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Protecting honey bees: *Metarhizium anisopliae* soon to be a viable commercial option for the management of *Varroa destructor*



Metarhizium anisopliae sporulating on Varroa mite

Honey bees play a critical role in agriculture by pollinating billions of dollars worth of crops annually. In recent years however, honey bee populations have been under attack by the invasive parasitic mite, *Varroa destructor* resulting in the destruction of thousands of colonies



Honey bee

each year. A research team led by Dr. Lambert Kanga, and involving scientists from USDA-ARS in Weslaco, TX, Sylvan BioProducts, Inc and beekeepers has been conducting field trials with a formulation of *Metarhizium anisopliae* in several States. The results to date have shown promise and production of a commercial formulation is now within sight.

Two new projects focusing on Bio-security funded by USDA-CSREES

In September 2008, USDA CSREES awarded the Center a half a million dollars to support two, three year bio-security research projects. (...see full story on page 11)

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FAMU President, Dr. James Ammons (second from right) formally releasing the CD version of the weevil identification tool developed by Center scientists. Looking on are (extreme right) Dr. Makola Abdullah, Professor and Dean, CESTA, (extreme left to right) Dr. Gale A. Buchanan, Undersecretary for Research Education and Economics, USDA, Drs. M. Haseeb and M. Kairo (CBC)

Editorial



Dr. Moses T.K. Kairo,
Center Director

As the third year of implementation of the Center's five year plan (2006-2010) draws to an end, it is timely that we have begun to identify research priorities for the period beyond 2010. During the coming year, we will complete a comprehensive review of the progress achieved under the current plan. We will also consult with stakeholders and assess how new plans will fit within the priorities set by the three key partners, Florida A&M University and the two USDA agencies,

Agricultural Research Service and Animal and Plant Health Inspection Service. It is also our intention to develop a stronger partnership with state agencies, particularly the Department of Agriculture and Consumer Services and Department of Environmental Protection among others. These activities come at a good time following the recent installation of a new university administration, and permanent dean for the college, Dr. Makola Abdullah, which has injected tremendous new energy and enthusiasm across the university.

The Center will continue to emphasize its multipronged approach linking research training and outreach. We will carry forward the research emphasis on invasive alien species with particular attention to: management of established invasive species, offshore research on high risk threats and, development of electronic diagnostic tools. Whereas current efforts are largely focused on arthropods, we

recognize the critical importance of weeds. In this regard, grant proposals in this area have been initiated. Efforts to develop biologically based pest management technologies for small scale farmers in North Florida will also be continued. As the Center continues to grow, an important priority during the coming years will be the development of Center facilities. High on the agenda is the development of laboratories where all the scientists can be housed under one roof. The potential benefits for doing this are numerous both in terms of increased synergy among faculty and efficiency, but also in serving students more effectively.



Dr. Stuart R. Reitz, Co-director

Staff News

Awards

2006 – **Ken Bloem, Stephanie Bloem, Jim Carpenter, and Stephen Hight.** Annual Achievement for Research Team, Florida Entomological Society.

2008 – **Stuart Reitz** was honored to receive the Florida Entomological Society's Annual Achievement Award for Research.

2008 – **Joel Floyd, Ken Bloem, Stephanie Bloem, James Carpenter, Stephen Hight, Billy Newton, John Stewart, Maurie Duffel, Ron Weeks, and Craig Hinton.** *Cactoblastis cactorum* Cooperative Program, USDA, APHIS, PPQ Deputy Administrator's Safeguarding Award. USDA, APHIS.

New Faces

Neil Miller – began his new position in August 2008 as a Biological Science Technician at USDA, ARS, CMAVE-FAMU/CBC. He obtained his B.S. in Psychology and M.S. in Entomology from Kansas State University in Manhattan, KS. His M.S. thesis involved a study on photoperiodic induction of diapause in the field bindweed moth *Tyta luctuosa* (Lepidoptera). He previously worked for several years as a biological science technician at USDA, ARS, Pacific Basin Agricultural Research Center in Hilo, Hawaii on biological control and IPM research of invasive fruit flies. Aloha and welcome!



Neil Miller



Rashunda Kenon

RaShunda Kenon: A warm welcome to Mrs. Kenon who joined the Center on July 1, 2008 as the new Office Manager. Mrs. Kenon was previously the Office Manager in the Center for Water and Air Quality and is therefore no stranger.

CBC Advisory Committee Meeting

The Center Advisory Committee met on December 17, 2007 to review the Center's activities. The meeting was chaired by Dr. Norm Leppla (UF-IFAS), and was attended by the following Committee members: Ms. Abby Fox (FDACS-DPI), Dr. Kenneth Bloem (APHIS-PPQ-CPHST), Dr. Jason Byrd (FDACS-DPI), Mr. Joshua Craft (Florida Farm Bureau), Dr. Catherine Preston (USDA-APHIS-PPQ), Dr. John Sivinski (ARS) and FAMU-CESTA Administrators. The meeting was attended by all CBC faculty and students who gave presentations on their work. The committee received reports on all of the Center's activities including research, training and outreach. The committee, including representatives from the three partner agencies (FAMU, ARS, and APHIS), noted that the Center was making excellent progress. It also noted that implementation of a continuing effort to review progress against the 2006-2010 strategic plan will be desirable.

Staff Departures

Ignacio and Sofia Baez:

Ignacio holds the distinction of being the very first M. S. graduate student from the Center in 2002. His thesis dealt with the population dynamics of flower thrips *Frankliniella* spp. (Thysanoptera) and the predator *Orius insidiosus* (Heteroptera) in tomato and pepper. While a student at FAMU, he was funded through the student temporary employment program of USDA, ARS, CMAVE/FAMU-CBC. Thereafter, he worked as a biological science technician at USDA, ARS, CMAVE/FAMU-CBC for several years. Sofia also did part time work at the Center. In October 2007, Ignacio accepted a position as National Program Staff Scientist in Risk Assessment at the USDA/APHIS/PPQ/CPHST in Raleigh, NC. We wish both Ignacio and Sofia well in their new endeavors.



Ignacio Baez

Student News

Florida A&M University Linnean Team Lights up the ESA-SEB meeting again

The Florida A&M University Linnean Team lit up the Jacksonville meeting of the Southeastern Branch (SEB) of the Entomological Society of America (ESA) in March 2008. The fireworks included a head to head punch up with University of Georgia that required a last minute tiebreaker to settle the duel. Unfortunately, FAMU lost but the team, comprising of Oulimathe Paraiso and Raphael Abanja (Ph. D. students), Eutyclus Kariuki (M.S. student), and freshman Kanessa Barr (B.S. student) who competed in place of Antonio Francis (Ph.D. student) who was conducting research in Trinidad, fought gallantly. This was the second year in a row that Florida A&M University has sent a team to the ESA-SEB meeting under the guidance of team coach Dr. Raymond Hix. 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 24th Annual SEB Linnaean Games. The team is expected to be at full strength with the return of Antonio Francis and you can bet that it will come out fighting next March, 2009 in Montgomery, Alabama!



Gloria Wright – After serving FAMU for over 34 productive years, Ms. Wright, the center office manager retired in April 2008. We wish her well in retirement.

Capelouto Foundation Provides Scholarships to Entomology Students

Once again the Capelouto Foundation provided four Scholarships to selected high achieving entomology students. They received their checks from Mr. Grant Capelouto at a ceremony during the Entomology Field Day. President Ammons was on hand to congratulate the students.



FAMU 2008 Linnean Team (front row L-R), Oulimathe Paraiso, Kanessa Barr and Raymond Hix (Coach), (back row L-R), Eutyclus Kariuki and Raphael Abanja.

Entomology students and faculty pose for a photo with President Ammons and Mr. Grant Capelouto.



Student News (cont.)

New Graduate Students

The student complement at the Center has continued to grow. Four new graduate students joined the Center during the last year and they will be working in different fields.



Mr. Eutyclus Kariuki is working on induced resistance in tropical soda apple under the supervision of Dr. Raymond Hix.



Ms. Roaida Said is assessing the effectiveness of applying entomopathogenic nematodes through drip irrigation for control of the grape rootborer and is supervised by Dr. Hix.



Mr. Abisoye Somorin is looking into the potential foe biological control of the small hive beetle under Dr. Lambert Kanga's supervision.



Mr. Nandkumar Divate is working on economic aspects of cogongrass, an important invasive weed under supervision of Dr. Michael Thomas



Mr. Kevin Lewis is assessing the evolution of key pest management challenges in conventional and organic vegetable systems in North Florida under supervision of Dr. Kairo.

Promoting interest in research through internships.

The Center places great emphasis on attracting undergraduate students to research especially in entomological fields. Every year it provides internship opportunities to a varying number of students. During the past year more than eight students were involved in this program.



Undergraduate research interns: FAMU undergraduate students, Elizabeth Aninakwa, William Ziegler and Shawanna Henderson (from left to right) sampling in St. Marks National Wildlife Refuge, Florida

Student Progress

Antonio Francis is officially a Ph.D. Candidate after successfully undertaking his written and oral examination in May, 2008. He has also continued to undertake his research on *Planococcus minor* in Trinidad with many exciting discoveries (see below). Antonio is essentially on the home stretch, and anticipates to complete his degree by the end of 2009.



Antonio Francis at the CABI laboratories in Trinidad



Oulimathe sampling cactus moth in St. Marks

Oulimathe Paraiso had originally planned to work on a new cycad scale parasitoid in quarantine at the Division of Plant Industry, Florida Department of Agriculture and consumer services. However, after the culture of the parasitoid was lost before she started here research, she has now switched

projects and will focus on natural enemies of the cactus moth, *Cactoblastis cactorum*.

Raphael Abanja is continuing research on his project on the control of the Glassy-winged sharpshooter and their putative genes that confer high tolerance levels to insecticides.



Research Reports

A new age approach to pest control

Stuart Reitz and colleagues from the University of Florida and the Università degli Studi della Basilicata, Potenza, Italy are continuing research on the use of plant essential oils and kaolin as a sustainable method to manage thrips and thrips-vectored tomato spotted wilt virus. Recent field trials have shown that the combination of certain essential oils and kaolin can significantly reduce the incidence of tomato spotted wilt in tomatoes and are as effective as current broad-spectrum insecticides. [Funding: USDA-SARE. Contact: Stuart R. Reitz]

Florida native wild grape inventory for potential grape root borer resistance and biological control agents

This project is focused on examining native wild grapes to establish root stocks with resistance to the grape root borer *Vitacea polistiformis* (Lepidoptera: Sesiidae), and entomopathogenic nematodes for use as biological control agents against grape root borer larvae. Ms. Roaida Said is currently working on a M.S. project to evaluate application methods of entomopathogenic nematodes commercially available to U.S. growers via irrigation systems in commercial grapes. Other aspects of her M.S. project are to evaluate the survivorship and movement of nematodes in the soil following application via drip irrigation. [Funding: FAMU/ARS Science Center, Contacts: Raymond Hix and Roaida Said M.S. student]



Development of Lucid Keys: Moving from individual taxa to commodity based resources



Frontispiece of new weevil key.

Another useful Lucid based electronic key will be published shortly. Entitled, 'Potentially Invasive Weevil Species from the Caribbean Countries to the United States,' is undergoing final testing and tweaking before being made available on the internet. [Funding: USDA APHIS, Contacts: M. Haseeb, C.W. O'Brien and M.T. Kairo]

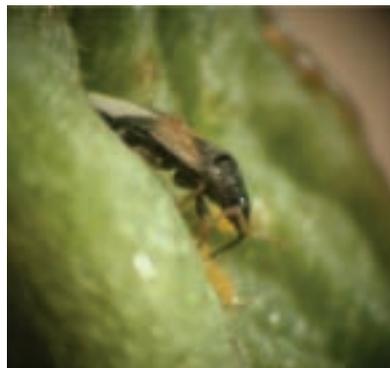
Can sunflower enhance natural enemies in vegetable cropping systems?

Thrips, *Frankliniella* spp. cause major losses to growers due to direct feeding and as vectors of plant diseases. The minute pirate bug, *Orius insidiosus* has been documented to be an important generalist predator of thrips. These predators have also been reported to be abundant in plants such as



Field experiment using sunflower as a predator refuge

sunflower. Several studies have shown that sunflower is a good refuge plant for the minute pirate bug. Drs. Jesusa C. Legaspi, Stuart Reitz and cooperators conducted studies on use of sunflower to enhance natural enemies and hence, reduce insect pest populations in vegetable crops. In 2005, we tested eight different varieties of sunflower crop to determine a variety that had the most abundant number of *Orius insidiosus*. The selected variety was then intercropped with bell peppers in 2006. The objective of the latter study was to determine if thrips populations may be suppressed in bell peppers with sunflower serving as a refuge crop for the *Orius* predators. The sunflower varieties studied in 2005 were the following: Bashful, Double Quick Orange, Pro Cut Bicolor, Pro Cut Lemon, Sundance Kid, Sunrich Lemon, Teddy Bear and Zebulon. We found that Double Quick Orange had the most numbers of *O. insidiosus* but also the highest numbers of thrips. When Double Quick Orange sunflower was intercropped with bell peppers, we found that *Orius* populations were highest in the sunflower border, followed



Orius insidiosus

by the bell pepper monoculture and the bell pepper intercropped with sunflower. Our results indicate that *Orius* predators remained in the sunflower; thus, the latter may be more useful as a trap crop rather than a source of *Orius* predators in different cropping systems. [Funding: USDA-ARS; Contact: Jesusa Legaspi & Stuart Reitz]

Development of a user-friendly technique to monitor for resistance in the vampire *Varroa* mite populations.

The invasive parasitic mite, *Varroa destructor*, is the most serious threat to beekeeping worldwide and has developed resistance to miticides (fluvalinate, coumaphos) used for control. Thus, it becomes critical to develop strategies to manage that resistance. A simple, fast and user-friendly technique using diagnostic doses in the glass vial tests was developed by Dr. Lambert Kanga's research team, to monitor for resistance in *Varroa* mite populations. [Funding: USDA-ARS; Contact: Lambert Kanga]



Monitoring honey bee colonies at FAMU's Quincy Farm

Why is *Planococcus minor* not a serious problem in Trinidad

Antonio Francis returned to Trinidad in January to continue research on the passionvine mealybug. A central focus of the work is to explain why this potentially very serious invasive pest from Asia is apparently only a minor pest in Trinidad. The answer it seems is - natural enemies. Antonio has discovered several natural enemies including two parasitoids which seem to be keeping mealybug populations under control. The research is continuing to assess the potential of these parasitoids for control of the mealybug. [Funding: USDA-APHIS; Contacts: Moses T.K. Kairo, Antonio Francis and Amy Roda]



Antonio Francis and Amy Roda setting up pheromone traps in La Reunion, Trinidad

Native plants show good promise for the control of cogongrass, *Imperata cylindrica*.

Efforts have been underway to understand the spread of cogongrass in different habitats, and to develop management strategies for its control and possible eradication as a noxious weed. Control measures include mechanical, chemical, biological control, and integrated treatments, in which the major idea is to reduce the rhizome mat. Within time constraints and budgets for the average landowner, the best combinations of management practices have not resulted in 100% long term control (> two years). The new approaches, which include the use of selected native grasses may increase the diversity of ecosystems infested by cogongrass. Ongoing research has been focused on evaluating the potential of using three grass species: switchgrass (*Panicum virgatum* L), maidencane (*Panicum hemitomom* Schult.), and muhlygrass (*Muhlenbergia capillaries* (Lam) Trin.) in various combinations with cogongrass in a greenhouse pot study. Results to date have shown significant reductions in the mass of cogongrass rhizomes in all combinations with other grasses. The greatest reductions occurred in combinations with maidencane or the switchgrass-muhlygrass combination. Muhlygrass was more or less stable. Cogongrass below ground biomass was reduced by 55, 56 and 57% at 12, 18 and 24 weeks; compared to cogongrass alone, while maidencane and switchgrass by 30 and 43%, respectively, at 18 and 24 weeks. Ongoing field studies were established in 2007 and we expect to finish in 2009. [Funding: USDA CSREES; Contact: O.U. Onokpise, J.J. Muchovej & S.K. Bambo]



Drs. Onokpise (left), Muchovej (right) and Bambo (center) assessing a cogongrass trial on Tram Road.

Update on Cactus Moth Eradication

The sterile insect technique (SIT) was applied to populations of the invasive cactus moth (*Cactoblastis cactorum*) in the U.S. and Mexico. Populations of the invasive moth have been eradicated from islands in Mexico and releases of sterile insects on Mississippi barrier islands are reducing the population of the moth. Two trips to the Yucatan Peninsula of Mexico were conducted this past year (Nov. 2007 & March 2008) at the request of the Mexican Government to review the status of the cactus moth infestation on Isla Mujeres and Isla Contoy, advise on eradication efforts, transfer trapping, sanitation and the SIT technology, and develop a monitoring system to evaluate the potential that the insect was established at other locations on the Peninsula. The Mexican Government has scheduled a formal announcement of the eradication success for October 2008 at a meeting of the North American Plant Protection Organization (NAPPO), Guadalajara, Mexico. APHIS acknowledged the success of the SIT in controlling the cactus moth by honoring ARS scientists and colleagues with the APHIS-PPQ Deputy Administrator's Safeguarding Award, March 2008 [Funding Source: USDA ARS, APHIS and Government of Mexico. Contact Stephen Hight]

Journal – Costa Rica

In March and April, the intrepid traveler, Dr. Flowers was in Costa Rica to consult with the Costa Rica National Biodiversity Inventory (INBio) on an initiative with The Nature Conservancy regarding a project on the Osa Peninsula. The project is entitled “Programa de Monitoreo Ecológico para la evaluación de la efectividad de las estrategias de conservación en el Área de Conservación Osa”. It is a 10 year monitoring project in and around two national parks to determine if water quality and plant and animal biodiversity are being maintained, or to detect declines in these values if they are occurring. Dr.



Habitat of rare mayflies on upper Río Tigre

Flowers’ specific role was to assist the water quality monitoring team by helping with the identification of sampling sites and problematic specimens and, o c c a s i o n a l l y assisting with field sampling and data collection. On this trip he flew down to the Osa Peninsula

and joined Socorro Ávila and Eida Fletes, two members of the Costa Rican field team who live in the area. They visited 17 sites over the next 10 days, taking invertebrate and water samples. Although there had been heavy rains a few days earlier, the weather was compliant and they were able to get to all the sampling sites. After returning to San José, Dr. Flowers met with Manuel Zumbado and Vilma Obando, project managers of the INBio-TNC project, to review progress and to plan activities for the coming year. He anticipates continued involvement in workshops for the local communities, which are tentatively scheduled for the end of 2008 or early 2009. One of the very interesting outcomes of the trip was the discovery in several of the sites of an undescribed mayfly genus. Over 20 years ago a graduate student of Dr. Bill Peters (FAMU) had discovered specimens belonging to this unknown genus in the western Amazon, but had never published the discovery. Dr. Flowers plans to work with Eduardo Dominguez in Tucumán to work out the biology and taxonomy of the group and hopefully publish by the end of the year. [Funding: USDA CSREES/TNC; Contact: Wills Flowers]



Collecting on upper Río Drake



Young Grevin Porras getting acquainted with the local aquatic biodiversity

The Economic Impact of Cogongrass on Private, Non-industrial Forest Owners in North Florida.

This new research is aimed at assessing the economic impact of cogongrass on private, non-industrial forest owners in North Florida. The study will document the direct economic impact of cogongrass on: lost forest inventory resulting from increased fire damage, reduced forest regeneration and productivity, and other collateral impacts related to the forest and its dependant activities. These impacts will be measured as both lost timber inventory (actual and potential), reduced forest-dependent activities and any costs related to the control and/or removal of cogongrass. The estimates of direct economic impact will be applied to an input/output economic model to extrapolate the indirect and induced effects of these losses to the economy at large. The project is at the data collection stage. [Funding: USDA-APHIS, Contact: Dr. Michael Thomas; Mr. Nandkumar Divate M.S. Student]

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Extension and Outreach Activities

Invited Symposia / Seminars / Presentations

Bloem, S., K.A. Bloem, S.D. Hight, J.E. Carpenter, S. Dom, M. Sarvary, H. Zimmerman. Understanding the factors that influence the geographical expansion of *Cactoblastis cactorum* in non-native habitats. Symposium: Sampling and Modeling the Spatial Responses of Insects across Spatial Scales, International Congress of Entomology, Durban, South Africa. 6-12 July 2008.

Carpenter, J.E., S.D. Hight, A.B. Rivera, and R.Z. Rodriguez. Eradication and containment of *Cactoblastis cactorum* in Mexico and the United States. International Congress of Entomology, Durban, South Africa. 6-12 July 2008.

Floyd, J., K.A. Bloem, S. Bloem, J.E. Carpenter, S.D. Hight, A.B. Rivera, and W. Enkerlin. An International cooperative effort to protect Opuntia cactus resources in the American Southwest and Mexico from the South American cactus moth, *Cactoblastis cactorum*. International Congress of Entomology, Durban, South Africa. 6-12 July 2008.

Haseeb, M., M.T.K. Kairo and T.W. Walters. Electronic identification resources and their importance in securing food safety in the United States. Research poster presented at AEA/ARD (Association of Extension Administrators/Association of Research Directors, 1890 Land Grant Conference, held in Memphis, TN, USA (8-11 June 2008).

Hight S.D. 2007. *Cactoblastis cactorum* sterile insect technique validation study results. International *Cactoblastis cactorum* Conference, Phoenix, AZ. 7-10 May 2007.

Hight S.D. and J.E. Carpenter. Development of the sterile insect technique to manage an invasive pest, *Cactoblastis cactorum*, attacking prickly pear cactus in Quintana Roo, Mexico, and Southeastern USA. Symposium: Biological Control of Weeds throughout the Americas, XXX Congreso Nacional de Control Biológico, Control Biológico Sin Fronteras, Mérida, México. 11-15 November 2007.

Hight S.D. and J.E. Carpenter. Research Update for *Cactoblastis cactorum* Sterile Insect Technique Program.: APHIS Operational Program Planning Meeting, Gainesville, FL. 16 October 2007.

Hight S.D., J.E. Carpenter, S. Bloem, K.A. Bloem, and J. Floyd. Development of control tactics against the invasive cactus moth, *Cactoblastis cactorum*, in North America. International Congress of Entomology, Durban, South Africa., 6-12 July 2008.

Hight S.D., J.E. Carpenter, S. Bloem, K.A. Bloem. Turning the tide - using the sterile insect technique to mitigate an unwanted weed Biocontrol agent. XII International Symposium on Biological Control of Weeds, La Grande Motte, France. 22-27 April 2007.

Paini, D., J. Funderburk, C. T. Jackson and S. R. Reitz. Competitive exclusion of a worldwide invasive pest by a native. Quantifying competition between two phytophagous insect on two host plant species. Ecological Society of America, San Jose, CA.

Reitz, S., G. Maiorino, L. Ritchie, S. Olson, R. Sprenkel, A. Crescenzi, M.T. Momol. 2007. The effects of plant essential oils and particle films on tomato spotted wilt and thrips in tomatoes. American Phytopathological Society, San Diego, CA. Phytopathology 97:S98

Reitz, S.R. 2007. A new age approach for management of tomato spotted wilt on tomatoes? Florida Phytopathological Society, Quincy, FL. May 2007.

Reitz, S.R. 2007. Do Little Differences in Little Things Matter? Ecology and Management of Thrips and Tospoviruses. Clemson University, Clemson, SC. November 2007.

Reitz, S.R. 2007. New Approaches for the Management of Thrips and Tomato Spotted Wilt. Gadsden County Tomato Forum, Quincy, FL. November 2007.

Shapiro, J.P., S. R. Reitz, J. Thomas and P. D. Shirk. 2007. Optimizing nutrition of *Orius insidiosus* for rearing and distribution. Association of Natural Biocontrol Producers and the International Organization for Biological Control (ANBP / IOBC), Montreal, CA.

CBC at the 90th Annual Meeting of the Florida Entomological Society, Sarasota, FL - July 15-18, 2007.

Shapiro, J.P., S. R. Reitz, P. D. Shirk and S. M. Ferkovich. 2007. Nutrition for optimal predatory performance of adult female *Orius insidiosus*.

Legaspi, J. C. Life table analysis for *Cactoblastis cactorum* immatures and female adults under five constant temperatures.

Haseeb, M. and M.T.K. Kairo. Identification tool for weevil biological control agents of aquatic and terrestrial weeds in the United States and Canada.

CBC at the 55th Annual Meeting of the Entomological Society of America, San Diego CA - December 8-12, 2007.

Abanja, R.N. and Kanga, L.H.B. 2007. Investigations of insecticide tolerance allele frequencies in *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae)

Haseeb, M. and C.W. O'Brien. Classical taxonomy and expert information systems: systematics in the modern world.

Kanga, L.H.B. and Abnaja, R. 2007. Monitoring and mechanisms of resistance to organophosphorus and pyrethroid insecticides in *Varroa destructor*, the ectoparasite of honey bee, *Apis mellifera*.

Legaspi, J. C. and I. Baez. Population dynamics of the cactus moth, *Cactoblastis cactorum*, in Florida.

Paraiso, O. and Kairo, M.T.K. 2007. Can risk communication during the importation of entomophagous biological control agents be improved?

Reitz, S.R. 2007. Does Bacterial Disease Control Affect UV Reflective Mulch for Thrips and Tospovirus Control in Tomatoes? Symposium on Integrating Integrated Pest Management.

Shapiro, J.P., P. D. Shirk, J. M. Gruters-Thomas and S. R. Reitz. 2007. Care and feeding of *Orius insidiosus* (Hemiptera: Anthocoridae): Assessing the impact of diet on predation following adult female eclosion.

CBC at 82nd Annual Meeting of the South Eastern Branch of the Entomological Society of America, Jacksonville, FL. March 2-5, 2008.

Abanja, R.N. and L.H.B Kanga. Investigations of insecticide tolerance frequencies in *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae).

Hix, R. L., M.T. Kairo and S. Reitz 2008. Does secondary plant metabolism provide a mechanism for plant defenses in the tropical soda apple *Solanum viarum* (Solanales: Solanaceae) against the beet armyworm *Spodoptera exigua* and southern armyworm *S. eridania*?

Kanga, L., C. Gracia and J. Cascino. 2008. Development of an effective and user-friendly method to control Varroa mites in colonies of honey bees.

Kairo, M.T.K. and M. Haseeb. 2008. In search of patterns of insect invasion: a look at selected insect taxa.

Legaspi, J. C., I. Baez and K. Marshall, Jr. 2008. Comparative phenology of *Cactoblastis cactorum* and *Melitara prodenialis* (Lepidoptera): pests of cactus in Florida.

Paraiso, O., M.T.K. Kairo and S. Bloem. How can we improve risk communication during the importation of entomophagous biological control agents?

CBC at 91st Annual Meeting of the Florida Entomological Society, Jupiter, FL. July 13-16, 2008.

Haseeb, M., C. W. O'Brien and M.T. K. Kairo, 2008. Identification tool for the potentially invasive weevil species from the Caribbean countries to the United States.

Medal, J., N. Bustamante, W. Overholt, R. Diaz, P. Stansly, D. Amalin, A. Roda, K. Hibbard, R. Gaskalla, B. Sellers, S. Hight and J. Cuda, 2008. Biological control of tropical soda apple in Florida: current status.

Reitz, S.R. 2008. Biology and ecology of the Western flower thrips (Thysanoptera: Thripidae): the making of a pest.

CESTA Career Fair. 2008. Sponsored and organized by the CESTA, FAMU held on 19-20 February 2008.



CBC at the CESTA Career Fair from L-R, R. Abanja, M. Haseeb, J. Legaspi, N. Divate, O. Paraiso and E. Kariuki.

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CBC at the CESTA Research Forum held in Tallahassee, FL (25-26 October 2007).

- Abanja, R. And Kanga, L.H.B. 2007. Investigations of Insecticide Tolerance Allele Frequencies in *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae). 15.
- Flowers, R.W. 2007. Off shore and sea shore: How the idiosyncratic cosmopolitan distribution of the mayfly *Choroterpes* (Ephemeroptera: Leptophlebiidae) echoes the pan-tethyan marine province. 18.
- Francis, A. and Kairo, M.T.K. 2007. Unravelling the bio-ecological mysteries of the passionvine mealybug, *Planococcus minor* (Maskell) a serious invasive pest threat to the United States. 18.
- Hansen, E and Reitz, S.R. 2007. Observed behaviour of *Frankliniella* thrips and their fecundity
- Haseeb, M and Kairo, M.T.K. 2007. Implications of an expert information system to manage aquatic and terrestrial weeds in the United States and Canada.
- Hight, S.D., Carpenter, J.E. Bloem, S., Bloem, K.A. and Floyd, J.P. 2007. *Cactoblastis cactorum* sterile insect technique validation study results.
- Hix, R.L., Kairo, M.T.K. and Reitz, S.R. 2007. Does Secondary Plant Metabolism Provide a Mechanism for Plant Defenses in weedy Nightshade Plants?
- Kanga, L.H.B., Jones, W. And Garcia, C. 2007. Efficacy of strips coated with *Metarhizium anisopliae* (Deuteromycetes: Hyphomycetes) for control of *Varroa destructor* (Acari: Varroidae) in colonies of *Apis mellifera* (Hymenoptera: Apidae) in Texas and Florida. 29.
- Legaspi, J.C and Ignacio, B. 2007. Intercropping sunflower varieties with bell pepper: Effect on populations of the minute pirate bug, *Orius insidiosus* and thrips. 30.
- Paraiso, O., Kairo, M.T.K. and Bloem, S. 2007. Risk communication and the entomophagous biological control agents permitting process. 35
- Sims, K., Funderburk, J. Reitz, S.R. and Boucias, D. 2007. Nematode parasitism reduces both the feeding of *Frankliniella fusca* and transmission of tomato spotted wilt virus. 41
- Yearby, E.L., Stuart R. Reitz, Joseph E. Funderburk, Julianne Stavisky, Steve M. Olson, and M. Timur Momol 2007. Integrated management tactics for *Frankliniella* thrips in field grown pepper. 45



Eurhinus magnificus a new introduction to Florida

Entomology Outreach

Raphaël Abanja and Jan Peters getting young children to appreciate insects in Madison county.



Agriculture Science Day for Fairview Middle School students, CESTA-FAMU, Center for Viticulture and Small Fruit Research, April 30, 2008



John Mass (CBC) showing to Fairview Middle School Students the pheromone trap for capturing cactus moth

Two new projects focusing on Bio-security (cont'd. from page 1)

The first project will develop a prototype electronic commodity-based identification resource for pests using cultivated palms as a model. The project will also provide opportunities for graduate training, experiential learning opportunities for undergraduates, and a chance to update and revamp the curriculum in systematic entomology. The investigating team for this project includes Drs. Moses Thairu Kairo, Muhammad Haseeb, and Ralph Wills Flowers. The second project aims to support the development of a regulatory plant science curriculum at FAMU. Using modern technology for long distance delivery of selected courses, the project will increase the scope of teaching at FAMU. Components of the project include: curriculum design and delivery, and provision of hands-on experiential learning opportunities for students and faculty. Currently, few institutions offer training in regulatory plant science and none of these institutions are focused on training minority students. The project team includes Drs. Kairo and Lambert Kanga from FAMU and Stephanie Bloem, USDA-APHIS. The two projects involve cooperation with the USDA Animal and Plant Health Inspection Service, Center for Plant Health Science and Technology, Florida Department of Agriculture, University of Florida and North Carolina State University.

Workshops

Developing a consensus on the best way to develop commodity based tools using cultivated palms as a model

The Center for Biological Control, in cooperation with the United States Department of Agriculture, Animal Plant Health Inspection Service (APHIS), CPHST organized a one-day workshop entitled "Developing a Lucid Identification Resource for Ornamental Palm Pests and Diseases." The workshop was held on January 9, 2008, at the FAMU Teleconference Center. Twelve participants attended including: Moses Kairo, Muhammad Haseeb, George Marshall, and Will Flowers (CBC, FAMU); Manuel Pescador, Andy Rasmussen, and Lambert Kanga; (FAMU-Entomology); Melinda Sullivan (CPHST - CAPS); Amanda Hodges (UF - SPDN); Cal Welbourn (FL - DPI); Julieta Brambila (PPQ - NIS); and Monica Elliott (PPQ, CAPS). Dr. Terrence Walters (USDA, CPHST, Fort Collins, Colorado) and Dr. Julia Scher (USDA, CPHST, IT, Sacramento, California) delivered the instructions on Lucid-based tools, including brief lectures on how to use resources to design, develop, and deploy commodity-based tools on the internet and CDs. Discussions from this first meeting were further advanced at a second workshop held at Ft. Lauderdale Research and Education Center (FLREC), Davie, FL. It was organized by USDA, APHIS, CPHST and FLREC, University of Florida. This workshop brought together for the first time, the Lucid developers and collaborators involved in the creation of Lucid resource entitled "Pests and Diseases of Cultivated Palms from the United States and Caribbean". The workshop was attended by Moses Kairo and Muhammad Haseeb (CBC, FAMU), Amanda Hodges (IFAS-UF, SPDN), Greg Hodges, Patti Anderson and Cal Welbourn (FDACS, DPI), Ian Maguire, Monica Elliott, Tim Broschat and Bill Howard (IFAS, UF) and Terrence Walter & Julia Scher (USDA, APHIS, PPQ). Critical decisions on the content and responsibilities of the different collaborators were made at this workshop.



Workshop held in Tallahassee, Florida (9-10 January 2008).



Palm Lucid Workshop II held at Davie, FL, (June 3, 2008).

Student Opportunities

GRADUATE RESEARCH ASSISTANTSHIP: The Center for Biological Control, 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 includes: development of electronic identification keys for insects, research on insect ecology especially in the context of invasive species etc.

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: Moses T.K. Kairo, e-mail: Moses.Kairo@FAMU.EDU.



Beautiful but invasive, *Eurhinus magnificus* was first reported in Florida in 2002 and appears to be established in South Florida.

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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