between each egg laying effort was 1.8 ± 0.23 days. The lifetime fecundity was 225.5 ± 26 eggs and there was no significant difference between the fecundity of mated vs. unmated females. Most females laid eggs on more than one leaf but always returned to the same spot in which they developed into adults after that. This whitefly showed an arrhenotokous parthenogenesis in which unmated females produced only males and mated females produced both males and females. Longevity was 27.5 ± 2.7 days for females and 36.8 ± 3.5 for males which were statistically significantly different. The results are compared to those of congeneric species, *Aleurodicus dispersus,* and also to *Bemisia tabaci*. A simple model incorporating fecundity and survival data was used to estimate adult population size across generations.

[**18**] **Visual behavior of the Asian Citrus Psyllid *Diaphorina citri* (Hemiptera: Liviidae).** Thomson M. Paris, Sandra A. Allan and Philip A. Stansly. University of Florida, Entomology and Nematology Department, Bldg. 970 Natural Area Drive PO Box 110620, Gainesville, FL 32611. [thomsonparis@ufl.edu](mailto:thomsonparis@ufl.edu)

As the vector of the global disease of citrus greening or huanglongbing (HLB), relatively little is known concerning the Asian Citrus Psyllid (ACP) behavior towards visual cues. The objective of this study was to elucidate behavioral responses of ACP towards several colors of filtered light using narrowband width filters. ACP responded most strongly to violet (400 nm), green (500nm) and lime-green (550nm) light. ACP were more responsive to polarized violet light (400nm) and slightly more responsive to green light (500 nm). Male and female ACP did not different significantly in their responses to visual cues. The ecological implications of these findings as well as potential applications for monitoring ACP through visual traps will be discussed.

[**19**] **Frequency of managed European-derived honey bee (*Apis mellifera* L.) colony usurpation by African matriline honey bee swarms in the southeastern United States.** Ashley N. Mortensen and James D. Ellis. University of Florida, 970 Natural Area Drive, Gainesville, FL 32601. [mortensena@ufl.edu](mailto:mortensena@ufl.edu)

In western honey bees, *Apis mellifera* L, usurpation occurs when an intruding swarm containing a mated queen enters an occupied colony, kills the resident queen, and introduces its own queen who begins to lay eggs. This phenomenon results in a dramatic genetic change of the colony. Little systematic study of usurpation has been conducted and reported annual frequencies vary from 0-30.3% of managed colonies being usurped. Usurpation has been considered a mechanism that could contribute to the dominance of the African honey bee, *A.m. scutellata* Lepeletier, matriline in the Americas. We hypothesized that usurpation of managed European-derived, *A. mellifera* sspp, colonies by African matrilines occurs at low frequencies in commercially managed apiaries and does not significantly perpetuate African matrilines. To evaluate this hypothesis, we monitored 288 European-derived honey bee colonies for 12 months at the northern limit of the African-derived population in the southeastern U.S. Samples of approximately 50 worker bees were collected from each colony every 3 months and morphometric and mitochondrial analyses were used to detect usurpation by African matriline swarms. Our results indicated that no definitive African matriline usurpations occurred. These data suggest that usurpation is not a primary factor in the perpetuation of the African matriline at the northern front of the African-derived honey bee population in the southeastern United States.

[**20**] **Visual learning may influence host selection in the Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Liviidae).** Dara Stockton, X. Martini, A. Hoyte, & L. Stelinski. University of Florida- Citrus Research and Education Center, 700 Experiment Station Road, Lake Alfred, FL 33850. [dara.stockton@gmail.com](mailto:dara.stockton@gmail.com)

The Asian citrus psyllid, *Diaphorina citri*, is an oligophagous herbivore that transmits *Candidatus* Liberibacter asiaticus, the devastating pathogen causing citrus greening disease. Efforts to manage ACP populations and slow the spread of the pathogen may be aided by effective monitoring as well as understanding of host plant preferences. While previous studies have indicated that olfactory learning may influence host plant selection, it is currently unknown to what extent learned visual associations interact with innate responses to drive host selection. This study investigated the plasticity of feeding and orientation response to visual cues. The first experiment conditioned ACP to respond to color by pairing yellow or green food coloring (CS) with sucrose (US). After experience feeding on green or yellow sucrose, ACP probed significantly more on wax tinted with the familiar color in a choice test arena, *χ2=8.86, df=2, p=0.01*. The second experiment conditioned ACP to orient towards a visual stimulus (blue light) after being paired with a nutritive stimulus (citrus x aurantium). Behavior was assayed using a modified y-tube with one arm lit blue and the other green. After feeding on blue light illuminated plants for 72 hrs, 46.7% of conditioned ACP preferred the color blue compared to 8% of naïve ACP, *χ2=9.88, df=1, p=0.002*. The results of this study suggest that ACPs do acquire visual information associated with host plants and use that information to influence feeding and locomotive behavior. Future work will focus on the interaction between learned olfactory and visual cues, as well as the role of reproductive reward in mediating learning.

[**21**] **Potential distribution of *Myllocerus undecimpustulatus undatus* (Sri Lankan Weevil) in North America.** Anita S. Neal, Ronald D. Cave, and Rodrigo R. Diaz. Entomology & Nematology Dept., University of Florida, Indian River REC, Fort Pierce, FL 34945. [asn@ufl.edu](mailto:asn@ufl.edu)

*Myllocerus undecimpustulatus undatus* Marshall, the Sri Lankan weevil, is a serious plant pest with a wide range of hosts. First identified in the United States on *Citrus* sp*.* in Pompano Beach, Broward County, Florida on 15 September 2000, thisweevilhas over 150 different host plant species including fruits, nuts, vegetables, and ornamentals. It was detected in 12 counties in Florida by May 2006. Historical data from 2000-2012 obtained from the Division of Plant Industry’s field agent submissions were entered into DIVA-GIS, a computer program for mapping and geographic data analysis. The BIOCLIM tool within this program predicted the potential distribution of Sri Lankan weevilin North America. Cold tolerance data indicate adults are acclimated to lower temperatures until reaching 0˚C and -5˚C. The cold tolerance data are correlated with the DIVA-GIS predictions to project potential distribution of the invasive species, which can provide valuable information to assist Extension agents and pest management professionals in preparing control strategies.

[**22**] **Insecticidal effects of Vochysiaceae leaf extracts against a noctuid pest, *Trichoplusia ni* (Lepidoptera: Noctuidae) and the role of PBO as a synergist.** Wagner de Souza Tavares, Yasmin Akhtar, José Cola Zanuncio, Jesusa C. Legaspi, Murray B. Isman. Department of Plant Science,

Federal University of Viçosa, 36570-900, Viçosa, Minas Gerais State, Brazil. [wagnermaias@yahoo.com.br](mailto:wagnermaias@yahoo.com.br)

The Vochysiaceae are Neotropical trees and shrubs, common in the savanna areas in Central Brazil (Cerrado). Many species of Vochysiaceae have long been used in folk medicine to treat several diseases. Reports regarding the insecticidal activity of Vochysiaceae are lacking. We will look at the insecticidal effects of ethanolic leaf extracts of 4 species of Vochysiaceae including *Vochysia cinnamomea* Pohl, *V. discolor* Warm., *V. elliptica* Mart. and *V. rufa* Mart. against third instar cabbage looper larvae. Contact toxicity effects were determined via topical application of 1 µL of extract solutions to the dorsum of third instar larvae. Mortality caused by the extracts increased progressively with time. Application of 10 µg/larva of *V. rufa*, *V. cinnamomea*, *V. discolor* and *V. elliptica* extracts produced 33.3, 43.3, 46.7 and 53.3% mortalities respectively at 120 h. However mortalities increased to 83.3, 93.3, 73.3 and 66.7% respectively for the same extracts in a 1:1 mixture with PbO (piperonyl butoxide). Efficacy of *Vochysia* extracts can be enhanced by using PbO as a synergist. *Vochysia* leaf extracts have potential to be used as a cheap and more environmentally friendly alternative to chemical pesticides for local use.

[**23**] **The innate immune system of the Asian citrus psyllid, *Diaphorina citri*.** Alex Arp, Wayne Hunter and Kirsten Pelz-Stelinski University of Florida Citrus Research and Education Center, 700 Experiment Station Rd, Lake Alfred, FL 33850. [aarp@ufl.edu](mailto:aarp@ufl.edu)

While the innate immune system of insect vectors of human diseases has been studied extensively, hemipteran vectors of agricultural diseases have been largely neglected. In those hemipterans studied, the pea aphid, *Acyrthosiphon pisum*, was seen to have a drastically reduced immune system, while the brown plant hopper, *Nilaparvata lugens*, has an immune system similar to other insects. Expanding these studies to other hemiperans will further the understanding of transmission parameters of insect vectored agricultural diseases and aid in the development of novel control methods. In this study, the innate immune system of the Asian citrus psyllid, *Diaphorina citri*, was investigated. *D. citri* is the vector of *Candidatus* Liberibacter asiaticus, the putative causal agent of citrus greening which is considered the most severe disease threatening citrus. The immune genes of *D. citri* were identified by searching the current draft genome using tblastx against innate immune associated genes from *D. melanogaster*, *A. gambiae*, *A. pisum*, and *A. mellifera*. Genes that did not return results were searched for using available sequences from additional insects. Results indicate that *D. citri* are similar to *A. pisum* and lack most components of the Imd pathway, PGRPs, and antimicrobial peptides. The reduced immune system of *D. citri* is apparent with high mortality observed after oral exposure or septic injections of non-virulent bacteria. The reduced immune system of *D. citri* could play a direct role in their ability to transmit the citrus greening pathogen.

[**24**] **Effect of *Isaria fumosorosea* Wize on survival and leaf consumption of *Microtheca ochroloma* Stål (Coleoptera: Chrysomelidae).** Angie A. Niño, Cecilia Gámez-Herrera, and Pasco B. Avery. University of Florida, 2199 South Rock Road, Fort Pierce, FL 34945. [anino@ufl.edu](mailto:anino@ufl.edu)

*Microtheca ochroloma*, commonly known as the yellowmargined leaf beetle, causes significant losses on organically produced crucifers in the southern United States. Pest management methods that can be implemented in organic production systems, such as biological control using entomopathogenic fungi, might help to maintain the populations of this pest below economically damaging levels. The fungus *Isaria fumosorosea* has shown low efficacy against *M. ochroloma* adults when applied directly on the beetle, but no information has been reported about its effect on leaf consumption. This study evaluated the effect on survival and consumption of *M. ochroloma* adults when fed leaves sprayed with *I. fumosorosea*. Ten bok choy plants were sprayed with one of four concentrations: 0.1, 0.5, 1, and 2 g of desiccated granules of the formulation PFR-97 per 100 ml of distilled water. Ten control plants were sprayed with distilled water only. Six adults were placed on each plant and the number of dead beetles was counted daily for 7 days. Four leaves from the center of the plant were removed, and the area consumed by the beetles was measured using the software ImageJ. No significant differences were found with adult mortality among the treatments or between the fungal treatments as a whole and the control. However, plants sprayed with 0.5 and 1 g/100 ml of water suffered significantly less damage than the control. Control plants had on average 3.7% more damage than the treated plants. Further evaluations should be done to determine any effect of *I. fumosorosea* on larval consumption.

[**25**] **Systemic insecticides and reflective mulch for Asian citrus psyllid (*Diaphorina citri* ) control in new citrus plantings.** Scott Croxton and Phil Stansly. UF/IFAS, Southwest Florida Research and Education Center, 2685 SR 29 N, Immokalee, FL 34142. [croxtsd@ufl.edu](mailto:croxtsd@ufl.edu)

Greening or huanglongbing (HLB) is a devastating disease of citrus caused by *Candidatus* Liberibacter asiaticus and transmitted by the Asian citrus psyllid (ACP), *Diaphorina citri*. HLB now occurs worldwide in most citrus growing regions except the Mediterranean and Australia. Management relies principally on insecticidal control of ACP which is insufficient, even for young trees which are most susceptible to the disease. We tested the ability of metalized polyethylene mulch to repel adult ACP as well as effects on incidence of HLB and early tree growth with and without insecticide treatments as well as with and without foliar nutrition. The experimental design is a 3-way factorial randomized complete split block design with 4 replications of 4 mail plot treatments : (1) supplementary foliar nutrients only, (2) insecticides only, (3) nutrients plus insecticides, and (4) neither nutrients nor insecticides (control). Each main plot was split with half being planted on metalized UV reflective mulch. Evaluations of all treatments include ACP populations on flush and sticky cards, trunk growth measurements, and leaf samples tested for the presence of HLB.

[**26**] **Functional and behavioral response of *Tamarixia radiate* (Hymenoptera: Eulophidae) to different densities of its host, *Diaphorina citri* (Hemiptera: Psyllidae)**. Xulin Chen and Philip A. Stansly. University of Florida-IFAS, Southwest Florida Research and Education Center, 2685 State Road, 29 N., Immokalee FL 34142. [xulin527@ufl.edu](mailto:xulin527@ufl.edu)

It has been claimed that success of parasitoids as biological control agents can be predicted by response to increasing host densities, termed “functional response” as mediated by so-called “searching time” and “attack rate” first characterized by the Holling Disk Equation and later refined by Rogers (1972). How do these parameters relate to actual behavior exhibited by the female wasp in the presence hosts? A functional response was evaluated by holding pairs of three-day-old *T. radiata* in 50 ML centrifuge tubes with access to an *M. paniculata* shoot infested with 10, 20, 30, 40, 50, or 60, 4th instar psyllid nymphs changed every 24 h. Parasitism was highest with 10 hosts at 43% and least at 18.5% with 60 hosts. Superparasistim showed the opposite trend, being highest (39.4%) at the lowest host density. Results conformed to a Type II functional response with attack rate (a’) estimated by the Rogers equation at 9.0 ± 1.3 cm2 / hr and handling time (Th) of 50.4± 3.6 min/ host. Behaviors of individual 3-day-old females in petri dishes with the same 6 host densities were recorded using Observer software for 30 minutes with much different results: handling time (3.1 ± 0.74 min/ host), defined as probing + oviposition, and attack rate (333 ± 72.6 cm2 /hr) calculated from the Rogers equation which equates encounters to the product of searching time, host density and attack rate. The search continues for relationships between functional response, parasitoid behavior and biological control success.

**Symposium: Clayton McCoy Legacy, Impact on Citrus IPM and Invertebrate Pathology.**

**Organizers**: Dr. J. E. Peña, Tropical Research and Education Center, U FL, Homestead, FL and Dr. Lance Osborne, Mid-Florida Research and Education Center, Apopka, FL.

[**27**] **Remembering Clayton W. McCoy Jr. 1938-2013: A video biography.** Lance Osborne, Mid-Florida Research & Education Center, 2725 S. Binion Road, Apopka, FL 32703-8504. [lsosborn@ufl.edu](mailto:lsosborn@ufl.edu)

After a short introduction we will play a 20 minute biographical video “ Remembering Clayton W. McCoy Jr.”  prepared by Dr. McCoy’s family for his Memorial Service.  This video details his life from his childhood in Minnesota to his passing in Florida last year.

[**28**] **Citrus rust mite economics,** David G. Hall, U.S. Horticultural Research Laboratory, USDA-ARS, 2001 South Rock Road, Fort Pierce, FL 34945. [David.Hall@ars.usda.gov](mailto:David.Hall@ars.usda.gov)

Citrus rust mites are important pests in Florida citrus. Extensive feeding by rust mites on fruit results in a russetting of the skin of the fruit with associated losses in fruit quality and yield. Models for predicting damage and yield losses at different mite densities can be used in conjunction with scouting estimates of mite densities to make mite control decisions, particularly in juice oranges. The density of citrus rust mites on fruit at which economic losses occur may vary from fewer than five up to 40 or more mites per cm2 depending on many factors such as the duration of an infestation, time of year and whether fruit is grown for the fresh or juice markets. This presentation will review the complexities of modelling economic damage by rust mites to oranges grown for the juice market.

[**29**] **The road to improving biological control using entomopathogenic nematodes.** David Shapiro-Ilan, USDA-ARS, 21 Dunbar Rd. Byron, GA 31008. [David.Shapiro@ars.usda.gov](mailto:David.Shapiro@ars.usda.gov)

The focus of this presentation is on collaborative research that Dr. McCoy and I conducted toward improving entomopathogenic nematodes (epns) as biocontrol agents. An important first step to developing a microbial control agent is to select the most potent pathogen species or strain and define optimum conditions for application. In that vein, we screened numerous species and strains of epns and determined that *Steinernema riobrave* possesses the greatest innate virulence to *Diaprepes abbreviatus* and *Heterorhabditis indica* also exhibits high virulence; furthermore we characterized the effects of temperature, soil type, and culture method on virulence. Another approach to improving biocontrol with epns is to find superior species or strains via discovery-oriented surveys; we discovered new strains of *S. riobrave* with higher virulence and also discovered and characterized a new epn species, *H. mexicana*. If existing or newly discovered species or strains are not sufficient then it is possible to create novel strains through hybridization; our research demonstrated the utility of hybridization techniques through the improvement of environmental tolerance in *Steinernema carpocapsae*. Enhancing fundamental knowledge of epn biology can also lead to further advancements in biocontrol; our research on infection dynamics elucidates important mechanisms in host-finding and foraging behavior.

[**30**] **Taking a bite out of the evil weevil: ants, nematodes and biological control of *Diaprepes abbreviatus* in Florida citrus groves**. Robin J. Stuart, Dundee Biological Control Laboratory, DPI, FDACS, Dundee, FL33838. [Robin.Stuart@FreshFromFlorida.com](mailto:Robin.Stuart@FreshFromFlorida.com)

The Diaprepes root weevil, *Diaprepes abbreviatus*, can be a devastating pest of citrus. The larvae feed on citrus roots, reduce yield, and often facilitate fungal infections by Phytophthora spp. The combination of Diaprepes and Phytophthora often kills trees and can destroy groves within a few years of an initial infestation. In developing an effective IPM program to control *D. abbreviatus*, it is important to maximize the effectiveness of as many of the natural enemies of this insect as possible. Research indicates that some of the major mortality agents of Diaprepes eggs, larvae, and adults in central Florida citrus groves are predators; and that the primary predators of neonate larvae on the soil surface are ants. Ants are also active predators on D. abbreviatus eggs in the citrus canopy and of larvae below ground. However, below ground, ants are probably less important as mortality agents of *D. abbreviatus* larvae than another major group of natural enemies, entomopathogenic nematodes. In association with Clay McCoy, I conducted a series of studies on the Diaprepes root weevil and the role of ants and entomopathogenic nematodes as biological control agents of this serious pest. In this talk, I will discuss our research and focus especially on the dynamics of ant predation on neonate D. abbreviatus larvae on the soil surface of citrus groves in central Florida.

[**31**] **Entomopathogenic fungi: Biological control of arthropod pests in Florida from past to present**. Pasco B. Avery, University of Florida/IFAS/Indian River Research and Education Center, 2199 South Rock Road, Ft. Pierce, FL 34945. [pbavery@ufl.edu](mailto:pbavery@ufl.edu)

Since the introduction of entomopathogenic fungi by Clay McCoy and others as biocontrol agents of arthropod pests in Florida, their use in agriculture has increased. This presentation will briefly cover the past and present use of entomopathogenic fungi as biocontrol agents of arthropod pests of fruits, vegetables, and floriculture in Florida. Special emphasis will be placed on the use of registered products containing *Hirsutella thompsonii*, *Isaria fumosorosea*, *Metarhizium brunneum*, or *Beauveria bassiana*. The successes and challenges of using these products as part of integrated pest management systems will be discussed.

[**32**] **Augmentation and enhancement of naturally-occurring entomopathogens as a means of biological control.** Wayne Gardner, Department of Entomology, University of Georgia, Griffin, GA. [wgardner@uga.edu](mailto:wgardner@uga.edu)

Biological control of insect pests frequently falls within the categorical methods of classical introduction, inundative releases or applications, and conservation and/or augmentation of naturally-occurring agents. Successful management of insect pests using fungal entomopathogens have been developed through conserving and augmenting naturally-occurring pathogens in the cropping system. Several examples will be presented and discussed.

[**33**] **What we don’t see: trophic cascades and the role of native entomopathogenic nematodes.** Larry Duncan, University of Florida, IFAS, Citrus Research and Education Center, 700 Experiment Station Rd., Lake Alfred, FL 33850. [lwduncan@ufl.edu](mailto:lwduncan@ufl.edu)

The root weevil *Diaprepes abbreviatus* inhabits both the citrus tree canopy and rhizosphere. The continual deregistration of soil applied insecticides had, by the 1990s, increased the propensity of growers to use entomopathogenic nematodes (EPNs) to control weevil larvae. Clay McCoy and I evaluated several commercial products containing different EPN species in field trials that showed *Steinernema riobrave* to be more effective for *Diaprepes* management than other available EPN species. The use in these trials of technical methods developed by McCoy, also revealed that naturally occurring, native EPNs kill soil arthropods at rates substantially higher in Florida than reported for any other region in the world. Indeed, the application of EPNs to orchard soils were shown to initiate trophic cascades that temporarily suppressed native nematodes and the natural control of weevils. Subsequent research established that at least 9 described and undescribed EPN species inhabit citrus orchards on the peninsula and that EPN communities are structured by soil properties, especially those related to soil moisture. EPN communities in poorly drained flatwoods orchards were less diverse and were dominated by *Heterorhabidtis indica*. In well drained soils on the central ridge, communities were more diverse and dominated variously by *S. diaprepesi, H. indica* and *H. javanica*. Because *Diaprepes* root weevils are less abundant on the central ridge where mortality caused by EPNs is generally highest, ongoing research is aimed at understanding how soils can be managed to favor those EPN communities that are most effective in suppressing this pest.

[**34**] **Lessons to be learned from the classical biological control of *Diaprepes abbreviatus* using exotic egg parasitoids.** Jorge E. Peña1, C. McCoy2, Jacas, J3., Ulmer, B6, A. E. Diaz4, Duncan, R1, S. Lapointe5 and D. Hall5 ; 1University of Florida, Tropical Research and Education Center, Homestead, FL 33031;2UF-CREC, Lake Alfred; 3Universita Jaume I, Castello, Spain; 4CorpoICA, Colombia; 5USDA, ARS, Fort Pierce, FL; 6Syngenta, Basel, Switzerland. [jepena@ufl.edu](mailto:jepena@ufl.edu)

A classical biological control program using egg parasitoids for *Diaprepes abbreviatus* started on 1997. More than seven different parasitoids (e.g., *Quadrastichus haitiensis, Aprostocetus vaquitarum, Ceratogramma etiennei, Fidiobia dominica, Haeckeliania sperata*) were collected and imported from islands in the Caribbean into Florida. Parasitoids were either released in citrus and ornamental fields infested with this weevil. *Quadrastichus haitiensis* and *Aprostocetus vaquitarum* successfully established in ornamental fields of southern Florida causing 70-80% parasitism, but failed to establish in citrus groves. One of the causes of this failure in citrus was the action of the indigenous parasitoid, *Brachyufens osborni*, which is is present in citrus systems, but not in ornamental settings. *B. osborni*’s role was determined as the key constraint to the establishment and success of the exotic parasitoids in citrus.

**Symposium - Spotted Wing Drosophila (SWD): Biology, Ecology and Management in Fruits**

**Organizer:** Dr. Oscar E. Liburd, Entomology and Nematology; Univ. of FL, Gainesville, FL

[**35**] **Biology, ecology, and management of *Drosophila suzukii* in North Carolina.** Katharine A. Swoboda Bhattarai and Hannah J. Burrack NC State University, Raleigh NC 27695. [kaswobod@nsu.edu](mailto:kaswobod@nsu.edu)

A classical biological control program using egg parasitoids for *Diaprepes abbreviatus* started on 1997. More than seven different parasitoids (e.g., *Quadrastichus haitiensis, Aprostocetus vaquitarum, Ceratogramma etiennei, Fidiobia dominica, Haeckeliania sperata*) were collected and imported from islands in the Caribbean into Florida. Parasitoids were either released in citrus and ornamental fields infested with this weevil. *Quadrastichus haitiensis* and *Aprostocetus vaquitarum* successfully established in ornamental fields of southern Florida causing 70-80% parasitism, but failed to establish in citrus groves. One of the causes of this failure in citrus was the action of the indigenous parasitoid, *Brachyufens osborni*, which is is present in citrus systems, but not in ornamental settings. *B. osborni*’s role was determined as the key constraint to the establishment and success of the exotic parasitoids in citrus.

[**36**] **Keeping the monster at bay: Monitoring and management of spotted wing drosophila.** Ashfaq Sial Ahmad. Department of Entomology, University of Georgia, Athens, GA 30602. [ashsial@uga.edu](mailto:ashsial@uga.edu)

Fruit production in the US has recently been challenged with a new invasive insect pest, spotted wing drosophila (SWD), *Drosophila suzukii* Matsumura (Diptera: Drosophilidae). The SWD is of Asian descent and was first detected in California in 2008. Since then SWD has spread throughout the United States causing significant losses in crop yield and quality, which have been estimated at $850-900 million annually. Unfortunately, currently available baits and monitoring traps are only useful for determining fly presence but are not reliable predictors of fly density and fruit infestation risk. The SWD management is achieved primarily through preventative insecticide applications on a weekly basis from the beginning of fruit ripening till the end of harvest. Fortunately, a number of highly effective insecticides are available in the market. However, growers must not only take into account the maximum reside limits in their target markets (local and/or export) while selecting chemicals to control SWD, but also rotate insecticide chemistries as part of their resistance management programs.

[**37**] **Seasonal biology and management of spotted wing drosophila in Arkansas**. Donn T. Johnson1, Barbara Lewis1, Elena Garcia2, Curt Rom2, and Luke Freeman2, 1Department of Entomology and 2Department of Horticulture, University of Arkansas, Fayetteville, AR 72701. [dtjohnso@uark.edu](mailto:dtjohnso@uark.edu)

The presence of spotted wing drosophila (SWD) was confirmed in at least 16 Arkansas counties with first larval infestation of blueberries on 22 May 2013. We recorded weekly or biweekly changes in SWD fly numbers captured in baited traps set in sprayed and unsprayed blackberry, raspberry, blueberry and strawberry plantings either in open fields or high tunnels. We tested efficacy of weekly applications of several conventional insecticides in rotation and an organic program that rotated spinosad (Entrust) and pyrethrum (Pyganic). Applications were made via a gas powered backpack air blast sprayer. We also coupled these organic sprays with mass trapping (traps set 3 m apart). We had minimal berry infestation with conventional insecticides but always had at least 10 SWD flies emerge from a 30 fruit sample of harvested fruits from fall fruiting blackberries and raspberries. ProtekNet Insect Netting did exclude SWD flies from a section of high tunnel blackberries and raspberries but eventually became infested due to constant re-entry to pick berries. In 2014, we began to use the D-VAC vacuum insect collector to sample for or remove SWD flies in berry plantings to determine: efficacy of sprays; note how fast SWD flies returned to a treated planting and time of day most prevalent; note if/when SWD flies entered a screened exclusion section of the berry planting; and how often a D-Vac must be used to significantly reduce SWD numbers so no fruit become infested.

La presencia de la mosca Spotted wing drosophila (SWD) fue confirmada en 16 condados de Arkansas con la primera infestación de larvas en arándanos el 22 de Mayo de 2013.  Anotoamos  los cambios en el número de SWD moscas que fueron capturadas en las trampas que tenian cebo en plantaciones de zarzamora, frambuesa, arandanos y fresa que fueron rociadas con insectidas y otras plantaciones sin insecticidas.   Hemos probado la eficacia de las aplicaciones semanales de varios insecticidas convencionales en rotación y un programa orgánico donde se rotaron spinosad (Entrust) y pelitre (Pyganic).  Las aplicaciones fueron hechas usando un “air blast sprayer”.  Nosotros también usamos trampeo masivo con los inseticidas  orgánicos (las trampas fueron puestas a cade  3 m).  Tuvimos infestación mínima de baya con insecticidas convencionales, pero siempre había por lo menos 10 SWD moscas que emergian en las muestra de 30 frutas de la zarzamora y frambuesa que da fruta en el otoño.  La “ProtekNet” red  exclyó la SWD moscas en una sección del túnel con zarzamora y frambuesas, pero finalmente  el túnel llegó a ser infestado debido a la constante entrada y salida  a cosechar bayas.  En 2014, comenzamos a utilizar una aspiradora,“D-VAC”,  para recoger  o elimiar la SWD moscas en plantaciones de baya para determinar: eficacia de los insecticidas; Notar que tan rápido la  SWD mosca  regresó a una plantación que fue roseada con insecticia  y la hora del día ; Notar si/o **cuándo** las moscas SWD entró en una sección de baya excluida; y con que frecuencia debe utilizarse la “D-Vac”aspiradora para reducir significativamente los números SWD para que ninguna fruta se infeste.

[**38**] **Florida situation: Distribution and management of spotted wing drosophila in Florida berry crops**. Oscar E. Liburd, Lindsy E. Iglesias and Teresia W. Nyoike. University of Florida, Entomology and Nematology Department, Building 970 Natural Area Drive, University of Florida, Gainesville, Florida 32611. [oeliburd@ufl.edu](mailto:oeliburd@ufl.edu)

The spotted wing drosophila (SWD), *Drosophila suzukii* (Matsumura), was first recorded in Hillsborough County, Florida in 2009 and since that time has spread to > 28 counties in the state. Initial monitoring efforts were focused on blueberries; however, during 2013-2014 strawberry growing season we expanded our SWD monitoring into strawberries. Monitoring traps were deployed on 16 farms in Plant City (the principal strawberry growing area), 6 farms in Bradford County and 4 farms in Alachua County, Florida. Monitoring traps consisted of clear plastic containers with covers and 8-10 holes along the upper side for *D. suzukii* to enter the traps. Each trap was baited with either apple cider vinegar or yeast sugar water. The number of traps deployed per farm varied from 2 to 5 depending on the size of the farm. Trap collections were brought back to the Small Fruit and Vegetable IPM Laboratory at the University of Florida where SWD males and females were identified under a dissecting microscope. The number of other drosophila flies including those from another invasive species, *Zaprionus indianus* was also recorded. We continued our monitoring operations in blueberries and trapping was conducted on 13 farms in 8 counties. We found that > 50% of the strawberry farms sampled were infested with SWD and that captures from perimeter traps were significantly higher than traps deployed within the field. In blueberries we found SWD on all of the farms where monitoring activities were conducted. We showed that wild blackberry, *Rubus* spp. was a primary host and a potential inoculation source for strawberry and blueberry fields.

[**39**] **Drivers and stoppers of *Drosophila suzukii* populations and crop damage in commercial berry production**. Michael Seagraves. Driscoll’s, Watsonville, CA 95076 [michael.seagraves@driscolls.com](mailto:michael.seagraves@driscolls.com)

*Drosophila suzukii*  impacts raspberry, blackberry, blueberry, and strawberry production in a variety of locations across North America and Europe. This talk will explore the fundamentals of management across these crops and geographies and also point out differences between them. A high level guide to management strategy, understanding crop susceptibility, and an international produce company’s perspective on the future technologies to control this pest will be covered in the presentation.

[**40**] **Wild blackberries and their role in spotted wing drosophila management**. Teresia W. Nyoike and Oscar E. Liburd. Entomology and Nematology Department, Building 970, Natural Area Drive, University of Florida, Gainesville, Florida 32611. [nyoiket@ufl.edu](mailto:nyoiket@ufl.edu)

Traps were placed within shrubs and trees near a blueberry planting to establish spotted wing drosophila (SWD), *Drosophila suzukii*, Matsumura population dynamics throughout the year in north-central Florida. Traps were baited with either apple cider vinegar or yeast-sugar water in 1 liter clear plastic traps. In addition, red and blue-black wild blackberries, *Prunus* spp. were picked from the field adjacent to the blueberry planting and incubated for 10-14 days and the number of SWD hatching from them was counted. Results from the year-long monitoring study show that SWD was found thriving in the shrubbery and tree- landscape throughout the year in north-central Florida. The main host plant in this landscape was the wild blackberries. No SWD flies hatched out of the red wild blackberries, while 2.24 adults per fruit were collected from the blue-black fruits in July increasing from 0.13 in May. A comparison of fruit susceptibility to SWD in wild blackberries and cultivated blueberries and blackberries will also be discussed.

[**41**] **Comparing spotted wing drosophila attraction to various fruit volatiles**. Cesar

Rodriguez-Saona1 John Abraham2, and Aijun Zhang3. 1Department of Entomology, Rutgers University, P.E. Marucci Center, 125A Lake Oswego Rd., Chatsworth, N.J. 08019, USA. 2Faculty of Science and Technology, Free University of Bozen-Bolzano, Piazza Università 5, 39100 Bolzano, Italy. 3USDA, ARS, Invasive Insect Biocontrol and Behavior Laboratory, 10300 Baltimore Ave., BARC-West, Beltsville, MD 20705. [crodriguez@aesop.rutgers.edu](mailto:crodriguez@aesop.rutgers.edu),

We conducted studies to investigate the behavioral and electroantennographic (EAG) responses of adultSWD to fruit volatiles (blueberries, raspberries, strawberries, and cherries); identify the EAG-active compounds from a highly attractive fruit (raspberry) using gas chromatography (GC) and coupled GC-EAD; and test a synthetic lure containing the EAG-active compounds from the raspberry volatile blend on adult attraction*.* Volatiles from all 4 fruit were attractive to SWD and elicited strong EAG responses. Using GC-EAD, we found 11 volatiles from the raspberry extract that consistently elicited antennal responses in SWD. In choice tests, a synthetic lure containing the EAG-active blend attracted more SWD than control lures. This is the first report of a behaviorally- and antennally-active blend of fruit volatiles attractive to SWD.

[**42**] **What makes a good host for *Drosophila suzukii*?** Lindsy E. Iglesias and Oscar E. Liburd. Entomology and Nematology Department, Building 970, Natural Area Drive, Gainesville, Florida 32611. [liglesias@ufl.edu](mailto:liglesias@ufl.edu)

*Drosophila suzukii* is an invasive pest native to East Asia and has become an increasingly important threat to the U.S. small and stone fruit industry. The fly is a generalist fruigivore that targets a wide range of small and stone fruits. However, some host fruits, species, or varieties are more suitable for *D. suzukii* than others. In Florida, two species of blueberry, a host of *D. suzukii*, are grown, southern high bush *Vaccinium corymbosum* L. x *V. darrowi* Camp and the southeastern native rabbiteye blueberry *Vaccinium virgatum* Aiton. No-choice experiments showed that more *D. suzukii* larvae developed in ripe southern highbush than rabbiteye blueberries. In 2014, further investigation was conducted to understand the role that fruit textural properties including color, firmness, sugar content, and pH, play in host preference and suitability for *D. suzukii*. Textural properties were analyzed for the ten most grown varieties of southern highbush and rabbiteye as well as berry ripeness stages. Analysis of textural properties and laboratory bioassays using *D. suzukii* revealed differences in host preference for and suitability of ripe southern highbush and rabbiteye blueberries.

**Symposium – IPM in Florida Agro-Ecosytems: What Have We Learned So Far?**

**Organizers:** Vivek Kumar (Mid-Florida Research and Education Center, IFAS-UF), and Garima Kakkar (Ft. Lauderdale Research & Education Center, IFAS-UF)

[**43**] **Management and mismanagement of pepper pests in Florida**. Phil Stansly. Southwest Florida Research and Education Center, University of Florida, IFAS, 2685 SR 29 N, Immokalee FL 34142 USA. [pstansly@ufl.edu](mailto:pstansly@ufl.edu)

The principal pests of pepper in Florida are pepper weevil, western flower thrips (WFT), broadmite and beet armyworm. Beet armyworm can be controlled effectively with selective insecticides and broadmite with miticides or the predaceous mite, *Amblyseius swirskii*. The real problem is pepper weevil, against which broad spectrum insecticides are only marginally effective and may also flare WFT. Therefore, an integrated approach is necessary employing cultural controls such as shortened crop cycles, crop residue destruction, and nightshade control, to limit pepper weevil infestations and avoid use of broad-spectrum insecticides, especially early in the crop cycle.

[**44**] **Developing and implementing mating disruption for area-wide control of citrus leafminer and citrus canker disease**. Stephen L. Lapointe. USDA, ARS, U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945. [Stephen.lapointe@ars.usda.gov](mailto:Stephen.lapointe@ars.usda.gov)

Successful development and commercial launch of the first semiochemical-based control method for a major exotic insect pest and associated disease of citrus in Florida have resulted from vigorous collaboration between university and government researchers with support from private industry and innovative funding from the citrus industry. A single application of the triene component [(*Z,Z,E*)-7,11,13-hexadecatrienal] of the binary sex pheromone of the leafminer (*Phyllocnistis citrella*) provided trap catch disruption as long as 8 months and significant reductions in the number of active mines. In 2014, we applied slow-release devices (DCEPT CLM™, ISCA Technologies Inc., Riverside, CA) to deliver approximately 140 mg/acre (350 mg/ha) of the triene to ~3,000 acres in three commercial groves in southeast and southwest Florida. Groves were chosen to provide a contrast between treated areas surrounded by untreated leafminer-infested citrus and treated areas isolated from leafminer host plants and therefore from sources of immigration by gravid *P. citrella* females. We hypothesize that control of mining and associated canker will increase with increasing scale of application. An area-wide approach seems particularly appropriate for this pest and disease complex. The Citrus Research and Development Foundation provided a subsidy to early adopters through their Commercial Product Delivery Committee to promote commercial launch of this alternative to repeated applications of broad-spectrum insecticides. Results from the 2013 and 2014 trials will be presented.

[**45**] **Banker plant systems: Tools and tactics in managing key pest problems in ornamental production.** Lance S. Osborne1 and Cindy L. McKenzie2. 1Mid-Florida Research and Education Center, University of Florida, 2725 Binion Road, Apopka, FL 32703; . [lsosborn@ufl.edu](mailto:lsosborn@ufl.edu)

Banker plants in the agro-ecosystem can provide long-term suppression of pest populations by providing ecological infrastructure for sustenance of a reproducing population of natural enemies. Banker plants can provide nutrient supplements in the form of nectar or pollen- important for the natural enemies’ survival in the absence of prey, as well as a modified microhabitat (domatium) which can protect them against adverse abiotic conditions and secondary enemies or from insecticide application. Such a self-sustaining pest management system can increase reliability of biological control strategies and can help reduce overall insecticide use. This presentation will summarize the reports from different greenhouse and nursery studies we conducted in Florida, where use of banker plants proved successful in managing whitefly and other key pests of ornamental production.

[**46**] **Pest problems in Florida tomato production**. Hugh A. Smith. Univ. Florida/IFAS/Gulf Coast REC, 14625 CR 672, Wimauma, FL, 33598. [hughasmith@ufl.edu](mailto:hughasmith@ufl.edu)

Key pests of Florida tomato are the silverleaf whitefly, *Bemisia tabaci* biotype B, and *Frankliniella* spp. thrips, both of which transmit viruses to the crop. Caterpillars, leafminers, mites and other pests such as stink bugs and leaf footed bugs can also impact production. Management of Tomato yellow leaf curl (vectored by *B. tabaci*) and thrips-vectored tospoviruses involves the destruction of inoculum sources, the use of repellant mulches, resistant varieties, and chemical control. The development of insecticide resistance due to overreliance on limited numbers of modes of action is a major challenge in the development of integrated management programs for tomato pests in Florida. The treatment window approach of applying insecticides is central to mitigating the development of resistance.

[**47**] **IPM of corn silk flies**. Greg Nuessly. Everglades Research and Education Center, University of Florida, IFAS, 3200 E. Palm Beach Rd., Belle Glade, FL USA. [gnuessly@ufl.edu](mailto:gnuessly@ufl.edu)

The unofficial common name ‘corn silk flies’ refers to a group of four picture-winged fly species (Diptera: Ulidiidae) in the USA whose larvae damage maize ears as primary pests: *Euxesta eluta, E. stigmatias, E. annonae*, and *Chaetopsis massyla*. Additional *Euxesta* spp. attack maize in Central and South America where they are referred to as mosca de estigma, mosca de mazorca, and mosquita pinta. Particularly important sweet corn pests in the southeastern U.S., the larvae clip silks resulting in reduced pollination, and feed within kernels and cobs causing as much as 100% yield loss. The long-lived adults feed on plant- and insect-based foods widely available in diverse crop production areas (e.g., pollen, plant exudates, decomposing fruits and vegetables, and insect frass). Populations are maintained at elevated levels in southern Florida due to a mild climate and a wide range of larval host plants beyond maize, including mechanically- and insect-damaged grasses, broad-leaved weeds, and sugarcane, as well as shed and culled fruiting vegetables. Predators place some pressure on corn silk fly populations by feeding on adult (spiders and Reduvidae) and immature flies (Anthocoridae, Chrysopidae, Staphylinidae). A pupal parasitoid (Hymenoptera: Pteromalidae) of these flies discovered in 2013 may further assist in natural control in grain and silage corn. However, sweet corn production is currently dependent on insecticides for corn silk fly control and their increasing resistance to these products poses serious economic concerns. The past, present and possible future strategies for IPM of corn silk flies will be discussed in this presentation.

[**48**] **IPM of rugose spiraling whitefly in the landscape**. Catharine Mannion, Siavash Taravati, Anthony Boughton and Holly Glenn. UF/IFAS Tropical REC 18905 SW 280th Street Homestead, FL 33031. [cmannion@ufl.edu](mailto:cmannion@ufl.edu)

Rugose spiraling whitefly, *Aleurodicus rugioperculatus*, is an invasive pest first observed in Florida in 2009. It feeds on a wide variety of host plants but appears to prefer certain plants in the landscape which include coconut palm, gumbo limbo, white bird of paradise and others. This pest is currently being management with pesticides, particularly the neonicotinoids. Several natural enemies have been identified attacking this whitefly and one parasitoid appears to be having impact on the population. Efforts have been ongoing to introduce this parasitoid to newly infested areas as well as to use in combination with pesticides. An update on current management practices and their impact on whitefly populations will be reviewed.

[**49] Development of a program integrating stockosorb® and zerogravity solution (BAM FX) for managing insect pests of vegetables in South Florida**. Dakshina R. Seal. UF/IFAS Tropical REC 18905 SW 280th Street Homestead, FL 33031. dseal3@ufl.edu

Separate studies were conducted to determine effectiveness of Stockosrb®, a granular organic synthetic cross-linked polymer, and a Zero gravity solution, a highly bioavailable mineral (BAM), for controlling silverleaf whitefly (SLW), American serpentine leafminer, melon thrips, flower thrips, melonworm, and cucumber beetle. Stockosorb at 20 lb./acre treated bean and cucumber plants having irrigated with 60% and 80% of standard water level (100%) showed suppression of silverleaf whitefly and melon thrips. Foliage quality and marketable yields of bean and cucumber did not vary among irrigation levels (60%, 80% and 100%). The Zero gravity product (BAM FX), having easily penetrable minerals in the plant system, was used at 2.0, 1 and 0.5 oz. (weight)/acre at planting as a soil drench to substitute organic fertilizer. BAM FX at 2.0 oz. (weight)/acre significantly reduced flower thrips and silverleaf whitefly populations on tomato for the first five weeks after planting. Accordingly, Tomato Yellow Leaf Curl Virus and Groundnut Ring Spot Virus like symptoms were significantly less than the untreated control plants. Application of Stockosorb® and BAM FX in combination for growing vegetable crops could be a novel method for suppressing insect pests and managing good plant quality.

[**50**] **RNAi-based strategies to reduce Asian citrus psyllid (Hemiptera: Liviidae).** Wayne Hunter. USDA, ARS, U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945. [Wayne.hunter@ars.usda.gov](mailto:Wayne.hunter@ars.usda.gov)

This research demonstrates a non-transgenic delivery method to apply ribonucleic acid, RNA, interference strategies, RNAi, to reduce psyllids which spread citrus greening disease, known as Huanglongbing. Devastation of citrus trees by plant-infecting bacteria *Candidatus* Liberibacter asiaticus (Las), associated Citrus Greening Disease, ruin fruit quality, reduces yield, and result in tree death, causing losses in the millions of dollars, and in thousands of jobs. Heavy use of insecticides has reduced the Asian citrus psyllid, *Diaphorina citri* Kuwayama, which spreads the bacterium, but also reduced many beneficial insects. Gene-based pest and pathogen management, such as RNAi provides a highly specific pest control strategy, HiSPeCS. RNAi is a natural, immune defense mechanism that allows the cell to recognize and cleave dsRNA, suppressing corresponding messenger RNA, thus disrupting protein production. An RNAi approach which reduces a specific pest population while leaving beneficial insects unharmed would be good for the growers, public, and the environment. Risk assessment in a double-blind trial on honey bees showed no significant difference between treated and controls in survival or immune gene expression. The aim of this research is to support sustainability of the citrus industry by development of a commercial RNAi-based product against the Asian citrus psyllid to reduce the spread of the pathogen associated with Citrus Greening Disease.

**Symposium: How Can I tell if it’s Dead? Conducting Efficacy Trials with Notoriously Difficult to Work with Insects and Mites.**

**Organizers**: Catherine Long, Syngenta Crop Protection, Vero Beach FL; Craig Heim, FMC, Savannah, GA; and Scott Ferguson, Atlantic Turf & Ornamental Consulting, Vero Beach, FL.

[**51**] **Trialing with Tetranychidae, design and methodology for effective spider mite efficacy tests.** Catherine Long, Syngenta Crop Protection, Vero Beach FL. [Catherine.long@syngenta.com](mailto:Catherine.long@syngenta.com)

Spider Mites (Tetranychidae) are a common pest in agricultural and landscape setting, attacking both ornamentals and vegetables. The largest adult mites are less than 0.5 mm in length. Some species may present as orange or red, but many individuals, particularly in the younger age classes, are a translucent yellow or green. In light to moderate infestation, mites harbor under the leaves. Mite's size and patchy distribution on their host plants can make this pest a challenge to evaluate in efficacy trials. Several experimental design factors and evaluation methodologies can contribute to the execution of a successful trial. Sample sizes should be commensurate with the size of the plot. Examine the untreated plots to determine where on the plants mites are active and sample from like areas across all the plots. If you will be removing the leaves, insure that plots are large enough to sustain multiple evaluations. Determine what proportion of the sampled leaf tissue you want to evaluate. Do you want to count the mites on an entire leaf or from a pre-determined area? Mites can be assessed directly on the host material or brushed from the leaves with a mite brushing machine. Depending on the research objectives, count dead and living, or mobile, mites.

[**52**] **A review of pepper weevil, *Anthonomus eugenii* (Cano) biology, management and development of control tactics.** James "Shine" Taylor, Field Development Rep., DuPont Crop Protection, Riverview, FL 33578. [james.e.taylor-1@dupont.com](mailto:james.e.taylor-1@dupont.com)

The pepper weevil, *Anthonomas eugenii* (Cano) is an important insect pest of peppers in the southern US. In Florida, it is the key species in pepper and is found throughout all growing regions and populations tend to peak in the warmer months, but it can be found at any time during the growing season. Adult pepper weevils feed on fruit and leaf buds and larvae feed inside pepper pods. Pepper weevils can be difficult to control and developing novel control tactics is important. Along with their cryptic nature, clumped pattern of distribution and level of damage they cause, they can be difficult to study, so practical ideas around testing new compounds or management strategies will be discussed.

[**53**] **Field and greenhouse techniques for conducting trials with the American serpentine leafminer, *Liriomyza trifolii*: 30 years of "tricks".** Scott Ferguson, Atlantic Turf & Ornamental Consulting, Vero Beach, FL. [Scott@atoconsult.com](mailto:Scott@atoconsult.com)

The American serpentine leafminer, *Liriomyza trifolii*, is a difficult to control economically important pest of ornamentals and vegetables, especially leafy vegetables and tomatoes. Additionally, it is exceptionally prone to developing insecticide resistance. For field trials, the recommended test crop is tomatoes, especially cherry tomatoes. A randomized complete block design of 4 replicates and a plot size of 4 rows x 10 meters is recommended. Leafminer populations can be increased by applying several weekly applications of methomyl or old pyrethroids, such as permethrin. Under heavy pressure, evaluations can be made by collecting leaves from plots, placing them in paper bags for 5 days, and then counting the numbers of puparia. Under lighter pressure, the number of live or completed mines per plant or per 2 minute search can be made. For greenhouse ornamental trials, the recommended test crops are mums, Salvia and petunias. Access to a lab reference culture for infestation is optimum for conducting greenhouse trials. A randomized complete block design with 5 single plant replicates is recommended. Plants are infested by releasing an average of 10 adult leafminers per plant into a cage for a specific ovipostion period of time or releasing adults into a greenhouse. There are a number of options for ratings, including: counting the numbers of live and/or completed mines per plant or per 5 leaves per plant; or cutting the plants at the soil line and hanging them upside down in paper bags then counting the puparia.

[**54**] **Mealy bug testing in the industry setting: rearing to testing tricks to reduce headaches and confusion.** Tom Macom, Bayer Crop Science, 981 NC Hwy 42 East, Clayton, NC, 27527. [Tom.macom@Bayer.com](mailto:Tom.macom@Bayer.com)

Mealybugs are one of the most common and hard to control scale insects attacking ornamental plants in nurseries and greenhouses. There are 275 different species of mealybugs in the continental United States, but only a few have reached significant pest status. This talk will center on two: the citrus mealybug (Planococcus citri [Pseudococcus citri] Risso) and Madeira mealybugs (Phenacoccus madereirensis Green). This talk will discuss rearing, infesting, rating and test methodologies for mealybugs in greenhouse and laboratory settings. Rearing mealybugs on squash is the easiest and most practical way to rear large numbers for testing. To ensure uniformity of infestation, it is recommended to use late instar females to infest the plants. The incorporation of randomized complete block with 4 replicates of 5 to 10 plants is the preferred test method. To get reliable data, Sampling individual branches using repeated measure designs is the quickest and an accurate method to test efficacy of the insecticide.

[**55**] **Confirmed Kill and Battle Damage Assessment - Western Flower Thrips (*Frankliniella occidentalis*) and other challenging thrips species.** Shannon Morsello, Syngenta Crop Protection, Greensboro, NC. [shannon.morsello@syngenta.com](mailto:shannon.morsello@syngenta.com)

Thrips cause extensive economic losses to greenhouse plants and vegetable crops via direct feeding, ovipositional damage and virus transmission. Populations of thrips reproduce rapidly and build large populations on weedy vegetation surrounding greenhouses and fields during the spring. As temperatures build and weedy plants senesce, thrips disperse to new viable plant hosts. These source plants may be useful to plan test plots around to provide a reliable source of thrips throughout the trial evaluation phase. To determine feeding and oviposition damage, plants can be visually rated for plant and/ or flower abortion, distortion, discoloration, stippling, rasping and tears or missing areas in the true leaves. A variety of thrips damage scales are available, but generally score: no visible damage, slight, moderate, severe and complete loss of true leaves or blooms. To determine population size in smaller plants and flowers, evaluations can be made by dipping leaves or blooms in cups of alcohol and then placed under a dissecting scope for counting the number of larvae and adults. To assess larger plants, plant parts can be collected and placed in dry-down cages with fresh cabbage or beans to draw the thrips out of the test plants. As the thrips move to the fresh cabbage or beans, they can be aspirated and counted.

[**56**] **Challenges in designing and conducting field experiments to test insecticides on invasive pest species: the case of the Red Imported Fire Ant and the Asian Citrus Psyllid.** Alejandro Calixto, Dow AgroSciences, Wesley Chapel, FL. [aacalixto@dow.com](mailto:aacalixto@dow.com)

A common practice by companies is the field testing of commercially available and newer compounds on selected pests and crops. The process involves rigorous work to design and conduct sound experiments to draw conclusions about the efficacy of their products and how to position these products in relation to current management practices and the current status of the target pest(s). Testing these products on invasive pest species poses several challenges particularly in recently invaded areas where researchers have limited familiarity with their biology. This familiarity helps the researcher identify what is feasible with respect to practicality and budget and provides the researcher with perspective in drawing conclusions. Two case studies are presented to exemplify the challenges while conducting field experiments with invasive species. The first case involves the Red Imported Fire Ant introduced in the US more than 80 years ago and is currently well established. The second one involves the Asian Citrus Psyllids recently introduced in the US and significantly impacting the citrus industry. One of the most common issues, particularly on recently introduced species, is to determining the magnitude of the effect of several compounds and the environmental interactions impacting these effects. Several alternatives are proposed to address these issues while evaluating compounds on invasive pest species.

[**57**] **You Want Me to do What?** John Paige III, Bayer Environmental Science, Vero Beach, FL. [John.paige@bayer.com](mailto:John.paige@bayer.com)

Doing research and product development on professional pest management products can lead one into many wonderful, but often strange areas. In the past decade, the resurgence of bed bugs, *Cimex lectularius*, has made the development of efficacious pest management products focus in areas traditionally not visited. An optimal bed bug research and development field site should have the following attributes: have multiple units infested with significant levels of bugs, be available to researchers, have management willing to cooperate with researcher, and understand that some trials will be more successful than others. Although these attributes will disqualify most traditional development sites such as hotels and apartment complexes, most substance abuse recovery programs are very willing participants, and offer not only challenges, but also many rewards to the development process.

**Submitted Papers Session 1**

[**58**] **Developing a color indicator for virus acquisition in insects (Hemiptera: Cicadellidae).** Sana Shareef1 and Wayne Hunter2.1Saint Edward’s School, 1895 St. Edward’s Drive, Vero Beach, FL 32963; 2 USDA, ARS, U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945. [sanas@steds.org](mailto:sanas@steds.org)

The glassy-winged sharpshooter (GWSS - *Homalodisca vitripennis*), is an important vector of *Xylella fastidiosa*, a bacterium causing Pierce’s Disease many crops. Reduction of population of GWSS is an important method in preventing further spread of *Xylella*. The Insect Iridescent Iridovirus, IIV-6, is a potential biological control agent to suppress GWSS populations. Current bioassays used to study virus acquisition by the GWSS take approximately 10 days. This study examined if the bioassay time could be reduced by correlating a dye with GWSS virus acquisition. Four different stain solutions were compared. The treatment containing 0.29 mL blue food dye, 1.5 mL Surfactant, in 13.21 mL water was the most visible, detectable, and nontoxic treatment to the plants and insects. The treatment was visible in insects, 56 hours post feeding. The virus stock used was propagated in *Diaprepes abbreviatus* L., larvae, USDA lab, Ft. Pierce, FL. The IIV-6 was absorbed by the plant; and ingested by GWSS which then fed on the treated plants. Polymerase Chain Reaction was used to validate the presence of viral DNA 56 hours post feeding in GWSS, and in plant tissues. Results: 1) There is a difference in the utility of different stain solutions for the detectability, visibility, and nontoxicity to the plant and the insect. 2) There is a correlation between the ingestion of stain solutions and virus acquisition. The treatment developed reduced the detection time for insect virus acquisition by approximately 7 days, saving the researcher/laboratory, a significant amount of time and money.

[**59**] **Evaluation of *Encarsia guadeloupae* Viggiani for the control of the rugose spiraling whitefly in Florida.** Antonio W. Francis, Betty Threlkeld, Trevor Smith, and Pasco Avery. Florida Dept. of Agriculture and Consumer Services, Division of Plant Industry, 2725 S. Binion Road, Apopka, FL 32703. [antoniowfrancis@gmail.com](mailto:antoniowfrancis@gmail.com)

The rugose spiraling whitefly continues to damage a broad range of ornamental and landscape plants in Florida. The whitefly causes significant aesthetic damage to these plants, nearby vegetation, buildings, etc. Ongoing efforts to combat this pest have relied on cultural and chemical control, and available native natural enemies that have adapted to feeding on the whitefly. One promising parasitoid is *Encarsia guadeloupae*, an aphelinid wasp that attacks the early whitefly instars. Experiments investigating its host stage preference, adult longevity and fecundity, and impact on rugose spiraling whitefly populations are ongoing to determine what role *E. guadeloupae* plays as part of the existing natural enemy complex attacking this whitefly in Florida.

[**60**] **Evaluation of *Diaphorina citri* Kuwayama development and reproduction on *Zanthoxylum fagara* (L.).** Jawwad A. Qureshi, Susan E. Halbert, Dyrana N. Russell and Philip A. Stansly. Department of Entomology and Nematology, University of Florida/IFAS, Southwest Florida Research and Education Center, 2685 SR 29 N, Immokalee, FL 34142 [jawwadq@ufl.edu](mailto:jawwadq@ufl.edu)

The Asian citrus psyllid *Diaphorina citri* is principal vector of the bacteria *Candidatus* Liberibacter spp. causal agent of huanglongbing (HLB) or citrus greening disease. Both vector and disease are now well established in Florida and also reported throughout the Americas and Asia. The host range of *D. citri* is limited to citrus and some rutaceous relatives. Use of additional host plants by *D. citri* could accelerate spread of HLB. Adults and a small nymphal colony of *D. citri* was observed on wild lime *Zanthoxylum fagara* during field surveys in Florida. Experiments were conducted to evaluate survival and development of *D. citri* on *Z. fagara* and the hybrid rootstock ‘Swingle’ citrumelo and. Adult longevity of 56.7±3.1 days and 76.2±1.5 days was observed on *Z. fagara* and ‘Swingle’ citrumelo*,* respectively. However, reproduction and nymphal survival was not successful on *Z. fagara*. Considering very short acquisition and transmission times for HLB pathogens by *D. citri*, adult longevity on *Z. fagara* appear to be sufficient to acquire and transmit the causal pathogens. However, probability of acquisition is low due to unsuccessful survival of nymphs which are considered more efficient at acquisition of HLB causal pathogens than adults. Nevertheless, adaptation to hosts presently inappropriate for reproduction could increase over time. There is need to determine if HLB pathogens can be transmitted to and/or acquired from *Z. fagara*. Field monitoring of citrus and *Zanthoxylum* spp. is warranted in order to maintain effective plans for vector and disease management.

[**61**] **Has the auditory system of the Polka-dot wasp moth with two-celled ears adapted for intraspecific acoustic communication?** Frank Coro. Natural and Social Sciences Department, InterAmerican Campus, Miami Dade College, 627 S.W. 27th Avenue, Miami, FL 33135 [fcoro@mdc.edu](mailto:fcoro@mdc.edu)

Noctuid and erebid moths have two-celled ears that have evolved under the pressure of the echolocation calls of insectivorous bats. Several of these species also have ultrasonic emission organs used in their interactions with bats. Among the species with a complete acoustic system is the polka-dot wasp moth, *Syntomeida epilais* (Erebidae). It has been demonstrated that in *S. epilais* acoustic communication is essential for successful mating behavior and that their acoustic emissions (named modulation cycles, MC) show sexual dimorphism. Our aim was to study if there is evidence for adaptations of its auditory system for intraspecific acoustic communication. We stimulated virgin, perched females outdoors during the hours of their mating behavior (3:30 – 6:30 AM) with playback of: conspecific male and female acoustic emissions; echolocation calls (search and buzz) from two sympatric bat species, including *Tadarida brasiliensis*, the most abundant insectivorous bat in Florida; and ultrasonic emissions from three sympatric insect species. Most of these ultrasonic signals were previously recorded at the same place and during the same time window at which females were acoustically stimulated. The phonoresponses were quantified by counting the number of modulation cycles produced by the female in response to the applied stimuli. More than 30 females phonoresponded preferentially (more MCs generated per applied stimulation series) to their conspecific male emissions. These responses depended on the hour of night, starting approximately 2 hr 30 min before civil twilight, corresponding with the time window of mating. These features may be considered as adaptations for intraspecific acoustic communication.

[**62**] **Temperature requirements and overwintering survival of *Lilioceris cheni*, a biological control agent of the air potato vine in Florida.** Veronica Manrique, Rodrigo Diaz, Melissa C. Smith, Ellen C. Lake, Paul D. Pratt, John Mass, Kristen Bowers, Stephen Hight, and William A. Overholt. University of Florida, Indian River Research & Education Center, 2199 South Rock Road, Fort Pierce, FL. [vero72@ufl.edu](mailto:vero72@ufl.edu)

The air potato vine, *Dioscorea bulbifera* L. (Dioscoreaceae), is a major problem in Florida where it invades a variety of habitats including disturbed uplands, abandoned nurseries, hardwood hammocks and pinelands. Since 2012, the air potato leaf beetle *Lilioceris cheni* Gressit and Kimono (Coleoptera: Chrysomelidae) has been released on public lands throughout the state for biological control of the invasive vine. Field observations at several release sites indicate that the beetle population is rapidly increasing and high defoliation has been observed at some locations but not others. In order to better predict establishment and performance of this agent, laboratory and field studies were conducted to determine the temperature requirements, diapause induction and overwintering survival of *L. cheni*. Results showed that females entered reproductive diapause when exposed to 20°C and short days (10: 14 L:D photoperiod) whereas reproduction occurred at 25°C either under short or long days. Adults are long-lived (> 6 months) and lifetime fecundity was 2068 eggs per female (range: 1038 – 4304) at 25°C. Complete development occurred in temperatures ranging from 20 to 30°C, whereas no eggs hatched at 10, 15, and 35°C. Field cages were established at three sites along a latitudinal gradient in Florida (Homestead, Fort Pierce, and Tallahassee) in October 2013, and adult survival was monitored monthly throughout the winter (25 adults per cage, 20 cages per site). Higher survival of beetles was reported in Fort Pierce (48%), followed by Tallahassee (34%), and low survival was reported in Homestead (7%). The significance of the results will be discussed.

[**63**] **Influence of low oxygen conditions on the efficacy of irradiation as a phytosanitary treatment**. Catriona Condon1, Sabrina A. White1, Woodward D. Bailey2, Laura A. Jeffers3, Robert L. Meagher4 and Daniel A. Hahn1. **1** Department of Entomology and Nematology, University of Florida, Gainesville FL, 32611.2 USDA-APHIS-PPQ Subtropical Quarantine Inspection, Coral Gables, FL, 33158; 3 USDA-APHIS-PPQ CPHST AQI Raleigh, Raleigh NC, 27606; 4 USDA-ARS, CMAVE, Gainesville, FL, 32611.. [chcondon@ufl.edu](mailto:chcondon@ufl.edu)

Irradiation can be used as a phytosanitary treatment to kill or sterilize invasive pests that arrive in imported agricultural products. However, the irradiation of insects in anoxia is known to buffer the damaging effect of radiation when compared to the same radiation treatment applied under normal atmospheric conditions. As commodities are often transported in low-oxygen environments, difficulty has arisen in determining a generic radiation dose for insect disinfestation in low-oxygen conditions. Here, we examine the efficacy of irradiation as a treatment to induce sterility in the Cabbage Looper (*Trichoplusia ni*) exposed to a range of oxygen conditions. Female pharate adults were exposed to an oxygen condition (0, 5, 10, 15, 20.9 kPa) for 1 hr and then irradiated at one of five doses (0, 200, 400, 600, 800 Gy). Females irradiated at 200 Gy in anoxia had greater fertility as adults than those from other atmospheres. At 400 Gy, anoxia rescued fertility compared to pharate adults irradiated in oxygen atmospheres of 15 and 20.9 kPa. However, fertility did not differ among females that were irradiated in 0, 5 and 10 kPa O2 or among 5, 10, 15 and 20.9 kPa O2 treatments. This result suggests that irradiation in low oxygen conditions (5, 10 kPa) may provide some rescue effect, however on a smaller scale than occurs from irradiation in anoxia. Across all atmospheric treatments, complete sterility occurred at 800 Gy.

[**64**] **Growth, survival, and reproductive behavior of *Metamasius callizona* (Chevrolat) (Coleoptera: Curculionidae) on different host bromeliads.** Teresa M. Cooper and Ronald D. Cave. University of Florida, Indian River Research and Education Center, 2199 South Rock Rd., Ft. Pierce, Florida 34945 [tmcooper@ufl.edu](mailto:tmcooper@ufl.edu)

*Tillandsia utriculata* is a bromeliad native to Florida that is being destroyed by an invasive bromeliad-eating weevil, *Metamasius callizona* (Chevrolat) (Coleoptera: Curculionidae). *Tillandsia utriculata* is also native to Central America where it coexists with *M. callizona* without suffering the great damages that the Florida form of *T. utriculata* suffers. *Metamasius callizona* attacks 11 other species of bromeliads in Florida, and shows variable demographics on those species. This research examines host bromeliad effects on the growth, survival, and reproductive activity of the weevil.

[**65**] **Simpler is better: Fewer non-target insects trapped with a 4-component chemical lure versus a chemically more complex food-type bait for spotted wing drosophila.** Dong H. Cha, Stephen P. Hesler, Shinyoung Park, Todd B. Adams, Richard S. Zack, Helmuth Rogg, Gregory M. Loeb and Peter J. Landolt. USDA-ARS, Yakima Agricultural Research Laboratory, 5230 Konnowac Pass Rd., Wapato, WA 98951. [dong.cha@ars.usda.gov](mailto:dong.cha@ars.usda.gov)

Food materials used as baits are generally attractive to many types of insect, and it can be difficult to sort through non-target insects to find and determine the pest species of interest. For spotted wing drosophila (SWD), we recently isolated and identified a 4-component chemical lure that was as attractive as the original material of a wine/vinegar bait. In this study, we compared the chemical lure to the wine/vinegar bait to determine if the chemical lure was less attractive to pest muscid flies at a dairy, cutworm and armyworm moths in a mint field, yellowjackets at an experimental farm, and non-target drosophilids in three SWD habitats in New York, Oregon and Washington. For non-drosophilid non-target insects, numbers of little house fly, false stable fly, spotted cutworm, Bertha armyworm, western yellowjacket and German yellowjacket were significantly lower in traps baited with chemical lures. Similar responses were also observed for three (*Drosophila melanogaster*, *D. obscura* and *D. immigrans*) and seven (*D. melanogaster*, *D. obscura*, *D. immigrans*, *D. putrida*, *D. simulans*, *D. tripunctata*, and *Chymomyza* spp.) non-target drosophilid species that accounted for more than 99% of non-target drosophilids captured in Washington and New York. In Oregon, this difference was observed with *D. melanogaster*.  Taken together, these results indicate that the chemical lure will be more selective for SWD compared to the wine/vinegar bait, making trap maintenance and the sorting of trap catches easier and cheaper.

[**66**] **Antennal and behavioral response of the Asian citrus psyllid to degradation products of citrus volatiles.** Justin George, Stephen Lapointe, Paul Robbins. USDA-ARS, USHRL,2001 South rock road, Fort pierce, FL 34952. [Justin.George@ars.usda.gov](mailto:Justin.George@ars.usda.gov)

Asian citrus psyllid, *Diaphorina citri* Kuwayama (Hemiptera: Liviidae) vectors the bacterial causal pathogen of the deadly citrus disease, Huanglongbing (Citrus greening) which is a major threat to citrus industry worldwide. We studied antennal and behavioral responses to principal components of headspace volatiles collected from citrus flush. Candidate compounds identified by GC-EAD were confirmed by EAG of neat compounds loaded into glass stimulus tubes. Tubes loaded with β-ocimene or citral produced no responses immediately after preparation at a range of concentrations. The same tubes became stimulatory after 3 to 9 days at room temperature, apparently through oxidative degradation. GC-MS demonstrated that both compounds degraded completely over 3 to 9 days in glass (with or without filter paper) to acetaldehyde, acetone, acetic acid, formic acid and other compounds. GC-EAD of extracts of filter paper loaded with neat compounds aged 3 to 9 days in glass pipettes identified peaks that elicit consistent and large antennal responses and determined by GC-MS to be acetic and formic acids. Both were highly stimulatory to *D. citri* antennae and positively correlated with log dose. Probing behavior of *D. citri* was studied by incorporating blends of antenally active compounds in varying proportions and amounts into an emulsified wax substrate (SPLAT TM, ISCA technologies, Inc). More probes were observed on SPLAT containing blends of acetic and formic acids compared with either acid separately or other compounds. Our study suggests that phytophagous insects may use degradation products for host finding and that the Asian citrus psyllid may orient to formic and acetic acid present in the citrus tree canopy. These observations of antennally active compounds, both constitutive and arising as degradation products from constitutive plant volatiles, may contribute to the development of attractants and/or repellants for this important psyllid species.

**Submitted Papers Session 2**

[**67**] **Monitoring coffee berry borer, *Hypothenemus hampei* (Coleoptera: Curculionidae) populations with alcohol-based traps in coffee farms in Colombia.** Luis F. Aristizábal, Mauricio Jiménez, Alex E. Bustillo, Steven P. Arthurs. University of Florida, IFAS, Mid-Florida Research and Education Center, 2725 Binion Road, Apopka, FL 32703. [larist@ufl.edu](mailto:larist@ufl.edu)

The most important insect pest in coffee plantations worldwide is the coffee berry borer CBB. The National Coffee Research Center, Cenicafé in Colombia has developed an integrated pest management program focused on cultural practices, as well as biological, physical, and chemical controls. In addition, a sampling plan for monitoring the CBB has been established. Alcohol-based traps may be useful for monitoring CBB population density throughout the season. Here, we report the use of alcohol-based traps in large and small coffee farms in the central region of Colombia. Through a participatory research project, coffee growers installed, and evaluated 5 or 10 alcohol-based traps per lot during six months. Results showed high number (>502) and high peaks (6174) of adult CBB captured per trap/week in large farms in contrast to small farms, which captured lower number (<175) and lower peaks (310) of the CBB in the same time period. In both cases, we observed peaks of activity from mid-January to mid-March. We conclude that alcohol-based traps can help farmers monitor and prepare for controlling CBB at appropriate periods during the coffee production season.

[**68**] **Bio-rational insecticides used for mitigating the spread of whitefly *Bemisia tabaci* (Hemiptera: Aleyrodidae) on ornamental shipments from Florida.** Luis F. Aristizábal, Pasco B. Avery, Vivek Kumar, Jean H. Caldwell, Cindy L. McKenzie, and Lance S. Osborne. University of Florida, IFAS, Mid-Florida Research and Education Center, 2725 Binion Road, Apopka, FL 32703. [larist@ufl.edu](mailto:larist@ufl.edu)

Several important crops including vegetables, cereals, fruits, and ornamentals are affected by the silverleaf whitefly *Bemisia tabaci* (Hemiptera: Aleyrodidae). In order to prevent the spread of this invasive insect pest on ornamental shipments from Florida’s nurseries to other states, the efficacy of bio-rational insecticides was tested through dip treatments pre-shipping. Clean *Mentha* sp. (Lamiales: Lamiacea) plants were exposed to adults of *B. tabaci* for 6 days. Adults were removed from plants and eggs and immature stages were treated with *Beauveria bassiana* (BotaniGard®), *Isaria fumosorosea* (Preferal®), NaturalOil®, and soap (Publix®). After treatments, plants were placed in commercial carton boxes (64 cm x 37 cm x 42 cm) (capacity for 15 plants per box) then shipped from Apopka to Fort Pierce, FL or placed inside a simulated shipping room held at 20°C ± 2, and 60-80 % RH in total darkness for 24 hours. Assessments were conducted at 3, 7, and 14 days after shipping. A small leaf disk (12 mm-diameter) taken from the mid-part of the leaf, was used for counting whiteflies under the dissecting microscope. Six plants were used per treatment and 4 replications (trials) were conducted. The entomopathogenic fungi and surfactants showed significant differences in reduction of the whitefly population. *B. bassiana* applied alone or in combination with NaturalOil and *I. fumosorosea* applied in combination with NaturalOil caused high mortality of whitefly population (average ranging between 82.5% ± 10, 88.5 ± 5, and 77.6% ± 6), respectively. Our results showed that dip applications with biopesticides as pre-shipping treatments could help mitigate the spread of whitefly on ornamental plants shipped from Florida to others states.

[**69**] **Use of acoustic technology to monitor the time course of *Rhynchophorus ferrugineus* larval mortality in date palms after treatments with *Beauveria bassiana*.** Johari Jalinas, Berenice Güerri Agulló, R. W. Mankin R. López-Follana, L. V. Lopez-Llorca. US Department of Agriculture, Agriculture Research Service, Center for Medical, Agricultural, and Veterinary Entomology, 1700 SW 23rd Dr, Gainesville, FL 32608. [Richard.Mankin@ars.usda.gov](mailto:Richard.Mankin@ars.usda.gov)

Spectral and temporal patterns of insect sound impulses were monitored daily for 23-d periods in 8, 10, or 5 small date palm trees containing larvae dipped in 0 (control), 104 (low), or 108 (high) conidia/ml doses of entomopathogenic fungus, *Beauveria bassiana (Bb 203)*, respectively. Each tree contained two identically treated larvae. Mortality times were estimated by setting thresholds for High and Low insect activity levels, and considering that mortality had occurred if activity levels remained below the Low activity threshold after a particular day since treatment. The trees were dissected and examined for larval condition after the end of the test. Mortality was 12.5%, 15%, and 50% for control, low and high dosage treatments, respectively. Activity levels remained below the Low activity threshold after 6 d in 50% of the high-dose treatments, but varied between Low and High activity in both the control and low-dosage treatments. Dead larvae were found in all of the trees where acoustic analysis had predicted mortality.

[**70**] **Evaluation of a new spraying machine for barrier treatment and penetration of bifenthrin-barrier spray on vegetation against mosquitos.** Rui-De (Rudy) Xue. Anastasia mosquito control district,500 Old Beach Road, St. Augustine, FL 32080 [xueamcd@gmail.com](mailto:xueamcd@gmail.com)

In order to evaluate a novel machine for barrier treatment, the study applied bifenthrin to a vegetated perimeter park-simulated area with known floodwater and woodland breeding populations of mosquitoes. Evaluations included trapping and excised leaf bioassays. Trapping results showed a 79 percent reduction in mosquito populations in the treated area when comparing pretreatment and posttreatment week-four collections. Depending on depth of spray penetration, leaf bioassays revealed an average mortality of 80% at 2.7 meters and 51% at 5.5 meters against laboratory reared *Aedes aegypti* (L.) for four weeks or five post treatment samples. Leaves collected from the treated areas caused high mortality at distances closest to the machine though the depth and coverage of chemical application was effective to five meters. The new ULV spray equipment could be a potential tool for mosquito control.

[**71**] **Managing leafhoppers and aphids in Florida watercress**. Hugh A. Smith and Michelle S. Samuel-Foo. University of Florida/Institute of Food and Agricultural Sciences/Gulf Coast Research and Education Center, 14625 CR 672, Wimauma, FL, 33598. [hughasmith@ufl.edu](mailto:hughasmith@ufl.edu)

Watercress in Florida is affected by a leafhopper-vectored phytoplasma and aphid-vectored viruses. Few insecticides are registered for use on this minor crop in the United States. Working in conjunction with the IR-4 Southern Region Program, the regional entity that facilitates pesticide registrations for specialty crops in the US, trials were carried out on a watercress farm in Indian River County Florida to evaluate the efficacy of six insecticide treatments on the suppression of leafhoppers and aphids. Buprofezin (Courier 40 SC), flupyradifurone (Sivanto 200SL), flonicamid (Beleaf 50 SG), sulfoxaflor (Closer SC), and tolfenpyrad (Torac 1.29 EC) were compared to a grower’s standard (imidacloprid (Advise 2 FL) alternated with spirotetramat (Movento 2SC)) and an untreated control. Of these materials, only the grower’s standard and Closer currently hold watercress registrations. Treatments were applied once a week for three weeks. Each treatment reduced numbers of adult leafhoppers compared to the untreated control. Beleaf, Closer and Torac reduced adult leafhoppers significantly compared to the untreated control within two days of the first application. Closer, Courier, Sivanto and Torac treatments also demonstrated efficacy against leafhopper nymphs. Leafhopper nymph numbers in the Beleaf treatment did not separate statistically from the untreated control on any sample date. Among the insecticide treatments, only Courier and Sivanto did not demonstrate significant efficacy against aphids. These results support an ‘A priority’ pest management need at the 2014 IR-4 Food Use workshop. Projects so identified translate to residue studies as an initial step towards establishing tolerance and achieving an eventual registration.

[**72**] **Fumigation of bed bugs, *Cimex lectularius* L. (Hemiptera: Cimicidae): Effective application rates for sulfuryl fluoride.** Thomas W. Phillips, Michael J. Aikins, Ellen Thoms, Joe DeMark and Changlu Wang. Dow AgroSciences, 7257 NW 4th Blvd, #20, Gainesville, FL 32607. [emthoms@dow.com](mailto:emthoms@dow.com)

Eggs, adults, and nymphs from a pesticide susceptible laboratory population of bed bugs, *Cimex lectularius*, were fumigated for 24 h using Vikane® gas fumigant (99.8% sulfuryl fluoride, SF) in airtight containers at 25oC and 15oC. Bed bugs were placed in separate ventilated glass vials and wrapped in mattress padding prior to fumigation. The gas concentration within each jar was determined using quantitative gas chromatography-mass spectrometry. Dose-response trials using eggs of known age (48-96 h) were conducted at five or six target concentrations measured as concentration x time accumulated dosages (g-h/m3) and one untreated control at each temperature. Each target dose was replicated in four different fumigation containers with at least 32 eggs per replicate. The number of hatched and unhatched eggs post-fumigation, and number of live and dead nymphs that resulted from hatched eggs, were evaluated daily for at least one week after egg hatch. The Lethal Accumulated Dosage (LAD99) for bed bug eggs was 69.1 g-h/m3 at 25oC and 149.3 g-h/m3 at 15oC. Confirmatory trials with dosages of 1.5x the lethal laboratory dosage were then conducted at both 25oC and 15oC with at least 15 adults, 13 late instar nymphs and 79 eggs of known age per replicate to validate a field applied dosage rate. These trials confirmed that at both temperatures, 1.9-fold the drywood termite dosage will control all life stages of bed bugs. This new dosage rate for bed bugs was reviewed and approved by the USEPA for the Vikane label.

[**73**] **Host-specificity tests with the kudzu bug, *Megacopta cribraria* (Hemiptera: Plataspidae) a new invader in southern USA.** Julio Medal, Susan Halbert, Trevor Smith, Bobbie Jo Davies, and Andrew Santa Cruz. **Florida Department of Agriculture, Division of Plant Industry. 1911 SW 34th Street. Gainesville, FL 32608.** [Julio.Medal@freshfromflorida.com](mailto:Julio.Medal@freshfromflorida.com)

The Kudzu Bug, *Megacopta cribraria* (Hemiptera: Plataspidae), was first reported in northeastern Georgia in fall 2009, and since then it has been spreading through Georgia, North Carolina, South Carolina, Alabama, Virginia, Mississippi, Maryland, Delaware, Tennessee, Kentucky, Louisiana and Florida. The kudzu bug was initially found in March 2012 on kudzu plants in north Florida, and it is currently reported in 23 Florida counties. In its native Asia, one of the kudzu bug’s preferred hosts is kudzu, *Pueraria* *montana*. This insect also is an agricultural pest of soybean*, Glycine max* and other legume plants and various fruit trees. Kudzu bug adults were exposed during 4-5 weeks to twelve potted plant species in a greenhouse. Egg masses were deposited and nymphs completed development to adult stage on kudzu, soybean, pigeon pea, *Cajanus cajan*; black-eye pea, *Vigna radiata*; lima bean, *Phaseolus lunatus* and pinto bean, *Phaseolus vulgaris*. However, sweet orange, *Citrus sinensis*; peanut, *Arachis hypogaea*; chickpea, *Cicer arietinum*; lentil, *Lens culinaris*; mungbean,*Vigna radiata* and jicama, *Pachyrhizus erosus* were not utilized as reproductive hosts. Implications and potential damage to Florida commercial sweet orange and legume crops is reviewed.

***We thank our***

***Sustaining and Corporate Members***

**Sustaining Members 2014**

*Bayer CropScience*

John Paige

Mark Sivic

*Dow AgroScience*

Joe Eger

*Nichino America*

Botond Balogh

*Amvac Chemical*

Ned French

*Slug A Bug*

Douglas Vanderpoest

**Corporate Members 2014**

*Dow AgroSciences*

Ellen Thoms

*Syngenta*

Clay Scherer

Eric Rawls

Teresa DuChene

***End of 2014 Florida Entomological Society Meeting / Thanks for your participation!***