ISSCT X Entomology Workshop

Solving Regional Arthropod Management Challenges in a Global World



A Workshop of the International Society of Sugar Cane Technologists hosted by the University of Florida Institute of Food and Agricultural Sciences Everglades Research and Education Center, Belle Glade, Florida, USA

December 2-7, 2018

Embassy Suites PGA Boulevard, Palm Beach Gardens, Florida, USA

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Workshop Program

Sunday 12/2/2018

3:00-5:00 PM Registration

5:30-7:30 PM Embassy Suites PGA Blvd. Evening Reception

Monday 12/3/2018

8:30 AM-12:00 PM Registration, Opening Session, and Keynote Presentation (Moderator: Julien Beuzelin)

8:30-9:00 AM Registration

9:00 AM Opening Statements
Julien Beuzelin
Philippe Rott
François-Régis Goebel

9:30 AM The Florida Sugarcane Industry and the University of Florida
Robert Gilbert, Ronald Rice

10:00 AM Break

10:30 AM The UF/IFAS Everglades REC
Gregg Nuessly

11:00 AM Keynote Presentation - BE1 - Innovation Within the Integrated Management of the African Sugarcane Borer *Eldana saccharina* Walker (Lepidoptera: Pyralidae)
Stuart Rutherford

12:00-2:00 PM Lunch

2:00 PM-5:00 PM Oral Presentations (Moderator: Sopon Uraichuen)

2:00 PM BE2 - Molecular and Morphological Characterization of Sugarcane-Associated Moth Borers for Improved Diagnostic Capability and Incursion Management of Exotic Threats
Kevin Powell

2:30 PM Group Discussion, Presentation on ISSCT XXX Congress

3:00 PM BE3 - Economic Losses in Sugarcane Production Caused by *Diatraea saccharalis* in Tucumán, Argentina
Analia Salvatore

3:30 PM Break

4:00 PM BE4 - Comparative Slaughter Technique in the Rearing of the Sugar Cane Spotted Borer *Chilo sacchariphagus* Bojer (Lepidoptera: Crambidae) in Mauritius
Nirupa Behary Parray

4:30 PM BE5 - Chemical Interaction Between the Sugarcane Stem Borer, *Chilo sacchariphagus*, and the Trap Crop *Erianthus arundinaceus*
Vincent Jacob

5:30-7:30 PM ISSCT X Entomology Workshop Welcome Reception

Tuesday 12/4/2018

8:30 AM-12:00 PM Oral Presentations and Group Discussion (Moderator: François-Régis Goebel)

8:30 AM **BE6 - Potential Insect Pests Switching from Rice Field to Sugarcane Plantations: Will They Become Key Sugarcane Pests?**
Sopon Uraichuen

9:00 AM **BE7 - The Locust *Schitoscerca cancellata* as a Newly Emerging Pest in Ledesma Sugarcane Fields**
Cecilia Easdale

9:30 AM **BE8 - *Fulmekiola serrata* Kobus (1893) (Thripidae: Thripinae), First Record for Argentina in the Sugarcane Crop**
Analia Salvatore

10:00 AM **Break**

10:30 AM **BE9 - Adapting Established IPM Practices to Emerging Pests: A Tale of Two Stem Borers in Louisiana Sugarcane**
Blake Wilson

11:00 AM **BE10 - Report of Mexican Rice Borer Infestation in Plant Cane through Third Stubble Cultivar Trials in the Rio Grande Valley, Texas**
Gregg Nuessly

11:30 AM **Group Discussion**

12:00-2:00 PM **Lunch**

2:00 PM-3:30 PM Oral Presentations (Moderator: Analia Salvatore)

2:00 PM **BE11 - Development of a Habitat Management Strategy Using Push-Pull Against *Eldana saccharina* Walker (Lepidoptera: Pyralidae)**
Desmond Conlong

2:30 PM **BE12 - Assessing the Feasibility of Using Push-Pull Pest Management Strategies in Small-Scale Sugarcane Farming Communities in KZN, South Africa**
Megan Mulcahy

3:00 PM **BE13 - Role of Agricultural Practices in Sugarcane Pest Management and New Research Avenues: How to Improve Connections Between Research and Farmers**
François-Régis Goebel

3:30 PM **Break**

4:00 PM **BE14 - Bridging the Gap Between Research and Extension: Addressing Entomological Challenges in Florida Sugarcane**
Matthew VanWeelden

4:30 PM-4:55 PM Poster Presentations (Moderator: Ronald Cherry)

4:30 PM **BEP1 - The Yellow Sugarcane Aphid, *Sipha flava* (Forbes) (Hemiptera: Aphididae): A New Insect Pest in Mauritius**
Nirupa Behary Parray

4:35 PM **BEP2 - The West Indian Canefly, *Saccharosydne saccharivora* (Hemiptera: Delphacidae): An Emerging Threat to Louisiana Sugarcane?**
Blake Wilson

4:40 PM **BEP3 - Use of Phenotypic Responses to Feeding by the Arthropods *Eoreuma loftini* and *Abacarus sacchari* to Identify Potential Sources of Resistance in Parental Sugarcane Lines**
Gregg Nuessly

4:45 PM **BEP4 - Sugarcane Harvest Management Effects on Arthropod Ground Predators and Plant Injury by Lesser Cornstalk Borer**
Hardev Sandhu

4:50 PM **BEP5 - Weedy Host Plants of the Sugarcane Root Weevil in Florida Sugarcane**
Calvin Odero

5:30-7:30 PM **Embassy Suites PGA Blvd. Evening Reception**

Wednesday 12/5/2018

7:00 AM-5:30 PM Field Tour

7:15 AM **Meet in Embassy Suites PGA Blvd. Lobby for Field Trip**

7:30 AM **Leave Embassy Suites PGA Blvd.**

9:00 AM **US Sugar Corp. Production Operations**
Les Baucum

10:30 AM **Tour of USDA-ARS Canal Point Station**
Duli Zhao, Wayne Davidson

12:30 PM **Lunch with EREC Faculty and Members of Industry**

1:00 PM **Presentation of the UF/IFAS Entomology and Nematology Department**
Blair Siegfried

1:15 PM **Visit of UF/IFAS EREC, Subsidence Post, and Insect Sampling in Sugarcane, Sorghum, and Corn**
Jango Bhadha, Julien Beuzelin

3:00 PM **Tour of Florida Crystals Corp. Packing Plant**
Diego Luzuriaga

5:30 PM **Arrive at Embassy Suites PGA Blvd.**

5:30-7:30 PM **Embassy Suites PGA Blvd. Evening Reception**

Thursday 12/6/2018

8:30 AM-12:00 PM Oral Presentations (Moderator: Stuart Rutherford)

8:30 AM **BE15 - Broadleaf Weeds and Conservation Biological Control of Sugarcane Stem Borers**
Germán Vargas

9:00 AM **BE16 - *Diatraea saccharalis* in Florida: An Insect Pest Under Biological Control**
Erik Roldán

9:30 AM **Group Discussion**

10:00 AM **Break**

10:30 AM **BE17 - Biology and Control of Soil Insect Pests in Florida Sugarcane**
Ronald Cherry

11:00 AM **BE18 - Development of a Virulent Fungal Entomopathogen for White Grubs (Coleoptera: Scarabaeidae): The Case of *Beauveria brongniartii* in South Africa**
Desmond Conlong

11:30 AM **BE19 - Challenges and Research Directions for Soldier Fly (Diptera: Stratiomyidae) Management in Australia**
Karel Lindsay (Presented by Kevin Powell)

12:00-2:00 PM **Lunch**

2:00 PM-5:00 PM **Oral Presentations and Closing Session** (Moderator: Desmond Conlong)

2:00 PM **BE20 - Insects New to Florida: Detection, Monitoring, and Management of Invasive Species Impacting Sugarcane**
Julien Beuzelin

2:30 PM **BE21 - Entomofauna Associated with Sugarcane in Panama**
Randy Atencio (Presented by François-Régis Goebel)

3:00 PM **BE22 - Sugarcane Leafhoppers: Do They Correlate as Insect Vectors of Sugarcane White Leaf Disease?**
Nichanun Kernasa (Presented by Sopon Uraichuen)

3:30 PM **Break**

4:00 PM **Closing Session and Award**
François-Régis Goebel

5:30-6:00 PM **Embassy Suites PGA Blvd. Evening Reception**

6:30 PM **Farewell Dinner: Vic & Angelo's PGA**

Friday 12/7/2018

8:30 AM-12:00 PM **Group Discussion**

12:00-2:00 PM **Lunch On Your Own**

2:00 PM-5:00 PM **On Your Own**

Keynote Presentation - BE 1

Innovation Within the Integrated Management of the African Sugarcane Borer *Eldana saccharina* Walker (Lepidoptera: Pyralidae)

R. S. Rutherford*, D. E. Conlong, S. A. McFarlane, S. J. Snyman

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In South Africa, losses to *Eldana saccharina* are estimated in the region of US$100 million/annum. The South African Sugarcane Research Institute (SASRI) promotes an integrated pest management (IPM) approach including measures that improve soil health and nutrition to minimize plant stress, habitat management ("push-pull"), the deployment of less susceptible cultivars, and the use of insecticides. In addition, the institute seeks management innovations, including host-endophyte-insect interactions, biorational insecticides, the sterile insect technique (SIT), and insect resistant genetically modified (GM) sugarcane. Recently, certain *Fusarium* species have been found to be beneficial to *E. saccharina*. Suspected mechanisms include plant defence suppression, improved larval nutrition and increased resistance to entomopathogens. *Fusarium* is frequently present as a symptomless endophyte. The removal and exclusion of *Fusarium* from seedcane through Hot Water Treatment (HWT) with fungicides, reduces subsequent *E. saccharina* infestation. The discovery of endophytic *Bacillus thuringiensis* (*Bt*) has prompted research into a combined HWT/Fungicide/*Bt* seedcane treatment. Endophytic *Bt* strains are selected for entomopathogenicity, antagonism of *Fusarium,* and ability to occupy the endophytic space. The latter appears to be influenced by sugarcane genotype. Two biorational insecticides have been selected for targeting peaks in moth activity. In addition to their primary modes of action, both are known to sub-lethally suppress insect immune responses to entomopathogens. When these are applied to moths at field relevant rates, fertility of mated females is significantly reduced and a transgenerational effect is observed. When only male moths are sprayed there is a lesser but still significant reduction in fertility. SASRI is exploring a novel version of SIT involving the mass rearing and release of F1 insects, the offspring of irradiated males and unirradiated females. It is envisaged that the F1 male will be of greater 'fitness' than its irradiated male parent, and less fertile. To further ensure F1 sterility, and to disseminate biorational insecticides into the field, moths could be sprayed before release. The production of GM sugarcane producing the *Bt* toxin is also in the pipeline. As part of pre-commercialization research, the use of SIT releases is being explored as a possible replacement for non-GM sugarcane refugia. The power of a multitactic IPM program which includes SIT and GM has been demonstrated in the southwestern USA where the pink bollworm has been eradicated from cotton. A similar multitactic approach could be highly effective for *E. saccharina* population size management, but not eradication, as *E. saccharina* is an indigenous pest.

BE 2

Molecular and Morphological Characterization of Sugarcane-Associated Moth Borers for Improved Diagnostic Capability and Incursion Management of Exotic Threats

Kevin S. Powell[1*], Andrew Mitchell[2], Timothy Lee[2], Stacey Anderson[3], Andrew Ward[4]

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At least 36 moth borer species, from four families, attack sugarcane worldwide. Twenty-two species represent medium to high risk to the Australian sugarcane industry. The geographic range of some species is extensive as is their ability to utilize multiple hosts. However, the current accuracy of species diagnostic methods for the major moth borer groups is questionable. Ecological and molecular diversity within species suggests that species delimitations need refinement, and taxonomic ambiguities should be resolved to ensure accurate identification and improve diagnostic protocols and incursion management approaches. A combined molecular and morphological approach in this study used DNA barcoding, high-throughput sequencing (HTS), and morphological descriptors. We generated 500 new cytochrome c oxidase I (COI) barcode sequences (667 bp) and analyzed them in combination with almost 800 existing public domain sequences. The samples covered several economically important families including Tortricidae, Crambidae, Pyralidae, Erebidae and Noctuidae. The new DNA barcode dataset greatly expanded available sequence data for target moth borer species, clarified the identity of the public domain sequences, highlighted many misidentified sequences, and created a draft reference DNA barcode sequence library for more accurate quarantine identifications. A subset of samples was used for HTS in a genome skimming approach to obtain almost complete mitochondrial genomes and nuclear gene sequences for species delimitation analyses. Morphological examination, especially of genitalia, was used to clarify species identity. However, our dataset has highlighted that significant knowledge gaps still exist regarding (i) diversity of moth borer species attacking sugarcane in countries neighboring Australia, most notably Indonesia and Papua New Guinea, (ii) a lack of reliable molecular and morphological diagnostic methods for all species, and (iii) species distribution maps. Further research will lead to an improved diagnostic capability for identification of major moth borers affecting sugarcane, in the event of future incursions. This improved diagnostic approach will also add value and lead to improvements in post-incursion management plans.

BE 3

Economic Losses in Sugarcane Production Caused by *Diatraea saccharalis* in Tucumán, Argentina

A. R. Salvatore[1*], E. Romero[2,3,4], M. L. del P. Pérez[2,3,4,5], M. G. Isas[6], R. Iovane[3], J. Rojas[3], E. Willink[3]

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Diatraea saccharalis is the most economically important pest of sugarcane in Tucumán Province, Argentina. This study aimed to characterize and quantify sugar losses caused by *D. saccharalis* in commercial sugarcane varieties. From the 2006 to 2009 harvest seasons, trials were conducted in fields of the Fronterita Mill using three commercial varieties: LCP 85-384, TUC 77-42, and RA 87-3. *D. saccharalis* attack effects were evaluated on stored sugarcane and newly harvested sugarcane (without storage). Ten-stalk samples were analyzed to determine infestation levels (I.I.%), namely uninjured sugarcane, and sugarcane with 1-10, 11-20, 21-30, and >40 I.I.%. Samples were weighed and juice was extracted and analyzed. Three replicates were analyzed per variety and infestation level, across three harvest periods (early, mid, late). Sugar losses were significantly greater in TUCCP 77-42 than in LCP 85-384 and RA 87-3. Mean sugar loss observed for each 1 % bored internode in LCP 85-384 for early harvest with and without storage was 0.620 and 0.530 kg/t, respectively. For late harvest, the loss was 1.101 and 0.930 kg/t with and without storage, respectively. As for RA 87-3, sugar loss observed for each 1 % bored internode was 0.610 and 0.500 kg/t for early harvest with and without storage, respectively. For late harvest, the loss was 1.150 and 0.965 kg/t with and without storage, respectively. Finally, for early harvest of TUCCP 77-42, the loss was 0.720 and 0.653 kg/t with and without storage, respectively. For later harvest, the loss was 1.160 and 1.080 kg/t with and without storage, respectively. The same trend was observed in Pol% and stem weight. With these data, it is possible to conclude that losses increase with storage and harvest time.

BE 4

Comparative Slaughter Technique in the Rearing of the Sugar Cane Spotted Borer *Chilo sacchariphagus* Bojer (Lepidoptera: Crambidae) in Mauritius

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In Mauritius, infestations by the sugarcane spotted borer, *Chilo sacchariphagus* (Bojer), can cause severe losses in sugarcane tonnage and quality. Insecticides are not recommended to prevent disruption of well-established biological control agents. The environmentally friendly sterile insect technique (SIT) has been identified to complement existing biological control measures. The present study aims to ensure the production of laboratory reared insects fit under field conditions through adoption of appropriate mating systems and development of species-specific diets using a comparative slaughter technique (a proven animal science formulated food procedure). *C. sacchariphagus* larvae were collected from infested fields in northern and southern Mauritius. Larvae of all sizes were brought to the laboratory and reared to the adult stage. Moth emergence from pupae was 94.1 %. Mating and oviposition techniques with different host plants were investigated and optimized. More than 1,000 eggs were obtained per cage in March 2018. About 1,000 field-collected larvae were freeze-dried, vacuum-sealed and forwarded to Stellenbosch University for comparative slaughter technique analyses. Shoots and leaf pieces of three sugarcane varieties (M 1176/86, M 1400/86, M 2593/92) were also collected, freeze-dried and analyzed. *C. sacchariphagus* dietary needs were determined through proximate and amino acid analyses of both plant samples and larvae. Based on these data, several diets were formulated for testing on *C. sacchariphagus* at MSIRI. The best diet will be further refined to mass rear high quality fully fit and field competitive insects for use in a planned SIT program. Should a SIT program be developed for Mauritius, it could be expanded to Reunion, Madagascar and Mozambique where the insect is causing yield losses in sugarcane. The technique could also be used in South Africa as a biosecurity intervention in case of a *C. sacchariphagus* introduction.

BE 5

Chemical Interaction Between the Sugarcane Stem Borer, *Chilo sacchariphagus*, and the Trap Crop *Erianthus arundinaceus*

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Sugarcane yield losses due to the sugarcane stem borer, *Chilo sacchariphagus*, are reduced when plants of *Erianthus arundinaceus*, a close relative to sugarcane, are dispatched at the border of sugarcane fields. Previous studies showed that *C. sacchariphagus* females lay preferentially their eggs on *E. arundinaceus* and that newly emerged larvae are unable to reach adulthood. *E. arundinaceus* is used currently in Reunion Island as a trap crop in an integrated agricultural system reminiscent of the push-pull system introduced in Kenya to control maize stem borers. We explored the chemical mechanisms underlying this insect-plant interaction. The volatile compounds released by intact plants were collected at dusk and analyzed with a thermodesorber, a gas chromatograph, and a mass spectrometer. This protocol was repeated on seven accessions of *Erianthus* and one sugarcane cultivar susceptible to *C. sacchariphagus*. We identified 80 compounds, 10 that were sugarcane specific and two (noted compounds A and B) that were *Erianthus* specific (ANOVA, $p<0.05$, $n=10$ per accession and species). We then tested the electroantennographic response of *C. sacchariphagus* to compounds A and B and found that both sexes are sensitive to compound A only (response threshold: 10^{-2} dilution, $p<0.01$ sign rank test, $n=10$), but with an olfactory sensitivity smaller than for the sugarcane compound linalool (response threshold: 10^{-3} dilution, $p<0.01$ sign rank test, $n=8$). Finally, we tested the olfactory orientation behavior of gravid *C. sacchariphagus* females in a Y-olfactometer at dusk. These insects spend significantly more time in the branch of the olfactometer with compound A than in the branch with clean air (bootstrap test, $p<0.01$, $n=14$). Our study suggests that compound A might be a key compound in the attraction of *C. sacchariphagus* by *E. arundinaceus*. This mechanism might be targeted to improve the strategies of management of *C. sacchariphagus* in infested areas.

BE 6

Potential Insect Pests Switching from Rice Field to Sugarcane Plantations: Will They Become Key Sugarcane Pests?

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According to Thai government's policy on agricultural land management, areas of rice cultivation switched to sugarcane may result in outbreaks of insect pests of both rice and sugarcane in sugarcane plantations. Therefore, we hypothesize that any pest present and causing damage in both rice and sugarcane fields is likely to be a major pest in sugarcane. Hence it is important to have sufficient information on insect pest management in case of outbreaks in sugarcane plantations. Research consisted of analyzing the risk of sugarcane pest shifting from paddy fields to sugarcane, surveying, collecting and evaluating these insect pests in rice growing area during 2015-16 crop season in Northeastern Thailand. There were at least 25 species of insect pests that might infest both rice and sugarcane being classified into 4 levels: high, medium high, medium, and low. Among lepidopterous and coleopterous insect pests collected from field surveys, four shoot and stem borers (*Sesamia inferens*, *Chilo infuscatellus*, *Scirpophaga excerptalis*, *Chilo sacchariphagus*) and a large black beetle (*Heteronychus lioderes*) were matched with the list of pests also present in rice fields and subjected to change of their status as major pests in sugarcane plantations. This means that there should be a risk of previous insect pest outbreaks after switching from rice to sugarcane fields. It is important to urgently prepare a suitable management program for these future pest outbreaks. In addition, at least five natural enemies were identified at survey sites: an earwig *Euborellia* sp., two larval parasitoids (*Cotesia flavipes*, *Elasmus zehntneri*), and two entomopathogenic fungi (*Beauveria bassiana*, *Metarhizium anisopliae*). Biological control using these promising natural enemies is likely to become the key control method in integrated pest management (IPM) for sustainable sugarcane production.

BE 7

The Locust *Schitoscerca cancellata* as a Newly Emerging Pest in Ledesma Sugarcane Fields

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Locusts are grasshoppers belonging to the Acrididae. These insects are usually solitary, but under certain environmental conditions they become more abundant and change their behavior and habits, becoming gregarious. The South American locust, *Schitoscerca cancellata*, has been considered the most serious agricultural pest during the late 1800s to mid-1900s in Argentina. After six decades of limited activity a sequence of outbreaks of this pest started in 2015.

In October 2017, the first locust swarms were detected in Ledesma sugarcane fields. At the beginning they settled in the hills and around sugarcane fields. At that time, low temperatures (< 20ºC) and rain delayed population movement. An aerial chemical control was applied giving good control. However, more swarms of the locusts continued to appear the following days due to the increasing temperatures and chemical controls showed limitations in term of efficacy. Thereafter, sampling was made where adults lay their eggs. This monitoring permitted us to control nymphs once they emerged since it is the stage of greatest vulnerability.

From this research we drew conclusions for better locust management:

- Chemical control of adults is limited because of their mobility. The most effective interventions are when locusts rest on the trees during the sunset or dawn but it is not always possible in practice.
- The best strategy is to wait until nymphs have emerged from the soil and control them during this stage because they are gregarious and vulnerable to chemical control. This strategy also allows us to reduce the number of treatments
- Monitoring is the main tool to increase effectiveness of the control of this pest

BE 8

Fulmekiola serrata Kobus (1893) (Thripidae: Thripinae), First Record for Argentina in the Sugarcane Crop

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Fulmekiola serrata Kobus (1893) is a species that causes losses between 18.0 and 26.8% (t of cane/ha) and of 16.2 to 24.0% (t of sugar /ha) in South Africa. There are no previous records of this species in association with sugarcane crops in the province of Tucumán, Argentina. For this reason it was proposed to evaluate the presence of *F. serrata* in the sugarcane area of the province. Sugarcane plantations in 15 locations of six province departments within the sugarcane area were monitored in 2011, using SASRI's methodology. Ten spindles were collected per plot, every five rows and 10 m apart. In the laboratory, the spindles were gently unraveled, washed with 70% alcohol, filtered with muslin cloth (1-2 mm), and counted under a microscope. Samples were transferred to Miguel Lillo Foundation for identification, where they were confirmed to be specimens of *F. serrata*. The presence of *F. serrata* was recorded in all monitored localities. The provincial average was 11.05 thrips/spindle, with the highest number being found in the Burruyacu department (26 thrips/spindle) and the lowest in the Monteros department (6.5 thrips/spindle). In the departments of Cruz Alta, Famaillá, La Cocha, and Simoca the number of thrips/spindle reached between 9.8 and 7.5. Thrips injury was observed in older leaves, which showed yellowish necrotic lesions. Leaf curling, which is cited as having the greatest economic impact on the crop, was absent. These results indicate that *F. serrata* is present within the province, therefore additional studies should be conducted to determine the damage this pest causes in sugarcane.

BE 9

Adapting Established IPM Practices to Emerging Pests: A Tale of Two Stem Borers in Louisiana Sugarcane

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The sugarcane borer, *Diatraea saccharalis* (F.) (Lepidoptera: Crambidae), has been the primary economic pest of Louisiana sugarcane for >100 years. Decades of integrated pest management (IPM) research has resulted in an effective management program utilizing resistant sugarcane cultivars, conservation biological control, and judiciously timed chemical controls. This IPM program has resulted in reducing *D. saccharalis* injury to less than 1% bored internodes in most years with an average of only 0.6 insecticide application/acre/year. Recent introduction of another crambid stem borer, *Eoreuma loftini* (Dyar), threatens to destabilize the sugarcane industry. Research findings indicate biological and ecological differences between the two species will require current IPM strategies be adapted to manage the stem borer complex. Predation by red imported fire ants, *Solenopsis invicta* Buren, a key source of mortality of *D. saccharalis*, is not as effective in reducing *E. loftini* injury. Reduced exposure of *E. loftini* larvae relative to *D. saccharalis* may also require revised chemical control practices. Additionally, dissimilarity in larval feeding behavior requires more labor intensive pest scouting. Evaluations of cultivar resistance to the two species indicate substantial differences in host preferences exist. These differences are further complicated by the occurrence of mixed infestations within the same field. Relative proportions of each species in a given field will likely be influenced by weather conditions and plant physiology. Conditions promoting vigorous cane growth in the spring are conducive to increased *D. saccharalis* infestations while *E. loftini* infestations are exacerbated in drought-stressed sugarcane. As *E. loftini* continues its eastward expansion in Louisiana, IPM practitioners are learning to adapt control tactics proven effective for *D. saccharalis*. Re-evaluation of widely practiced IPM strategies is needed to prevent widespread economic impacts.

BE 10

Report of Mexican Rice Borer Infestation in Plant Cane through Third Stubble Cultivar Trials in the Rio Grande Valley, Texas

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Sugarcane stalks were harvested in late October 2017 for full dissection to determine Mexican rice borer (*Eoreuma loftini*, MRB) infestation from plant cane through third stubble plantings located throughout the Rio Farms Cooperative holdings in the Lower Rio Grande Valley of Texas (LRGV). Work was completed with the cooperation of Rio Farms, USDA-ARS Sugarcane Research Laboratory at Houma, LA, and University of Florida Everglades Research and Education Center current and retired employees. Significant variation was observed among plantings and among cultivars in percentage bored internodes. Results indicate the possibility for significant damage to the crop in the LRGV by the MRB. Mean percentage bored internodes reached their greatest level (42%) in the plant cane evaluation. Only three of the over 4,000 stalks examined were found with damage by the sugarcane borer (*Diatraea saccharalis*). Based on the current value of sugarcane and the greater yields being enjoyed by the LRGV growers due to their cooperative selection program with the USDA at Houma, LA and Canal Point, FL, as well as the Florida Sugarcane League and University of Florida, it is recommended that growers of this region conduct trials of treated and untreated fields of the same sugarcane cultivar at no fewer than four sites throughout the LRGV to evaluate the economic benefits of using effective insecticides for managing MRB.

BE 11

Development of a Habitat Management Strategy Using Push-Pull Against *Eldana saccharina* Walker (Lepidoptera: Pyralidae)

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The success of the push-pull strategy at managing *Chilo partellus* Swinhoe (Lepidoptera: Crambidae) in maize fields in Kenya in the early 1990s started research in South Africa to examine the use of this strategy to manage *Eldana saccharina* (Lepidoptera: Pyralidae) in South African sugarcane. The first research in 1994 identified suitable "pull" plants (i.e., those plants preferred by *E. saccharina* as oviposition sites over sugarcane) and the use of *Melinis minutiflora* (used as a "push" plant in the Kenyan situation against *C. partellus*). The major indigenous host plants of *E. saccharina* (i.e., *Cyperus dives* and *C. papyrus*) proved suitable pull plants, as did older aged Bt maize. In addition to attracting oviposition, these indigenous host plants had a guild of parasitoids attacking *E. saccharina*, and the Bt toxin gene engineered into the maize killed any young larvae boring into it. *Melinis minutiflora* repelled *E. saccharina* moths from sugarcane. Based on these findings, pilot 100 m by 100 m plots of sugarcane planted with push and pull plants were compared to similar plots without any associated plants in the irrigated north of Kwazulu-Natal. Initial results showed a 50% reduction in *E. saccharina* populations and damage in the push-pull plots compared to the control plots. More rigorous trials in the North Coast and Midlands North sugarcane growing areas, and in the North and South Coast areas conclusively showed stalk borer reductions in treated vs. untreated plots. In 2014 this research project was moved as an intervention to be rolled out as an extension initiative. However, this has not been as successful as hoped. This paper will discuss the above successes, and the farmers and extension staff perceived constraints which could have contributed to this lack of acceptance by growers.

BE 12

Assessing the Feasibility of Using Push-Pull Pest Management Strategies in Small-Scale Sugarcane Farming Communities in KZN, South Africa

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Eldana saccharina Walker (Lepidoptera: Pyralidae) is a major pest of sugarcane in South Africa, particularly in the coastal sugarcane growing regions of KwaZulu-Natal. Conventional methods of pest control have failed to provide adequate solutions to the problem, leading to the development of an integrated pest management (IPM) program. Push-pull technology (PPT) forms an integral part of this IPM approach. PPT is a form of habitat management that seeks to manipulate pest populations using components of the agroecosystem. Despite success in other growing regions, the uptake of PPT by coastal farmers has been poor, particularly among small-scale sugarcane growers (SSGs). There are many complex reasons for low levels of IPM adoption among small-scale farmers in sub-Saharan Africa. However, traditional top-down extension approaches used in agricultural development programmes are a key factor in the lack of adoption of IPM technologies. Participatory research allows growers to better communicate their wants and needs to extension officers and researchers. Therefore, it can be used as a tool to facilitate IPM implementation. The aim of this study was to explore the feasibility of implementing PPT in coastal SSG communities using participatory research. The objectives were to assess the role that sugarcane plays in SSGs livelihoods and to determine sugarcane production constraints. Perceptions and knowledge of pests and pest management were also assessed. This was done to determine whether PPT was a useful tool for pest management in this area, and whether it could be tailored to suite SSGs pest management strategies.

BE 13

Role of Agricultural Practices in Sugarcane Pest Management and New Research Avenues: How to Improve Connections Between Research and Farmers

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Agricultural practices in sugarcane husbandry have a considerable impact on pest infestations and the presence of natural enemies. There is a real need to better understand this impact and develop new approaches with industry stakeholders, particularly farmers, to help implement agroecological crop protection tactics. The preservation of the arthropod fauna by using different companion plants in and around sugarcane fields, which are often viewed as a monocrop, has become a priority. In addition, agricultural practices typically implemented to improve sugarcane yields (soil fertilization, irrigation, burning, pesticides, etc.) need to be revised or adapted with the help of producers and millers to decrease pest pressure and increase functional biodiversity. New research avenues to improve pest management include a multidisciplinary and multiscale approach such as the inclusion of the landscape scale. Trainings and farmer field schools with different stakeholder groups can be a way to better connect sugarcane producers and crop protection specialists.

BE 14

Bridging the Gap Between Research and Extension: Addressing Entomological Challenges in Florida Sugarcane

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The passing of the Morrill Act in 1862 established the Land-Grant University System in the United States, providing thousands of Americans with access to higher education. Subsequent provisions including the Hatch Act of 1887 and Smith-Lever Act of 1914 further enhanced land-grant universities by developing a system for conducting agricultural research in addition to a means of disseminating this knowledge to stakeholders throughout the country. As a United States land-grant institution, the University of Florida's mission encompasses the principles of teaching, research, and extension to enhance the lives of its citizens using scientifically-driven, unbiased recommendations for solving everyday problems.

The Everglades Agricultural Area in south Florida contains approximately 95% of the 400,000 acres of sugarcane grown in the state. Florida's proximity to coastal ports makes the region susceptible to invasive arthropod pests. These invasive pests, in addition to numerous native pests present in the region, provide persistent challenges in coordinating research and extension programs for addressing growers' needs. Research and extension collaborations have been crucial in developing recommended management strategies for three arthropod pests, including the lesser cornstalk borer, *Elasmopalpus lignosellus* (Lepidoptera: Pyralidae), sugarcane rust mite, *Abacarus sacchari* Channabasavanna (Trombidiformes: Eriophyidae), and rice stink bug complex, *Oebalus* spp. (Hemiptera: Pentatomidae). Research methodology and extension programmatic efforts will be summarized for each arthropod pest, in addition to the impacts of these collaborations on the local industry level.

BE 15

Broadleaf Weeds and Conservation Biological Control of Sugarcane Stem Borers

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Diatraea spp. are the most economically important pests in sugarcane in Colombia and management involves the release of egg and larval parasitoids. In addition, there are high levels of larval parasitism by *Genea jaynesi*, a wild tachinid which efforts to mass rear have been futile. The behavior of *G. jaynesi* was observed under manipulation of wild broadleaf flowering weeds that grow on field edges to determine the possibility of conservation biological control. In some fields, conservation of these flowering plants was allowed while in others conventional weed management was implemented with herbicides. Observations of the sugarcane stem borers and their larval parasitoids were made at two (time at which weed control was implemented) and at four months of crop age. Conservation of broadleaf flowering plants was associated with higher abundance of *G. jaynesi* adults and increased parasitism. The advantage of maintaining plant shelters as source of food for natural enemies is discussed as an additional pest management alternative for sugarcane stem borers.

BE 16

Diatraea saccharalis in Florida: An Insect Pest Under Biological Control

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The sugarcane borer, *Diatraea saccharalis* (F.), has not been the target of sugarcane insect pest management programs in Florida for more than a decade because of successful biological control efforts between the mid-1990s and early 2000s. A study was conducted to determine the status of *D. saccharalis* and its natural enemies under current production practices. Thirty-two commercial sugarcane fields were selected in the main sugarcane production area in Florida. These fields, which were composed of shallow organic, deep organic, and mineral soils, were sampled during the 2017 and 2018 growing seasons to determine *D. saccharalis* injury and population levels, as well as parasitism rates by *Cotesia flavipes* (Cameron). In addition, because ants are also considered major *D. saccharalis* biological control agents, ant foraging activity was determined in each field using plastic tubes baited with hot dog sausage. In 2017, *D. saccharalis* injury was observed in 22% of the fields at the end of the growing season. However, out of the 1,600 stalks sampled, only 0.7% of stalks sustained bored internodes and only one live *D. saccharalis* larva was observed. One *C. flavipes* cocoon mass was also observed. The red imported fire ant, *Solenopsis invicta* Buren, which is an effective predator of *D. saccharalis*, was the most abundant ant during the growing season and across the three soil types, representing 48 to 87% of the collected ants. Differences in *S. invicta* abundance among the three soil types were not detected. Other ants collected in the study included: *Pheidole moerens* Wheeler, *Pheidole dentata* Mayr, *Nylanderia bourbonica* (Forel), *Tetramorium bicarinatum* (Nylander), *Dorymyrmex bureni* (Trager), and *Tapinoma melanocephalum* (F.). These results suggest that *D. saccharalis* infestations were extremely low during the 2017 sugarcane growing season and that *C. flavipes* and *S. invicta* continue to provide valuable biological control.

BE 17

Biology and Control of Soil Insect Pests in Florida Sugarcane

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Several insects are important soil pests of Florida sugarcane. The only curculionid species is the sugarcane root weevil, *Diaprepes abbreviatus.* In 2010, infestations of the weevil were observed causing damage to Florida sugarcane for the first time. Although several species of Elateridae are found in Florida sugarcane, the corn wireworm, *Melanotus communis*, is clearly the dominant species being 88% of all wireworms found in most recent surveys. White grubs (Scarabaeidae) in six genera have been reported associated with Florida sugarcane and three species have been reported as pests in Florida sugarcane. They are *Cyclocephala parallela*, *Phyllophaga latifrons*, and *Tomarus subtropicus*. *Tomarus subtopicus* was considered the most important grub pest. However, populations of this grub have declined drastically in Florida sugarcane for reasons not fully understood. Soil insect pests in Florida sugarcane have been sampled with light traps, pitfall traps, Japanese beetle traps, and soil samples. Soil insecticides, controlled field flooding, and discing and replanting are used to control the soil insect pests in Florida sugarcane.

BE 18

Development of a Virulent Fungal Entomopathogen for White Grubs (Coleoptera: Scarabaeidae): The Case of *Beauveria brongniartii* in South Africa

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White grubs are sporadic recurring pests in southern African sugarcane. Typical of many soil insect pests, they are difficult to control with insecticides because of their long life cycle and cryptic larval nature. In the early 2000s, SASRI partook in a project collecting entomopathogens of agricultural crop pests. During field surveys, many mycosed white grub larvae were found and the causal agent identified as the fungus *Beauveria bassiana*. To further develop its potential as a biocontrol agent, its more widespread occurrence was investigated. Two more epizootics were discovered in the area. This time, *Beauveria brongniartii* was the causal agent. Laboratory investigations revealed a number of strains of *B. brongniartii* occurring, with many of them more virulent than the original *B. bassiana*. A strain (C17) isolated from adult cadavers was very virulent to adult white grubs, and another (HHWG1) isolated from larvae was very virulent to larvae in laboratory bioassays (95% mortality recorded with both). The most common white grubs, and most infected by these entomopathogens were *Schizonycha affinis* and *Pegylis sommeri*, also pests of *Acacia mearnsii* inter-planted with sugarcane in the area. A further study in large scale pot trials determined that HHWG1 was as effective as an insecticide in killing *S. affinis* larvae in the soil and protecting sugarcane roots. In addition, the host range of HHWG1 was increased in laboratory bioassays to include larvae of *Schizonycha neglecta, Heteronychus tristis* and *Temnorhynchus clypeatus* (80-90% mortality); and C17 to include adults of *Heteronychus licas, Asthenopholis minor* and *H. tristis* (60-80% mortality). C17 further showed its efficacy as a biocide by causing mean mortality of 77% on adult *Cacosceles newmannii*, a recent cerambycid sugarcane pest.
The efficacy of HHWC1 and C17 strains of *B. brongniartii* on seven white grub pests and one cerambycid, in two crops, point to their potential to be developed as commercial entomopathogenic fungal biocides.

BE 19

Challenges and Research Directions for Soldier Fly (Diptera: Stratiomyidae) Management in Australia

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The sugarcane soldier fly, *Inopus rubriceps* (Macquart) and yellow soldier fly, *I. flavus* (James) are economically important insect pests of sugarcane in some regions of Australia. The larvae feed on sugarcane roots which results in poor yields and reduced ratooning. Currently there are no management strategies to control the pests. Recent research activities have focused on field trials screening insecticides (applied at high rates) for reducing populations in a plant crop and identification of soldier fly tolerant sugarcane varieties. Three insecticide efficacy trials were conducted using a range of insecticides registered for use against other insect pests. Four variety tolerance trials were conducted using clones recently released to the industry. Trials were established in a randomized complete block design with four replications per treatment. The plots in insecticide efficacy trials were 15 m by four rows and were 10 m by three rows in variety tolerance trials. In each trial, soldier fly larvae were sampled approximately four weeks after the sugarcane was harvested by taking four soil core samples (65 mm diameter by 200 mm depth) per plot next to four sugarcane stools approximately 5 m from the plot boundary. Insecticide efficacy trials were sampled after the first harvest while variety tolerance trials have been sampled for three consecutive years. Sugarcane shoots and gaps between sugarcane stools more than 60 cm were counted in the ratooning crops. Insecticides including clothianidin (1,000 g a.i/ha and 2,000 g a.i/ha) and imidacloprid (2,000 g a.i/ha) significantly decreased soldier fly populations. However, the high application rates of these insecticides may create difficulty in altering the label application for these products. Future trials need to examine the efficacy of these treatments at lower rates. A tolerant variety has not yet been identified due to insufficient soldier pest populations in field trials.

BE 20

Insects New to Florida: Detection, Monitoring, and Management of Invasive Species Impacting Sugarcane

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The Mexican rice borer, *Eoreuma loftini* (Dyar), is an invasive species native to Mexico that infests sugarcane in Texas and Louisiana. *E. loftini* also occurs in Florida where it was first detected in 2012. Population monitoring efforts using pheromone traps suggest that *E. loftini* has not become established in the main sugarcane production area in southern Florida; however, trapping efforts confirmed that the invasive species has become established in a region 300 km further north.

The flat grass scale, *Aclerda takahashii* Kuwana, and the sugarcane thrips, *Fulmekiola serrata* Kobus, are two other invasive species that were first observed feeding on sugarcane in Florida in 2016 and 2017, respectively. These observations were new continental records for these two species in North America. *A. takahashii*, while widespread in Florida, seems to only feed on sugarcane clones with relatively thin stalks and non-self-stripping leaf sheaths while commercial sugarcane varieties are not infested. Thus, the insect is not considered a threat to the Florida sugarcane industry. *F. serrata* is also widespread in Florida; however, this insect is considered a threat because infestations can cause unacceptable stress to young sugarcane. Thus, studies were conducted in 2017 and 2018 to determine the efficacy of insecticide treatments of interest and *F. serrata* infestation levels on common sugarcane varieties. Three field evaluations showed that lambda-cyhalothrin, which is registered for use on sugarcane, provides acceptable levels of suppression of pest populations. Flupyradifurone, imidacloprid, and thiamethoxam also provided thrips suppression but to a lesser extent than lambda-cyhalothrin. *F. serrata* infestation levels on eight and five commercial in 2017 and 2018, respectively, did not exhibit major differences.

BE 21

Entomofauna Associated with Sugarcane in Panama

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The diversity of entomofauna associated with sugarcane in Panama was investigated. Arthropods were collected using plastic bottle traps, pitfall traps, and direct captures in field sites located in three sugarcane zones (agriculture, proximity to a stream, proximity to mangrove swamp) during twenty-six months, from January 2015 to February 2017. In total, 4,735 individuals were collected representing two classes, 14 orders, 48 families, and 81 species that included phytophagous arthropods, predators, parasitoids, coprophagous insects, florivores, and omnivores. The five most abundant families by numbers of individuals were Formicidae (39.41%), Termitidae (12.25%), Pyralidae (10.22%), Drosophilidae (7.18%), and Araneidae (5.72%). The five most diverse families by species were Formicidae (11), Araneidae (5), Pompilidae (4), Curculionidae (3), and Chrysomelidae (3). The most abundant ants were *Ectatomma* sp. (18.98%) and *Camponotus* spp. (15.37%) and the most abundant spiders were *Alpaida veniliae* (Keyserling) (3.36%), *Eriophora ravilla* (C.L. Koch) (1.35%), and *Leptofreya bifurcata* (F.O. Pickard-Cambridge) (1.10%). Fifteen sugarcane pest species were found in sugarcane. The diversity of arthropod species found in Panama sugarcane fields shows the need for integrated pest management program in the context of the local agro-ecosystem interactions and farming practices. This integrated pest management program will ultimately support conservation of existing biodiversity.

BE 22

Sugarcane Leafhoppers: Do They Correlate as Insect Vectors of Sugarcane White Leaf Disease?

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Sugarcane white leaf disease (SWLD) caused by sugarcane white leaf phytoplasma (SWLP) is a major disease of sugarcane production in Thailand. During the 2011-2012 cropping season, it was reported that more than 32,000 hectares had been infected with SWLD. The SWLP is transmitted and spread by insects, mainly leafhoppers and psyllids. Two sugarcane leafhoppers, *Matsumuratettix hiroglyphicus* Matsumura and *Yamatotettix flavovittatus* Matsumura (Hemiptera: Cicadellidae), are the primary insect vectors of SWLD which spread SWLD throughout sugarcane plantations in Thailand. Infected sugarcane exhibit leaf chlorosis and tiller proliferation. Until now, there have been no reports of any sugarcane-resistant varieties or effective control methods to manage SWLD, except for the elimination of infected plants to decrease the amount of the phytoplasma inoculum. Measures to limit the spread of the disease have been focused on control of the insect vectors; however, there is no data from field studies to confirm the role of these vectors in the expansion of SWLD in Thailand. A field trial was conducted to reveal the exact role of *M. hiroglyphicus* in correlation with SWLD spread in sugarcane. A complete randomized block design was used with four treatments which included releasing adults of *M. hiroglyphicus* with and without phytoplasma to disease-free sugarcane, and without phytoplasma to infected sugarcane, along with a control. Presence of SWLP from collected samples was detected by a nested PCR. The outcome of this study demonstrated the lack of a relationship between *M. hiroglyphicus* and SWLD in Thailand.

BEP 1

The Yellow Sugarcane Aphid, *Sipha flava* (Forbes) (Hemiptera: Aphididae): A New Insect Pest in Mauritius

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The yellow sugarcane aphid, *Sipha flava* (Forbes), was observed on sugarcane seedlings in Mauritius in January 2017. This observation follows reports of the pest on sugarcane in Africa, specifically in Morocco and South Africa in 2006 and 2013, respectively. Island-wide surveys from January to May 2017 indicated the presence of the pest in very low numbers on sugarcane. However, high populations were recorded during the same period on several graminaceous weed species in the genera *Panicum*, *Digitaria*, *Setaria*, and *Paspalum*. Important infestations on young plant cane were reported in a nursery in northern Mauritius in August-September. Prominent leaf yellowing and reddening symptoms on variety M 1392/00 coupled with a high aphid population (28 aphids/leaf on average) were recorded. The presence of the pest in high numbers on four other varieties (M 2256/88, M 1698/02, M 683/99, M 1002/02) was also observed; however, variety M 915/05 was not infested. In another field in the same region, leaves exhibiting symptoms or leaves infested with aphids (29 aphids/leaf on average) were found in nearly all the rows of variety M 1392/00 whereas no reddening symptoms were observed on variety M 2593/92 despite 16 aphids/leaf on average. The situation was monitored closely and no increase in infestation was recorded in October-November 2017. Elimination of infested weeds and biological control by predators including lacewings, syrphids, earwigs, and coccinellids coupled with heavy rains resulted in a drastic decline in aphid populations across the various localities in December. Surveys are on-going to determine the pest's distribution and economic importance across the island. In the laboratory, preliminary choice tests showed that R 570 was the most preferred sugarcane variety for the aphid. Our existing long-term biological control approach involving a large array of established predatory species in sugarcane is expected to contribute to the integrated management of the yellow sugarcane aphid.

BEP 2

The West Indian Canefly, *Saccharosydne saccharivora* (Hemiptera: Delphacidae): An Emerging Threat to Louisiana Sugarcane?

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The West Indian canefly, *Saccharosydne saccharivora* (Westwood), has been reported as a significant pest of sugarcane in the Antilles. In Louisiana, this insect has historically been observed feeding on sugarcane but at population levels not thought to cause economic losses. However, high *S. saccharivora* infestations were observed during the 2012 and 2016 growing seasons following mild winters, and to a lesser extent in 2017. In response to these outbreaks, the USDA-ARS and LSU AgCenter conducted insecticide efficacy evaluations. Data from these evaluations indicate that the neonicotinoids, imidacloprid and acetamiprid, along with lambda-cyhalothrin and flupyradifurone, provided effective control. This research helped lead to crisis exemption labels for the use of imidacloprid (2012) and acetamiprid (2016) for *S. saccharivora* management. Yield losses caused by *S. saccharivora* infestations were determined for the first time under current Louisiana commercial production practices. The degree of yield loss was dependent on pest population density and duration of infestation. Observations during outbreaks suggest infestations occur in immature sugarcane during the spring and persist into mid-summer. In 2017, infestations immigrated from maturing fields to young stubble which was cut early for seed during the late summer. Cultivar is thought to influence infestations although susceptibility of commercially grown cultivars in Louisiana has not been studied. While currently still considered a sporadic pest, *S. saccharivora* may be emerging as a new consistent threat to sugarcane production in Louisiana.

BEP 3

Use of Phenotypic Responses to Feeding by the Arthropods *Eoreuma loftini* and *Abacarus sacchari* to Identify Potential Sources of Resistance in Parental Sugarcane Lines

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Both the Mexican rice borer (*Eoreuma loftini*) and sugarcane rust mite (*Abacarus sacchari*) can be significant economic pests of commercial sugarcane. Observations paired with a sugarcane lineage database suggest that enough data is now available to identify parental lines for use in expanding pest management strategies to include the development of resistant cultivars. Recorded observations by cultivar of leaf symptoms caused by sugarcane rust mite feeding and of percentage bored internodes caused by Mexican rice borer larvae for >10 years in Florida and 4 years in Texas, respectively, were compared with cultivar lineage records to identify potential resistant parents.

BEP 4

Sugarcane Harvest Management Effects on Arthropod Ground Predators and Plant Injury by Lesser Cornstalk Borer

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Sugarcane (*Saccharum* spp. hybrid) is normally harvested either green or burnt. Green cane harvest leaves a thick harvest residue layer (trash blanket) on the soil surface that can be managed through partial or complete removal from the field. A field study was conducted to estimate arthropod ground predator populations and lesser cornstalk borer, *Elasmopalpus lignosellus* (Zeller), injury in different harvest management treatments in Histosols. The harvest management treatments were pre-harvest burning (burn) and green cane harvest with no trash removal (0% trash removal), partial trash removal (33% and 66% trash removal) and complete trash removal (100% trash removal). Populations of ground dwelling arthropods were measured with pitfall traps in first ratoon. One trap was located in a sugarcane row in the middle of each plot. Tests were conducted for 4 months during May through August 2016. Lesser cornstalk borer injury was measured by counting the number of dead hearts in each plot and then percent dead hearts were calculated based on total plant population in each plot. Out of 7 taxonomic groups caught in pitfall traps, 48% were ants (Hymenoptera) followed by 16% spiders (Araneae). Harvest management had significant effect only on centipedes (Chilopoda). Centipedes had higher population in burnt cane harvest than green cane harvest. Trash removal treatments did not affect ground dwelling arthropod populations. Trash removal increased lesser cornstalk borer injury to young sugarcane plants. The percent dead hearts were 8.9, 3.8, 1.7 and 1.4% in 100, 66, 33 and 0% trash removal treatments, respectively, with significant differences among all but 33 and 0% treatments. Overall, our results show that harvest management may not have a short term effect on the majority of arthropod ground predators. Pre-harvest burning in sugarcane may not potentially eliminate or significantly reduce arthropod ground predator populations. Higher trash removal ($\geq$66%) can increase lesser cornstalk borer injury to young sugarcane plants. Further research is required to determine long-term effects of harvest management on arthropod ground predators and lesser cornstalk borer populations.

BEP 5

Weedy Host Plants of *Diaprepes abbreviatus* in Florida Sugarcane

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Free-choice studies were conducted in the greenhouse to evaluate adult *Diaprepes abbreviatus* (sugarcane root weevil) residence, feeding damage, and oviposition on sugarcane and broadleaf weed species associated with Florida sugarcane. Sugarcane varieties included CP 89-2143, CP 88-1762, CP 80-1743, and CP 78-1628. Broadleaf weed species included common lambsquarters (*Chenopodium album*), spiny amaranth (*Amaranthus spinosus*), common purslane (*Portulaca oleracea*), sicklepod (*Senna obtusifolia*), and coffee senna (*Senna occidentalis*). Coffee senna had the highest adult residence followed by spiny amaranth, sicklepod, and common purslane. Few adults were found in association with sugarcane and common lambsquarters. There was significant adult feeding damage on all weed species with the exception of common lambsquarters. Coffee senna, spiny amaranth, and sicklepod had the highest feeding damage. There was limited feeding damage observed on common lambsquarters and sugarcane. Oviposition by adults was observed on sugarcane and weed species with exception of common lambsquarters and sicklepod. Significantly, more egg masses were found on sugarcane compared to the weed species. Our results show that several broadleaf weed species commonly found in sugarcane in Florida are suitable as food sources and oviposition sites for *D. abbreviatus* while sugarcane is generally more preferred for oviposition. Based on these results, a front-line defense against *D. abbreviatus* in Florida sugarcane is efficacious control of broadleaf weed species used by adults as host plants.