SOUTHERN INSECT MANAGEMENT RESEARCH UNIT

USDA-ARS
Mid South Area

Mission

- *The mission of the Southern Insect Management Research Unit (SIMRU) it 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

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

PROJECT INVESTIGATORS

- Clint Allen
- **Ryan Jackson (Project Leader)**
- Randall Luttrell
- OP Perera
- Gordon Snodgrass
- Yu Cheng Zhu

CRIS PROJECT

Control of Tarnished Plant Bugs by Biocontrol and Other Methods

PROJECT INVESTIGATORS

- Randall Luttrell
- Maribel Portilla
- **Gordon Snodgrass (Project Leader)**

CRIS PROJECT

Effect of Resistance on Insect Pest Management in Transgenic Cotton

PROJECT INVESTIGATORS

- Clint Allen
- Ryan Jackson
- Randall Luttrell
- **OP Perera (Project Leader)**

NEW PUBLICATION *CONGRATULATIONS*
Dr. OP Perera

ARTICLE IN PRESS

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The complete genome sequence of a single-stranded RNA virus from the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois)

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ABSTRACT

The complete genome sequence of a single-stranded RNA virus infecting the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), was identified by sequencing cDNA prepared from insects collected from the Mississippi Delta. The 9655 nucleotide positive-sense single-stranded RNA genome of the *L. lineolaris* single-stranded RNA virus (LylLV-1) contained a single open reading frame of 8958 nucleotides encoding a 2986 amino acid genome polypeptide. The open reading frame was flanked by untranslated regions of 603 and 69 nucleotides at the 5′- and 3′-ends of the genome, respectively. Database searches and homology based modeling was used to identify four capsid proteins (VP1–VP4), helicase/AAA ATPase, cysteine protease (CSP), protease 2A, and the RNA directed RNA polymerase (RdRp). In addition, a region with weak similarity to the eukaryotic structural maintenance of chromosome (SMC) domain was identified near the amino-terminal of the polyprotein and adjacent to the VP1 domain. The amino acid sequence of LylLV-1 was approximately 44.4% similar to that of sacbrood virus (SBV) of the honey bee. The genomic organization of both viruses showed remarkable similarity with the exception of highly divergent amino acid regions flanking fairly conserved structural and non-structural polypeptide regions. High similarity to the SBV genome and similarities in the genome organization and amino acid sequence with the viruses of the family *Iflaviridae* suggested that LylLV-1 was a novel member of this family. Virus particles were 39 nm in diameter and appeared to transmit vertically via eggs. Although this virus may only cause covert infections under normal conditions, the potential for using this virus in biological control of *L. lineolaris* is discussed.

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NEW PUBLICATION *CONGRATULATIONS*
Dr. Yu Cheng Zhu

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Down Regulation of a Gene for Cadherin, but Not Alkaline Phosphatase, Associated with Cry1Ab Resistance in the Sugarcane Borer *Diatraea saccharalis*

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Abstract

The sugarcane borer, *Diatraea saccharalis*, is a major target pest of transgenic corn expressing *Bacillus thuringiensis* (Bt) proteins (i.e., Cry1Ab) in South America and the mid-southern region of the United States. Evolution of insecticide resistance in such target pests is a major threat to the durability of transgenic Bt crops. Understanding the pests' resistance mechanisms will facilitate development of effective strategies for delaying or countering resistance. Alterations in expression of cadherin- and alkaline phosphatase (ALP) have been associated with Bt resistance in several species of pest insects. In this study, neither the activity nor gene regulation of ALP was associated with Cry1Ab resistance in *D. saccharalis*. Total ALP enzymatic activity was similar between Cry1Ab-susceptible (Cry1Ab-SS) and -resistant (Cry1Ab-RR) strains of *D. saccharalis*. In addition, expression levels of three ALP genes were also similar between Cry1Ab-SS and -RR, and cDNA sequences did not differ between susceptible and resistant larvae. In contrast, altered expression of a midgut cadherin (DsCAD1) was associated with the Cry1Ab resistance. Whereas cDNA sequences of DsCAD1 were identical between the two strains, the transcript abundance of DsCAD1 was significantly lower in Cry1Ab-RR. To verify the involvement of DsCAD1 in susceptibility to Cry1Ab, RNA interference (RNAi) was employed to knock-down DsCAD1 expression in the susceptible larvae. Down-regulation of DsCAD1 expression by RNAi was functionally correlated with a decrease in Cry1Ab susceptibility. These results suggest that down-regulation of DsCAD1 is associated with resistance to Cry1Ab in *D. saccharalis*.

NEW PUBLICATION *CONGRATULATIONS*
Dr. Clint Allen

Temporal and Spatial Distribution of *Helicoverpa zea* and *Heliothis virescens* (Lepidoptera: Noctuidae) Moths in Pheromone Traps across Agricultural Landscapes in Arkansas[1]

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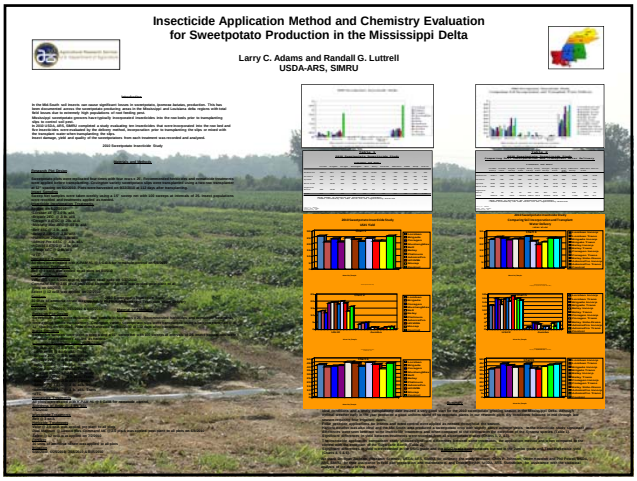
Abstract Pheromone trap captures of *Helicoverpa zea* (Boddie) and *Heliothis virescens* (F.) from 2002 - 2005 were used to examine the distribution of these species across a multiple crop environment in southeast Arkansas. The greatest number of *H. virescens* moths was collected during 2003, but densities were low compared with *H. zea* throughout the study. Overall, fewer *H. virescens* moths were captured next to Bt corn and Bt cotton than next to nonBt cotton and early-maturing soybean. A significant relationship was not detected between pheromone trap captures of *H. virescens* and the percentage of these moths that fed on cotton as larvae. More *H. zea* moths were captured in traps located next to Bt corn and nonBt corn during the month of June than in traps located next to cotton, sorghum, or soybean, whereas traps located adjacent to early- and late-maturing varieties of soybean, Bt cotton, nonBt cotton, and grain sorghum captured greater numbers of moths than those traps located next to corn during July. Therefore, the distribution of *H. zea* appeared to be influenced by corn acreage during the month of June. Later in the season, this species was widely distributed across the agricultural landscape. Compared with 2 other regions of AR, fewer *H. zea* moths were captured during the month of June and more *H. virescens* moths were captured during August in Mississippi Co., an area of intense cotton production.

ESA INSECT PHOTO EXHIBITION
Submitted by Dr. Perera

- Spine-Legged Redbolt (R*hodothemis rufa*, Rambur 1842) is one of the 116 dragonfly species found in Sri Lanka.

- This photograph was accepted by the Nature Section of the 2011 National Insect Exhibition of the Entomological Society of America.



SIMRU Outreach
Thanks Les Price

- Les Price of SIMRU attend **The 16th Annual Farm Ed Day** in Memphis, TN on November 3, 2011.
- Since 2003 Les Price has volunteered as a presenter at the Farm Ed Day, a program designed to teach students and teachers about agriculture.
- The students and teachers are from a variety of schools both inner city public and private schools.

SIMRU Outreach (con't)
Thanks Les Price

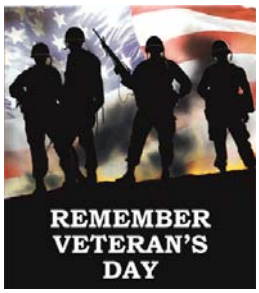
- Local farmers, government, and universities participate in the communication of the importance of agriculture in our daily lives. Some have included catfish displays, corn, cotton, soybeans, and various livestock pens including poultry cages.
- Les has used hissing cockroaches, insect collections and live honey bees as a part of explaining both the positive and negative impacts of insects in agriculture. In 2010 Les showed a pollen trap and the variety of pollens that bees collect. He then extracted a frame of honey.
- Les helps teachers with planning and initiating projects for students to learn about scientific inquiry. Les says the greatest aspect of his interaction is the stories of insect diversity in agrisystems, the pollinating bees and the communication that insects help to provide our food and fiber.

Veterans' Day November 11th

- Soldiers of the 353rd Infantry near a church at Stenay, Meuse in France, wait for the end of hostilities. This photo was taken at 10:58 a.m., on November 11, 1918, two minutes before the armistice ending World War I went into effect.
- November 1919, President Wilson proclaimed November 11 as the first commemoration of Armistice Day with the following words: "To us in America, the reflections of Armistice Day will be filled with solemn pride in the heroism of those who died in the country's service and with gratitude for the victory, both because of the thing from which it has freed us and because of the opportunity it has given America to show her sympathy with peace and justice in the councils of the nation."

Veterans' Day (con't) November 11th

- The United States Congress officially recognized the end of World War I when it passed a concurrent resolution on June 4, 1926, with these words:
- ***Whereas*** the 11th of November 1918, marked the cessation of the most destructive, sanguinary, and far reaching war in human annals and the resumption by the people of the United States of peaceful relations with other nations, which we hope may never again be severed, and ***Whereas*** it is fitting that the recurring anniversary of this date should be commemorated with thanksgiving and prayer and exercises designed to perpetuate peace through good will and mutual understanding between nations; and ***Whereas*** the legislatures of twenty-seven of our States have already declared November 11 to be a legal holiday: Therefore be it Resolved by the Senate (the House of Representatives concurring), that the President of the United States is requested to issue a proclamation calling upon the officials to display the flag of the United States on all Government buildings on November 11 and inviting the people of the United States to observe the day in schools and churches, or other suitable places, with appropriate ceremonies of friendly relations with all other peoples.



Veterans' Day (con't) November 11th

- An Act (52 Stat. 351; 5 U. S. Code, Sec. 87a) approved May 13, 1938, made the 11th of November in each year a legal holiday—a day to be dedicated to the cause of world peace and to be thereafter celebrated and known as "Armistice Day." Armistice Day was primarily a day set aside to honor veterans of World War I, but in 1954, after World War II had required the greatest mobilization of soldiers, sailors, Marines and airmen in the Nation's history; after American forces had fought aggression in Korea, the 83rd Congress, at the urging of the veterans service organizations, amended the Act of 1938 by striking out the word "Armistice" and inserting in its place the word "Veterans." With the approval of this legislation (Public Law 380) on June 1, 1954, November 11th became a day to honor American veterans of all wars.

SIMRU Thanksgiving Dinner

Monday, November 14, 2011
4th Floor Conference Room
11:30 a.m. to 12:30 p.m.

Thanksgiving Day November 24th

- In 1621, the Plymouth colonists and Wampanoag Indians shared an autumn harvest feast that is acknowledged today as one of the first Thanksgiving celebrations in the colonies.
- For more than two centuries, days of thanksgiving were celebrated by individual colonies and states.
- It wasn't until 1863, in the midst of the Civil War, that President Abraham Lincoln proclaimed a national Thanksgiving Day to be held each November.

NOVEMBER BIRTHDAYS CELEBRATION

Randy, Cathy, Yolanda, and Henry