# USDA-ARS
# Mid South Area

## SOUTHERN INSECT MANAGEMENT RESEARCH UNIT

## CRIS PROJECT

**Control of Tarnished Plant Bugs by Biocontrol and Other Methods**

**PROJECT INVESTIGATORS**

Randall Luttrell
**Maribel Portilla (Project Leader)**

## Mission

*The mission of the Southern Insect Management Research Unit (SIMRU) is to generate new knowledge of arthropod pest biology, ecology and management and integrate this knowledge into contemporary farming systems that will promote economical and environmentally stable pest management practices for the southern U.S.*

*The vision of SIMRU is to be a recognized center of innovation for negating agricultural pest problem through deployed scientific knowledge of pest biology, ecology and management options.*

## CRIS PROJECT

Effect of Resistance on Insect Pest Management in Transgenic Cotton

**PROJECT INVESTIGATORS**

Clint Allen
Nathan Little
Randall Luttrell
Katherine Parys
**OP Perera (Project Leader)**
Maribel Portilla

## CRIS PROJECT

**Insecticide Resistance Management and New Control Strategies for Pests of Corn, Cotton, Sorghum, Soybean, and Sweetpotato**

**PROJECT INVESTIGATORS**

**Clint Allen (Project Leader)**
Randall Luttrell
Katherine Parys
OP Perera
Yu Cheng Zhu

## WELCOME
## 2015 SUMMER EMPLOYEES

- Cadarius Cannon
- Christopher Brent
- Dillon Robinson
- Emily Bodin
- Gerard Winters
- Jacob Smith
- Jana Slay
- Jaret Reister
- John A. Coleman
- John Wiltcher
- Johnathan Clerk-Beamon
- Kaleb Murry
- Kenneth Wells
- Kyle Scott
- Mamadou Fadiga
- Manuela Jojoa
- Marcus Cannon
- Megan Holley
- Mi'Shayla Johnson
- Nicholas Manus
- Raksha Chatakondi
- Robert Adams
- Robert Hurt
- Russell Godbold
- Sariah Warren
- Severino Signa
- Shawnee Gundry
- Shundalyn Moore

## Congratulations to SIMRU and Dr. Luttrell

Delta Council honored Dr. Luttrell and SIMRU on Outstanding Contributions to Research





## Welcome Aboard Priya Chatakondi

Please join us in welcoming Ms. Priya Chatakondi to the Southern Insect Management Research Unit (SIMRU) and the USDA ARS Stoneville, Mississippi Location. Ms. Chatakondi joined SIMRU as a student employee while pursuing a degree at the Moorhead Community College and continued to work as a Biological Science Technician after graduation. Recently she was selected for a 13-month term appointment to work on insect husbandry and genetics research in Dr. O. P. Perera's laboratory. She has four years of experience in maintaining insect colonies with specific traits, bioassays, and nucleic acid extractions. Ms. Chatakondi's office is located in 302A in Bldg. 1 of the Jamie Whitten Delta States Research Center, Stoneville, Mississippi.

## 80th Annual Meeting of Delta Council

Luttrell Recognized for Outstanding Contributions to Research

Dr. Randy Luttrell of Stoneville was honored recently at the 80th Annual Meeting of Delta Council as the 2015 recipient for Outstanding Contributions to Research. In announcing his award, Delta Council President Walton Gresham said, "When it comes to the management of insect pests of row crops such as cotton, corn, and soybeans, there is no one more respected in the Nation than Dr. Luttrell and we are pleased that he is the recipient of our recognition for Outstanding Contributions to Research. A long-time leader in entomology circles, Dr. Randy Luttrell is the Research Leader of the USDA's Southern Insect Management Research Unit in Stoneville and recognized worldwide for his scientific horsepower."

## Welcome Aboard Dr. Mathew Seymour

Please join us in welcoming Dr. Mathew Seymour to the USDA, ARS Southern Insect Management Research Unit (SIMRU)y. Dr. Seymour joined SIMRU as a Research Entomologist (Research Associate) in bioinformatics and is working closely with Dr. O. P. Perera's group to study insect genetics. He is trained as an ecologist and evolutionary biologist with specific interest in spatial ecology, evolutionary biology, and eco-evolutionary dynamics and has acquired coding skills in R and Python. He obtained B.S. degrees from the University of Wyoming in wildlife management and environment natural resources. Additional research experience includes serving as a a field and lab technician for multiple labs at the University of Wyoming where he worked on a diversity of ecological projects, including pocket gopher and American marten trapping and population genetics of river otters and harbor seals. He obtained a M.S. degree at Hólar Univeristy College, Iceland, studying the ecology and evolution of three spine sticklebacks across the Belgjarskógur, a wetland pond system in Northern Iceland. Recently, he obtained a PhD at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland, studying the effects of river network structure on biodiversity using a series of protist microcosm experiments and Swiss-wide biodiversity monitoring data of freshwater macroinvertebrates. Dr. Seymour's office is 309 in Bldg. 1 of the Jamie Whitten Delta States Research Center, Stoneville, Mississippi.

## Congratulations Yolanda Harvey On Fifteen Years of Service

## FAREWELL AND BEST WISHES CELEBRATION HONORING CATHY WARREN

NEW PUBLICATION
CONGRATULATION
Dr. O.P. Perera

**Generation of a Transcriptome in a Model Lepidopteran Pest, Heliothis virescens, Using Multiple Sequencing Strategies for Profiling Midgut Gene Expression**

Omaththage P. Perera, Kent S. Shelby, Holly J. R. Popham, Fred Gould, Michael J. Adang, Juan Luis Jurat-Fuentes

PLOS ONE DOI:10.1371/journal.pone.0128563

**ABSTRACT:** Heliothine pests such as the tobacco budworm, Heliothis virescens (F.), pose a significant threat to production of a variety of crops and ornamental plants and are models for developmental and physiological studies. The efforts to develop new control measures for H. virescens, as well as its use as a relevant biological model, are hampered by a lack of molecular resources. The present work demonstrates the utility of next-generation sequencing technologies for rapid molecular resource generation from this species for which lacks a sequenced genome. In order to amass a de novo transcriptome for this moth, transcript sequences generated from Illumina, Roche 454, and Sanger sequencing platforms were merged into a single de novo transcriptome assembly. This pooling strategy allowed a thorough sampling of transcripts produced under diverse environmental conditions, developmental stages, tissues, and infections with entomopathogens used for biological control, to provide the most complete transcriptome to date for this species. Over 138 million reads from the three platforms were assembled into the final set of 63,648 contigs. Of these, 29,978 had significant BLAST scores indicating orthologous relationships to transcripts of other insect species, with the top-hit species being the monarch butterfly (Danaus plexippus) and silkworm (Bombyx mori). Among identified H. virescens orthologs were immune effectors, signal transduction pathways, olfactory receptors, hormone biosynthetic pathways, peptide hormones and their receptors, digestive enzymes, and insecticide resistance enzymes. As an example, we demonstrate the utility of this transcriptomic resource to study gene expression profiling of larval midguts and detect transcripts of putative Bacillus thuringiensis (Bt) Cry toxin receptors. The substantial molecular resources described in this study will facilitate development of H. virescens as a relevant biological model for functional genomics and for new biological experimentation needed to develop efficient control efforts for this and related Noctuid pest moths.

## JUNE
## BIRTHDAYS CELEBRATION

Kaleb (June 10)
Nathan (June 12)
Kenya (June 15)
Dillion (June 25)
Donny (June 26)

NEW PUBLICATION
CONGRATULATION
Dr. Yu Cheng Zhu

**Evidence of multiple/cross resistance to Bt and organophosphate insecticides in Puerto Rico population of the fall armyworm, Spodoptera frugiperda**

Yu Cheng Zhu, Carlos A. Blanco Maribel Portilla, John Adamczyk, Randall Luttrell, Fangneng Huang

Pesticide Biochemistry and Physiology 122 (2015) 15–21 www.elsevier.com/locate/pest

**ABSTRACT:** Fall armyworm (FAW) is a damaging pest of many economic crops. Long-term use of chemical control prompted resistance development to many insecticide classes. Many populations were found to be significantly less susceptible to major Bt toxins expressed in transgenic crops. In this study, a FAW strain collected from Puerto Rico (PR) with 7717-fold Cry1F-resistance was examined to determine if it had also developed multiple/cross resistance to non-Bt insecticides. Dose response assays showed that the PR strain developed 19-fold resistance to acephate. Besides having a slightly smaller larval body weight and length, PR also evolved a deep (2.8%) molecular divergence in mitochondrial oxidase subunit II. Further examination of enzyme activities in the midgut of PR larvae exhibited substantial decreases of alkaline phosphatase (ALP), aminopeptidase (APN), 1-NA- and 2-NA-specific esterase, trypsin, and chymotrypsin activities, and significant increases of PNPA-specific esterase and glutathione S-transferase (GST) activities. When enzyme preparations from the whole larval body were examined, all three esterase, GST, trypsin, and chymotrypsin activities were significantly elevated in the PR strain, while ALP and APN activities were not significantly different from those of susceptible strain. Data indicated that multiple/cross resistances may have developed in the PR strain to both Bt toxins and conventional insecticides. Consistently reduced ALP provided evidence to support an ALP-mediated Bt resistance mechanism. Esterases and GSTs may be associated with acephate resistance through elevated metabolic detoxification. Further studies are needed to clarify whether and how esterases, GSTs, and other enzymes (such as P450s) are involved in cross resistance development to Bt and other insecticide classes.

## Gleaning Sweet Potatoes for a Good Cause

After grading and collecting research data, Larry Adams and his crew fill sweet potato sacks for delivery to the Leland Food Pantry in Leland, Mississippi. There, the freshly dug sweet potatoes will be distributed to low-income families and other needy members of the community.

Adams, an entomologist with USDA's Agricultural Research Service (ARS) in Stoneville, Mississippi, figures the potatoes will be made into any number of tasty dishes—from casseroles and pies to chips, gratin and fries.

North Carolina, followed by Mississippi, Louisiana, California and Texas, produces the lion's share of America's $500 million sweet potato crop, considered a "nutritional powerhouse" food for its high content of beta carotene, vitamins, minerals and fiber.

Adams's sweet potatoes come from small field plots that he maintains in support of research led by Randy Luttrell at ARS's Southern Insect Management Research Unit in Stoneville. The plots, which Adams establishes in May using small shoots called "slips," are integral to Luttrell's research on protecting the crop from harm caused by insect pests such as wireworms and tiny wormlike organisms called "nematodes."

Luttrell's projects run the gamut from evaluating different insecticide regimens prior to transplanting the slips to collecting data on the performance of new potential sweet potato varieties. Once that data are collected and analyzed, the plots are cleared in preparation for the next season's research.

But a few years ago, Adams got to thinking more about the large amount, and good condition, of the sweet potatoes that often remained in the plots after the research had ended.

"I thought, we're getting ready to destroy all these sweet potatoes, that's a waste!" So, he called the operator of the Leland Food Pantry and asked her if she wanted the sweet potatoes. She did, and Adams and a group of volunteers from the lab dug up the potatoes, put them in 12- to 15-pound sacks, and drove their bounty to the pantry.

The sweet potatoes were a hit, so he donated the following year's harvest as well. Adams estimates the lab donated 150 pounds of sweet potatoes this past November and 400 pounds the year before. This year's crop is in the ground for the coming fall season. We hope to donate a good-sized harvest again to this community organization. Regardless of the size of the harvest, "they go quickly," he says.