



Professor Selected as 2009 Fulbright Scholar



Ralph Wills Flowers, Ph.D.

Ralph Wills Flowers, Ph.D., professor and entomologist in the Center for Biological Control, was selected as a Fulbright scholar grantee to Ecuador by the J. William Fulbright Foreign Scholarship Board (FSB). Since 1999, Flowers has worked in western Ecuador through a partnership between FAMU and Virginia Tech in the IPM-CRSP and SANREM-CRSP programs. As a Fulbright scholar, Flowers will be working in western Ecuador on the faculty at the Universidad Técnica Estatal de Quevedo, a small agricultural university. He will teach two classes at the advanced undergraduate level on: Water Quality Bio-monitoring and Insect Biosystematics.

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Technology and Agriculture*

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New Approaches for Managing Tomato Spotted Wilt

It only takes a few minutes of feeding for thrips to transmit the virus that causes tomato spotted wilt disease (TSW), despite growers' attempts to prevent such assaults with insecticide spraying. But thrips are highly visual insects, and Stuart Reitz (CBC-ARS) has teamed up with Timur Momol and Steve Olson from the University of Florida to exploit that dependency to, in effect, camouflage the tomato plants by spraying plants with kaolin, a type of powdered clay. In addition, they have combined kaolin with three different plant essential oils, geraniol, lemongrass oil and tea tree oil, which act as repellents to thrips. In field trials, combined treatments of kaolin and one of three plant essential oils have reduced the incidence of TSW by 50 percent.



Tomatoes treated with kaolin

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Kaolin treated tomato plants and a close-up of a Western Flower Thrip with kaolin particles on the body

Editorial: View from the Director's Office



Dr. Moses T.K. Kairo,
Center Director

The center is now midway through implementation of its 2006-2010 strategic plan. With this in mind, one of the agenda items during the February 25, 2009 Advisory Committee Meeting was to review progress over the three year period January 2006 to December 2008. Several metrics identified in the strategic plan were used to assess the Center's outputs and impacts. This included number of:

publications, other research outputs and extension activities, etc. (Figs 1 & 2 and also see page 10). Almost all key indicators showed a steady positive growth.

While the Center has been making good progress as acknowledged by the Advisory Committee, it is now time to begin planning for the next five year period. We plan to hold

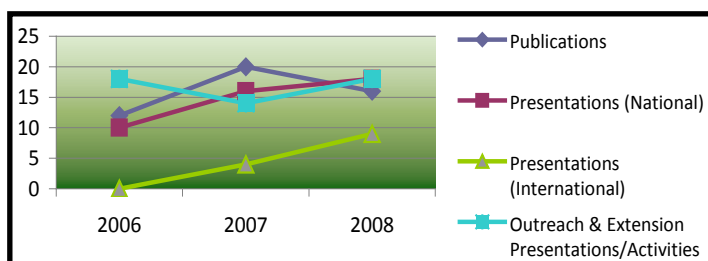


Figure 1. Publications and other scholarly activities by Center faculty and students during 2006-2008.



Dr. Stuart R. Reitz, Co-director

several meetings in the course of the coming year to discuss the future direction and needs of the Center. Clearly some key items include development of a joint facility to house the entire Center's faculty, staff and students. Recruitment of additional students and staff remains a priority. The Center gratefully acknowledges the tremendous support from various partners including NIFA (CSREES), APHIS and ARS, and the Florida Department of Agriculture and Consumer Services. However, we realize that sustained funding from these sources cannot be guaranteed in these difficult economic times, and that the Center must aggressively seek extramural funding to support our activities. Key to all of these goals will be heightening awareness of the center, and we will endeavor to raise our public profile. We appreciate your continuing support of the Center as we move into the future.

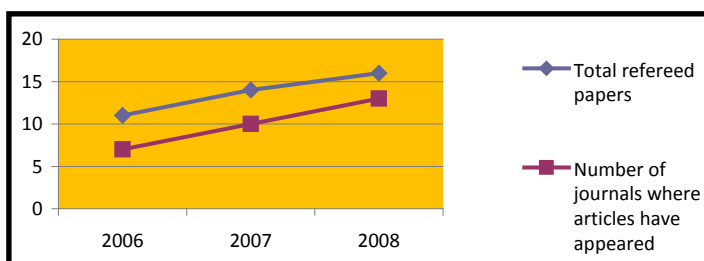


Figure 2. Refereed publications and number of journal outlets.

Tomato Spotted Wilt continued from page 1

Kaolin forms a white coat that may interfere with thrips' ability to zero in on color cues during flight. The essential oils are highly volatile and further deter thrips from landing. Thrips that do still land on treated plants may find the kaolin coat difficult to penetrate with their mouthparts. This, in turn, may diminish their transmission of the TSW. Recent lab experiments

have demonstrated that the combination of kaolin and plant essential oils significantly reduce thrips feeding. They are currently investigating the degree to which virus transmission is reduced by these anti-feeding effects. This research is supported by a grant from USDA-SARE.

[Contact: Stuart Reitz]

Center Advisory Council Meeting (February 25, 2009)

Dr. Norm Leppla chaired the meeting of the Advisory Council held on February 25, 2009. The council was pleased to welcome several new members including Dr. Catherine Preston, USDA, APHIS, PPQ, Gainesville; Dr. Don Schmitz, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL, and Dr. Charles Mellinger, Glades Crop Care, Jupiter, FL. Others in attendance were: Dr. Jason Byrd, FDACS, Division of Plant Industry (DPI), Gainesville, FL; Mr. Joshua Craft, Agricultural Policy Division, Florida Farm Bureau Federation, Gainesville, FL; Mr. Dan Fieselmann, USDA, APHIS, PPQ, CPHST, Raleigh, NC; Ms. Abbie Fox, DPI, Gainesville, FL, and Dr. John Sivinski, USDA, ARS, CMAVE, Gainesville, FL. University representatives included Dr. Makola Abdullah, Dean and Director Land Grant Programs CESTA. All Center students, staff and faculty participated in the meeting.

Staff News

Retirement of Mr. George Benn Marshall Biological Scientist at FAMU

After serving 36 years (1973-2009), **Mr. George Benn Marshall**, Biological Scientist, Center for Biological Control retired on 30 June 2009. He has left a strong legacy and too many friends & colleagues behind his work place. His



excellent service to the Center for Biological Control, CESTA, FAMU was recognized by faculty, staff, school administrators and family members on 26 June 2009.

Dr. Makola Abdullah in his remarks praised Mr. Marshall long term loyalty to FAMU and awarded him a college plaque for his long term service, excellent standards and successful service.

Dr. Moses Kairo, in his remarks showed a great appreciation for Mr. Marshall's long term affiliation and service to the Center.

Mr. Marshall worked with Dr. Charles O'Brien (Retired) for 32 years. The following paragraph's comments were forwarded to us by Dr. O'Brien for Mr. Marshall Retirement reception.

"Benn was a student of mine at Texas Tech University in Lubbock in 1970 and we began to collect together. Based on the friendship that developed between us and the excellent work that Benn was capable of, when the opportunity came to hire a technician and assistant at FAMU in 1973, my first

choice was Benn. He agreed to come to Florida and after a trial period in the summer, I was able to hire him full time and we worked together for the next 32 years. As anyone who is acquainted with him knows, Benn is a quiet soft-spoken true gentleman. He is patient and very hardworking and puts up with a great deal of pressure and continues to do his job while facing impossible deadlines without complaint. We have traveled together widely throughout the World, at times under very unpleasant conditions, for weeks to months at a time, and never had harsh words nor problems that could not be quickly resolved. While at FAMU we collected together in Mexico, Honduras, South Africa and Namibia, and made a memorable 15,000 mile four and a half month trip to Panama by road from Tallahassee. We survived in spite of venomous snakes, avalanches that closed the road, antigovernment guerillas and other difficulties and Benn as always remained calm, serene and his usual helpful self. One occasion that was especially memorable was some trouble we had when we entered the territory of a troop of Howler monkeys in Nicaragua. The dominant male in the troop took exception to our presence in his territory and began to throw fruit, small branches and certain unmentionable substances at us. The final straw was when the large male broke off a 6 foot branch about 3 inches in diameter, and threw it, missing Benn by a few feet. I decided it was time to leave and Benn reluctantly agreed, since the collecting in the forest there was so good. His dedication to the work at hand was exemplary and fair weather or foul, he was ready to continue working. He was a pleasure to work with in the field, because he would not quit until I said we had to do so. I am grateful to have Benn as my friend and to have been fortunate to have worked with him for so many years".

I worked with Mr. Marshall for more than seven years said Dr. Muhammad Haseeb. We both left Texas earlier to serve FAMU but at different years. During these years, I enjoyed working with him. Mr. Marshall is a persistent, hardworking scientist and colleague. His long term service and achievements will be remembered by all of us.

Numerous faculty, staff, students, administrators and family & friends enjoyed the retirement reception for Mr. Marshall and passed on individual remarks for his success at the Center for Biological Control, College of Engineering Sciences, Technology and Agriculture, Florida A&M University.

Wills Flowers Awarded Fulbright Scholarship—

The university is located in Quevedo, a small agricultural and commercial city which is conveniently located between the western Andes and the Pacific coastal mountains. Although this part of Ecuador has been heavily impacted by mechanized agriculture, numerous undescribed species can be found in remnant forest patches.

Along with the teaching component of his fellowship, Dr. Flowers will also be conducting an inventory of aquatic insects in the streams of coastal Ecuador. This is an unexplored area for aquatic entomology. He will be working with the Museo Ecuatoriano de Ciencias Naturales, and Dr. Andrea Encalada of the Universidad San Francisco de Quito. Dr. Flowers will also continue to work on joint Virginia Tech—FAMU CRSP projects, through the Pichilingue Tropical Experiment Station.

New Member to CBC Staff



Oulimathe Paraiso (l) and Shalom Siebert (r)

Shalom Siebert is not new to FAMU, but she is a recent welcome addition to the CBC. Since graduating from FAMU-Entomology with high honors in August 2009, Shalom has been working with Oulimathe Paraiso and ARS on

biological control of the cactus moth.

Student News

Graduate Students

Mr. Abisoye Somorin defended his thesis in August titled "Pest Management Strategies for Control of the Small Hive Beetle *Aethina tumida* Murray, a Destructive Pest of the Honey Bee, *Apis mellifera* L." Mr. Somorin's major adviser is Dr. Lambert Kanga.



Abisoye Somorin

The three graduate students below plan to graduate during the fall or spring 2010 semesters.



Mr. Eutyclus Kariuki's MS work is on induced resistance in tropical soda apple to *Gratiana boliviana*, a tortoise beetle imported for the biological control of this weed. He is working under the supervision of Drs. Raymond Hix and Stuart Reitz.

Mr. Eutyclus Kariuki

Mr. Kevin Lewis' thesis work deals with assessing the evolution of key pest management challenges in conventional and organic vegetable systems in north Florida. Mr. Lewis is working under the supervision of Dr. Moses Kairo.



Mr. Kevin Lewis



Antonio Francis is a Ph.D. Candidate working on *Planococcus minor* in Trinidad with many exciting discoveries (see below). Mr. Francis is working under the supervision of Dr. Moses Kairo.

Mr. Antonio Francis



Mr. Ki Duk Kim

Mr. Ki Duk Kim is a new Ph.D. student in the Center for Biological Control working under the supervision of Dr. Raymond Hix and Stuart Reitz. Mr. Kim recently completed his M.S. in entomology at Michigan State University under the supervision of Dr. Mark Whalon. Mr. Kim started in the spring 2009 semester in the FAMU/UF cooperative Ph.D. program.

Mr. Keith Marshall completed his B.S. degree in Agricultural Science with emphasis in entomology at FAMU in May 2009. For his M.S., he is looking into the monitoring and mechanisms of resistance to miticides in *Varroa* mite populations across the gulf coast states under the supervision of Dr. Lambert Kanga. Mr. Marshall is planning to complete his studies in summer of 2010.



Ms. Latasha Tanner completed her B.S. degree in Agricultural Science with emphasis in entomology at FAMU in May 2009. For her M.S., she is working on the biology and population dynamics of the redbay ambrosia beetle, a new invasive forest pest in Florida under the supervision of Dr. Lambert Kanga.

Undergraduate Students

Undergraduate FAMU student assistants at USDA, ARS

Ms. Elizabeth Aninakwa – graduated Spring 2009

Mr. Keith Marshall, Jr. – graduated Fall 2008

Mr. Byron J. Franklin, Jr. – graduated Fall 2008



Student activities: Ms. Sophie Hyson, a freshman Environmental Sciences major at Barnard College, has been an intern in Dr. Stuart Reitz's lab this summer. She has been involved in a number of field and lab projects related to thrips ecology.

Safeguarding the Nation - Getting to Know What USDA-APHIS PPQ Does

As part of the new project, 'Development of a Regulatory Plant Science Curriculum at FAMU, two undergraduate students, **Mr. James Richardson** (left) and **Mr. Bryan Reese** (right) interned at the USDA-APHIS-PPQ Center for Plant Health Science and Technology (CPHST), Raleigh, N.C. This internship was tailored to provide hands on training in regulatory plant science. Each student undertook a specific project, mentored by an individual CPHST staff (Alison Neeley and Roger Magarey). Such internships will be available every summer for up to four students. Contacts: Moses T.K. Kairo and Stephanie Bloem (CPHST) [Funding: USDA CSREES]



James Richardson (left) and Bryan Reese (right)



Ms. Kaneisha Barr and Ms. Jordan Williamson are undergraduate students working with Drs. Kairo and Haseeb.

Oulimathe Paraiso Passes Candidacy Exams

Ms. Oulimathe Paraiso passed her candidacy exams and is now a Doctoral Candidate in the FAMU-UF Cooperative Ph.D. in Entomology program. Her major adviser is Dr. Moses Kairo. The title of her dissertation project is "Development of Protocols for Risk Analysis of Entomophagous Agents used in Classical and Augmentative Biological Control Programs in the U.S." Ms. Paraiso has served as a student representative to the Southeastern Branch of the Entomological Society of America 2007-09 as well as the Student Affairs Committee of the Florida Entomological Society. She has been a member of the FAMU Linnaean Team.



Oulimathe Paraiso

Florida A&M University Linnaean Team Competes at ESA-SEB 3rd Straight Year



Raphael Abanja, Oulimathe Paraiso, Eutyclus Kariuki (Ki Kim not pictured)

The Florida A & M University Linnaean Team took on the Auburn University team at the meeting of the Southeastern Branch (SEB) of the Entomological Society of America (ESA) in March 2009 in Montgomery, AL. The game went down to the final question, but the Rattlers came up short. The 2009 team was comprised of **Oulimathe Paraiso**, **Raphael Abanja**, **Ki Kim** (Ph.D. students), and **Eutyclus Kariuki** (M.S. student). This was the third year in a row that Florida A&M University has sent a team to the ESA-SEB meeting under the guidance of Dr. Raymond Hix. Dr. Andy Rasmussen served as the team's interim coach while Dr. Hix served as the Master of Ceremonies and Moderator of the 26th SEB Linnaean Games. Nine teams including FAMU, University of Florida, North Carolina State University, Auburn, University of Tennessee, University of Georgia, Louisiana State University, University of Arkansas, and Clemson University competed in the 26th Annual SEB Linnaean Games. The Games were won by NCSU with LSU the runner-up. NCSU and LSU will be representing the SEB at the National completion at the ESA National Meeting in December at Indianapolis. The FAMU team is beginning preparations to compete at the SEB branch meeting in Atlanta, GA next March.

Research Reports

Enlisting the fungi *Hirsutella* and *Metarhizium* to protect the honey bee from the vampire *Varroa* mite

Honey bee plays a critical role in agriculture by pollinating many billions of dollars worth of crops annually. Yet, honey bee populations have been under attack by the invasive parasitic mite, *Varroa destructor* resulting in the destruction of millions of colonies each year. A research team led by Dr. Lambert Kanga, and involving beekeepers and fungal producing companies are having end-users field test fungal formulations for control of *Varroa* mite populations in bee colonies. [Contact Lambert Kanga]

A development of an Integrated Pest Management Strategy for the small hive beetle in honey bee colonies.

The small hive beetle has recently become a destructive pest of honey bees in the United States and it has caused significant economic loss to beekeepers. There is currently no effective control measure for this new and invasive pest species. Dr. Lambert Kanga and his research team have developed and field tested a successful IPM strategy which includes a sequential use of IGR, low concentrations of fenitrothion and chlorpyrifos and two fungal pathogens. [Contact Lambert Kanga]

Induced Resistance in Tropical Soda Apple

Some plants can defend themselves against insect damage by producing chemicals that are harmful to insect herbivores. Eutyclus Kariuki is evaluating a particular strategy common in some plants known as induced resistance. In this situation, feeding by one species of insect induces changes in the plant's chemistry that make the plant resistant to attack by other insect species. Eutyclus' study system involves a spiny plant introduced from Argentina, Tropical Soda Apple (TSA), a serious weed to pastures in Florida and other southeastern states, and the tortoise beetle, *Gratiana boliviana*, a biological control agent against TSA. The objective of this study is to investigate whether the feeding of *G. boliviana* on TSA has any impact (via induced resistance) on other insect herbivores feeding on the same plant. Eutyclus is conducting studies in growth chambers, field cages, and open release areas to address the issue of TSA induced resistance.



Mr. Eutyclus Kariuki collecting insect herbivores on tropical soda apple. Eutyclus is under the supervision of Dr. Raymond Hix.

Is the coffee mealybug, *Planococcus lilacinus* present in the Dominican Republic?



Dr. Colmar Serra (left) and Mr. Enger Ramirez (center) of IDIAF and Moses Kairo (right) collecting mealybugs on cocoa Mata Larga, Dominican Republic.

The old world coffee mealybug, *Planococcus lilacinus* is another insect of concern to the United State. This mealybug has been reported as present in the Caribbean but there have been no recent collections. The Dominican Republic (DR) is one

of the islands where this pest is apparently present. Dr. Amy Roda, USDA-APHIS-PPQ-CPHST Miami, and Dr. Moses Kairo (CBC), visited the DR from 8-12 December, to work with local counterparts agencies including the Instituto Dominicano de Investigaciones de Agricultura Y Forestales (IDIAF), Dr. Colmar Serra; Departamento de Sanidad Vegetal, and local APHIS-IS personnel (Dr. John Shaw, Christopher Cobbs, and Paula Morales), to develop a program to determine the occurrence, and if present, impact of coffee mealybug on local agriculture, and assess whether natural enemies are providing any control for the pest. The main goal of the mission to the DR was to outline a work plan for the student and begin the initial studies to determine the coffee mealybug's host range and pest status. Working with IDIAF and coffee/cacao grower associations, production areas were identified and initial surveys were conducted in order to locate populations of the coffee mealybug. The group surveyed coffee and cacao plantations located near La Vega, San Cristobal and Mata Larga. Multiple species of mealybugs were found, however populations of mealybugs were noticeably low. In the laboratory a subset of the mealybugs were encapsulated in order to determine if they were parasitized and another subset was separated for identification. This work will continue during 2009-2010. [Funding: USDA-APHIS; Contacts: Moses T.K. Kairo and Amy Roda (APHIS-CPHST, Miami)]

Ladybeetle is an important insect predator of the silverleaf whitefly

The ladybeetle, *Delphastus catalinae*, is an important insect predator of the silverleaf whitefly, *Bemisia argentifolii*. This whitefly species causes damage to plants through direct feeding and transmission of plant diseases. *D. catalinae* is a voracious predator of whiteflies in various plants such as vegetables, ornamentals, horticultural and row crops. This beetle is also mass produced by biological control companies and is popularly sold in commercial greenhouses, especially in Europe. Drs. J. C. Legaspi and A. Simmons (USDA, ARS, Charleston, SC) studied the predation, development and reproduction of this predator to optimize its use in mass rearing and augmentation in field conditions. They fed immature and adult *D. catalinae* with the silverleaf whitefly on tomato leaves under the following temperatures: 22, 26 and 30 °C. Female adults weighed slightly more than males. As temperature increased from 22 to 30 °C, immature development time from eggs to pupae declined from 24 to 15 days, and adult longevity ranged from 138 and 77 days. Thermal units required for immature development was ≈300 degree-days. *Delphastus catalinae* was found to perform better at 22 and 26 °C; 30 °C was detrimental to immature development and adult reproduction. This information will aid in development of biological control tactics against the silverleaf whitefly. [Funding: USDA, ARS; Contact: Jesusa C. Legaspi]



Ladybeetle, *Delphastus catalinae*



Keith Marshall samples for the silver leaf whitefly in cabbage during his undergraduate studies with Dr. Legaspi.

Florida A&M University sets up IPM Core Group

In 2009, a core group to spearhead IPM activities at FAMU as part of the Smith Lever IPM Extension Program. The core group is coordinated by Moses Kairo and comprises Drs.: Raymond Hix and Muhammad Haseeb (CBC), Jack Petersen (John Mulrennan Public Health Entomology Research and Education Center), Odemari Mbuya (Center for Water and Air Quality) and Bobby Phills (Center for Viticulture and Small Fruits Research). This team is working to link together and develop new IPM initiatives at FAMU. Activities were initiated in 2009 with funding from CSREES, now NIFA.

Control of the Invasive Argentine Cactus Moth

Populations of the invasive cactus moth, *Cactoblastis cactorum*, have been eradicated from islands in both the US and Mexico by conducting sanitation efforts and releasing sterile moths. Two trips were made this year (Oct. 2008 and August 2009) to Mexico at the request of the Mexican Government to assist them in implementing their continued monitoring efforts for the invasive cactus moth throughout the Yucatan Peninsula. Collaborations are continuing with the ARS South American Biological Control Laboratory in Argentina to conduct a project on field life-table studies and mortality factor analysis of the cactus moth in the insect's native range. Similar studies are being conducted in the moths' introduced range of Florida to compare the insects' development parameters and mortality agents with findings in Argentina. While 8-9 species of parasitoids have been identified attacking cactus moth in South America, only three species of natural enemies have been found at very low levels in Florida. A wasp in Argentina that attacks *C. cactorum* larvae has potential as a biological control agent, but additional host specificity studies are needed. [Funding: USDA-ARS, USDA-APHIS, and Mexican Government; Contact Stephen Hight]



Stephen Hight (left), John Mass (center), Guillermo Logarzo (ARS-Argentina), and Laura Varone (kneeling, ARS-Argentina) locating cactus moth eggsticks to follow their fate on prickly pear cactus plants.

The Red Palm Weevil – A new pest threat in the Caribbean

The Red Palm Weevil (RPW), *Rhynchophorus ferrugineus*, is a major pest of palms in several parts of the old world. This native of tropical Asia was recently, accidentally introduced into the Caribbean (Curacao and Aruba). Damage to palms is caused mainly by the larvae, and unfortunately by the time the first symptoms of the pest appear, the plants are usually already so seriously injured that they frequently die. Because of the potential risk of spread of the pest to the United States, USDA-APHIS-IS, APHIS-PPQ and Florida A&M University are collaborating to: identify likely pathways for the RPW, to optimize survey tactics and protocols, and to develop mitigation strategies. Drs. Amy Roda (APHIS-PPQ-CPHST),

Moses T. Kairo (FAMU) and Mr. Wayne De Chi (APHIS-IS), carried out a mission to both Curacao and Aruba in September 2009, to initiate collaborative activities with the Departments of Agriculture in both islands. During the mission, they met several local stakeholders, and more importantly, they held fruitful meetings with island representatives including Mr. Kenneth Heidweiller (Director DLVV, Curacao) and Clinton Johanns; and Mr. Damian Theophilo (Director DLVV, Aruba) and Facundo Franken. In both islands, a program for monitoring the RPW was also initiated. [Key contacts: Moses Kairo and Amy Roda – This work is funded by APHIS]



Wayne De Chi (APHIS-IS), examining a palm tree in Curacao (above) affected by the Red Palm Weevil (right).



Photos taken by Amy Roda and Moses Kairo

RPW damage on frond.



Clinton Johanns (DLVV Curacao), Amy Roda (APHIS-CPHST) and Kenny Heidweiller (DLVV Curacao) surveying for RPW in a nursery in Curacao.

2009 Scientific Publications

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Awards & Honors

Dr. Wills Flowers: Fulbright Scholarship
 Dr. Stuart Reitz: Awarded Florida Entomological Society Annual Award for Research (July 2008)
 Dr. Raymond Hix: Best in Show and Best Traditional Macro, Southeastern Branch-Entomological Society of America, March 2009, Montgomery, AL

Recent Presentations and Seminars:

Carpenter, J.E. and Hight, S.D. Development of control tactics against *Cactoblastis cactorum* in the USA and Mexico. Training Course "Training to Identify and Manage the Cactus Moth", Cozumel, MX, Dirección General de Sanidad Vegetal. 31 October – 1 November 2008.

Carpenter, J.E. and Hight, S.D. 2008. Applying the Sterile Insect Technique against *Cactoblastis cactorum*. Training Course "Training to Identify and Manage the Cactus Moth", Cozumel, MX, Dirección General de Sanidad Vegetal. 31 October – 1 November 2008.

Haseeb, M., M.T.K. Kairo, R.W. Flowers and T.W. Terrence. Digital identification resource for insect pests of cultivated palms in the United States and Caribbean countries. Poster presented at the 15th Biennial Research Symposium, held in Atlanta, GA (28 March-1 April 2009).

Haseeb, M. and M.T.K. Kairo. Pest management in organic vegetable production using biological control. Talk presented at the First University Research Summit (FAMU), held in Tallahassee, FL (26-27 March 2009).

Haseeb, M. Targeting invasive pest species offshore: Are we targeting the right ones? Poster presented at the 56th Annual Meeting of Entomological Society of America, held in Reno, NV (16-19 November 2008).

Haseeb, M. Lucid based identification of resources. Plant biosecurity symposium organized by Southern University held in Baton Rouge, LA (21-22 November 2008).

Haseeb, M., C.W.O'Brien and M.T.K. Kairo. Identification tool for potentially invasive weevil species from the Caribbean Countries to the United States. Poster presented at the 91st annual meeting of Florida Entomological Society, held in Jupiter, FL (13-16 July 2008).

Hernández, L.A. and Hight, S.D. 2008. Field practice with monitoring traps for *Cactoblastis cactorum*. Training Course "Training to Identify and Manage the Cactus Moth", Cozumel, MX, Dirección General de Sanidad Vegetal. 31 October – 1 November 2008.

Hight, S.D. and Carpenter, J.E. 2008. Trapping methods to monitor for *Cactoblastis cactorum* in Mexico. Training Course "Training to Identify and Manage the Cactus Moth", Cozumel, MX, Dirección General de Sanidad Vegetal. 31 October – 1 November 2008.

Hight, S.D., Carpenter, J.E., Bloem, S., Bloem, K.A., Floyd, J. 2008. Development of control tactics against the invasive cactus moth, *cactoblastis cactorum*, in North America. XXIII International Congress of Entomology, Durban, South Africa.

Hight, S.D. Development of control tactics against the invasive cactus moth, *Cactoblastis cactorum*, in North America. APHIS-PPQ Invertebrate & Biological Control Programs, USDA-ARS National Program Leader, Biological Control, Riverdale, MD. 2 February 2009.

Hight, S.D. Potential and risk of biological control for *Cactoblastis cactorum*, in North America. APHIS-PPQ Invertebrate & Biological Control Programs, USDA-ARS National Program Leader, Biological Control, Riverdale, MD. 2 February 2009.

Hight, S.D. Cactus moth research update – traps, lures, and pheromone. Binational Meeting on the Cactus Moth Program, Mexico-USA. 4 August 2009.

Hight, S.D. and J.E. Carpenter. Research needs for the binational cactus moth program. Binational Meeting on the Cactus Moth Program, Mexico-USA. 4 August 2009.

Hix, R. L. Untapped resource or just poor marketing?: Are insects the potential food resource for the future? National Meeting of the Entomological Society of America Reno Nevada 16-17 Nov 2008.

Kairo, M.T.K. Biosecurity challenges imposed by invasive species. Invited presentation to the Florida State University System Board of Governors on invasive species. January 29, 2009 http://www.fibog.org/pressroom/meeting_items.php?id=49&agenda=181

Kairo, M.T.K. "Fore-armed: The case for strategic research on classical biological control" Seminar Department of Entomology and Nematology, University of Florida, February 26 2009.

Kanga, H. B. L, W. A. Jones, and C. Gracia. 2009. Monitoring and Mechanisms of Miticide Resistance in the Parasitic Mite, *Varroa destructor*, a Major Pest of Honey Bees. Annual Meeting of the Entomological Society of America, Reno, NV.

Legaspi, J. C. Integrated Pest Management. Ecology of Food Class, Florida State University, Tallahassee, FL, October 2008.

Legaspi, J. C. How to study predators the O'Neil way. A Celebration of the career and contributions of Robert J. O'Neil. Annual meeting of the Entomological Society of America. Reno, NV, November 2008.

Legaspi, J. C., C. Gardner, G. Queeley, N. Leppla, and J. Cuda. Demonstrating integrated pest management of hot peppers. 44th Annual Meeting of the Caribbean Food Crops Society. Miami, FL, July 13-17, 2008.

Legaspi, J. C. and B. C. Legaspi, Jr. Ovigeny in selected generalist predators. 3rd International Symposium on Biological Control of Arthropods, Christchurch, New Zealand, February 8-13, 2009.

Lewis, K.M., M.T.K. Kairo and M. Haseeb. Characterization of insect pests of crucifer vegetables in small holder conventional and organic farmers in north Florida. Poster presented at the 15th Biennial Research Symposium, held in Atlanta, GA (28 March-1 April 2009).

Mézquita, R.C. and Hight, S.D. 2008. Identification of *Cactoblastis cactorum*. Training Course "Training to Identify and Manage the Cactus Moth", Cozumel, MX, Dirección General de Sanidad Vegetal. 31 October – 1 November 2008.

Reitz, S. Top-down, bottom-up, and stuck in the middle. Symposium on Entomology of Florida flowers, Annual Meeting of the Florida Entomological Society, 2009

Reitz, S. Thrips management in solanaceous and cucurbit crops. Symposium on Thrips IPM, 6th International IPM Symposium, Portland, OR, 2009.

Reitz, S. Ecology of the western flower thrips: The making of a pest. Symposium on the Thrips Management. Annual Meeting of the Southeastern Branch – Entomological Society of America, Montgomery, AL, 2009

Reitz, S. Biology and ecology of the western flower thrips: What makes it a pest? Symposium on Challenges in Managing the Western Flower Thrips. Annual Meeting of the Entomological Society of America, Reno, NV. 2008

Reitz, S. Ecology of the western flower thrips: The making of a pest. Symposium on the Western Flower Thrips in Florida. Annual Meeting of the Florida Entomological Society of America. 2008.

Reitz, S. Ecology and management of thrips and Tospoviruses: Little things, big problems, and some solutions for vegetable growers. USDA-ARS Northern Plains Agricultural Research Laboratory, Sidney, MT. 2008



M. Haseeb (CBC), Y. Colmenero and D. Moore (CABI) and F. Hossein (MALMR Trinidad and Tobago) conducting a palm pest survey in Salybia, Trinidad (May 2009)

Popular Press Articles

Reitz, S. Researchers Testing "One-Two Punch" Against Disease-Spreading Thrips <http://www.ars.usda.gov/is/pr/2009/090615.htm>
 Reitz, S. Pirate Bug Tag-Team Spells Double Trouble for Thrips <http://www.ars.usda.gov/is/pr/2009/090619.htm>

Training/workshops:

- 1) USDA, APHIS, Palm Resource Workshop III. Pests and Diseases of Palms Cultivated in the United States and Caribbean: Identification Keys to Palms and Their Pests, Diseases, and Disorders. Organized by the Center for Plant Health Science and Technology and FDACS, DPI and University of Florida, IFAS, held at Gainesville, FL (January 22, 2009).
- 2) W.L. Peters, 32nd Annual Field Day and Workshop organized by Entomology program, College of Engineering Sciences, Technology and Agriculture, FAMU in cooperation with the Division of Education, Tallahassee-Leon County Civic Center, Florida (5-7 November 2008).

Meetings Organized:

- 2009 Key Organizer (Kairo, M.T.K.; Leppla, N and McEvoy, P) for Symposium entitled; "Integrating strategies for invasive species management: capacity, compatibility and operational changes" during the 6th International IPM Symposium, March 24-26 2009, Portland Oregon <http://www.ipmcenters.org/ipmsymposium09/>
- 2009 Co- Organizer (McEvoy, P; Kairo, M.T.K. and LeBeck, L.); S-1034/W-2185, Joint Meeting of the Western and South Eastern Regional Biological Control Projects, March 22-23, 2009, Portland Oregon <http://www.cnr.berkeley.edu/biocon/W1185%20Officers.htm>
- 2009 3rd International Symposium on Biological Control of Arthropods, Christchurch, New Zealand (Feb 8-13 2009) <http://events.lincoln.ac.nz/isbca09/default.htm> (Regional Coordinator, Caribbean)
- 2008 Entomological Society of America, Program Symposium; An Entomological Perspective Addressing Challenges in the Developing World: New Frontiers in Food and Bio-security. Reno, Nevada, November 16-19 2008. Organizers: Lambert H. B. Kanga; Moses Kairo; Sonja Brannon.; Joseph E. Munyaneza, <http://www.entsoc.org/am/cm/theme/pr-symp.htm>

Editorial continued from page 2

Significant outputs and impacts from the Center during 2006 – 2008

A. Research

1. Management of established invasive pests and IPM:
 - Thrips: contributed to successful delivery of new IPM tactics to farmers.
 - Tropical soda apple: Participated in release and monitoring of *Gratiana boliviana*
 - Cogongrass: The use of indigenous grasses to displace cogongrass show promise, with further field studies underway.
 - Cactus moth: CBC scientists contributed to the successful eradication program in Mexico.
 - *Varroa destructor*: A mycopathogen product for this serious honey bee pest was developed and is currently undergoing multi-state testing.
 - Grape root borer: The effectiveness of potential biological control agents was assessed.
 - Safety of classical biological control of arthropods: A stakeholder survey on risk communication during the importation of entomophagous biological control agents was completed. This knowledge will be used to improve the importation process.
2. Digital identification tools:
 - Lucid Keys: the Center released one identification tool and beta testing was completed on two others. The Center also established collaborative partnerships to develop a commodity based resource for palms – the first time such an effort has been mounted.
3. Economics:
 - A study on economic impact of tropical soda apple was completed.
 - New research by a graduate student is examining the economic impact of cogongrass.
4. Offshore research:
 - Passionvine mealybug: Research by a CBC Ph.D. student generated the necessary knowledge for the development of a management program against this high risk pest threat. This included identification of effective natural enemies that could be used in the US.
 - Coffee mealybug: Research on the biology and ecology of this high risk pest threat for the US was initiated in the Dominican Republic.

B: Training

1. Student recruitment and graduation:
 - CBC has the largest number of graduate students in the college, currently nine (4 Ph.D. and 5 M.S.).
 - 2 M.S. students graduated from the program.

2. Our students have participated for two years in the Linnaean games, cementing FAMU's entomology program among the other schools in the region.
3. Distance learning and international training:
 - Established a distance learning partnership with USDA APHIS and North Carolina State University focusing on biosecurity training.
 - International training. Conducted training workshops in E.E.T.Pichilingue, Ecuador during 2006-2008, a total of 64 persons were trained. In another workshop for SESA in Guayaquil, Ecuador in 2008, 38 persons were trained.

C. Extension and Outreach activities

- The Center implemented a range of activities including:
- Participation in three field day presentations
 - Production of an annual center newsletter.
 - Cogongrass website - www.aboutcogongrass.org – FAMU is now recognized and listed by the Global Invasive Network Database, as one of only seven places in the world to get cogongrass information.
 - Organization and participation in state, regional and national conferences:
 - Center faculty have organized one program and three regular symposia during the Entomological Society of America Annual meetings.
 - Center faculty and students have given an increasing number of presentations at these meetings (Figure 1)
 - Center faculty established good working relationships with extension as evidenced through development of joint projects.

D. Center Administration Initiatives

1. Establishment of new partnerships:
 - Partnership with the University of Minnesota NSF IGERT project on invasive species and genotypes.
 - Active participation in the Caribbean Invasive Species Working Group
 - Partner in the CABI led Global Environment Facility project on mitigation of invasive species in the insular Caribbean.
 - Developed a new five year MoU with USDA APHIS.
 - Established an MoU with CABI
2. Faculty:
 - Center faculty took national leadership of two USDA CSREES multistate projects (Chair of S1034 and Chair of W1008).
 - One tenure-track faculty joined the Center.
 - Center faculty and students continued to receive honors and recognition.
3. Funding:
 - The Center has expanded its funding base and level of funding.

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The CBC Advisory Council met Feb, 25 2009 on the FAMU Campus

M.S. AND PH.D. GRADUATE RESEARCH ASSISTANTSHIPS AVAILABLE: The Center for Biological Control and related centers in the College of Engineering Sciences, Technology and Agriculture, Florida A&M University has several assistantship available immediately to motivated students wishing to pursue a M.S. or Ph.D. degrees in entomology. A strong background in biology or agriculture is required but preference will be given to those with basic knowledge in entomology and taxonomy. The Ph.D. is offered as part of a program between Florida A&M University and the Department of Entomology and Nematology University of Florida. The scope for research broad and includes: research on insect ecology and management especially in the context of invasive species in both natural and managed ecosystems.

UNDERGRADUATE STUDENT INTERNSHIPS: The Center has a range of regular and summer internship opportunities for undergraduates interested in research. Some of these opportunities are based with the Center's partners: USDA-ARS and USDA-APHIS.

For more information on these opportunities, please contact:
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Or Lambert Kanga, e-mail: Lambert.Kanga@FAMU.EDU (Graduate Coordinator)

Website Links:

FAMU: <http://www.famu.edu/index.cfm?a=cesta&p=CenterforBiologicalControl>

USDA-ARS: http://www.ars.usda.gov/Main/site_main.htm?docid=3014

Securing Food, Natural Resources and Human Health
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