

Developing and Implementing Field and Landscape Level Reduced-Risk Management Strategies for Lygus in Western Cropping Systems

An Interim Report on a Risk Avoidance and Mitigation Program grant

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Students (advisors): Frances Sheller (Jay Rosenheim)

Partner Organizations:

Arizona Pest Management Center

Cotton Incorporated Core Funding Program

Texas State Support Committee, Cotton Incorporated

California State Support Committee, Cotton Incorporated

New Mexico State University IPM Laboratory

Texas Tech University

University of California Statewide IPM Program

UC Davis Agronomy Farm

UC Shafter Research and Extension Center
UC West Side Research and Extension Center
USDA-ARS Arid Lands Agricultural Research Center
Maricopa Agricultural Center, University of Arizona
Yulex Corporation
Arizona Cotton Research and Protection Council
Agrochemical Industry Support (BASF, Chemtura, FMC, Valent)
USDA National Research Initiative program
Arid Southwest IPM Network

Target Audiences:

Professional Pest Control Advisors (PCAs), growers, agricultural industry representatives, Cooperative Extension, pesticide regulatory agencies, entomologists, IPM practitioners, Land Grant & USDA colleagues.

Outputs

I. Field Level: Yield/Damage/Thresholds

- Conducted over 20 field and lab experiments related to field-level Lygus damage to a variety of crops including upland cotton, seed broccoli, romaine, dry beans, chiles, lesquerella and guayule in CA, AZ, NM and TX. Experimental data are currently being analyzed, as well as 4-years of Lygus chemical control termination data in cotton from prior studies that will inform the development of grower guidelines.
- A preliminary Lygus threshold (based on preliminary work) for New Mexico cotton will be released in late 2007, the first such information available in NM.
- Took digital images from experimental romaine field for an electronic bulletin we plan to prepare to describe Lygus damage to fall romaine lettuce under desert growing conditions.
- Worked with a Pest Control Advisor in diagnosing and describing Lygus damage to “organic” lettuce.

II. Field Level: Insecticide Efficacy/Selectivity

- Conducted 4 series of field experiments related to determining insecticide efficacy, timing, and effect on natural enemies in cotton and dry beans in AZ and CA. This included small plot experiments to determine deployment options for selective reduced-risk Lygus control compounds in cotton and evaluations of control strategy impact on natural enemies in cotton.

III. Landscape Level

- About 10 large landscape level studies were conducted in AZ, CA and TX to determine Lygus presence and movement among crops and non-crop areas, including cotton, alfalfa, guayule, weeds and native plant communities. These data will lead to the development of landscape level guidelines for Lygus management.
- Landscape level sampling of cotton and surrounding crops and non-crop areas for Lygus and beneficial arthropods was conducted over large regions in 3 states (AZ, CA, TX), covering about 1,800 sq. miles (4,600 sq. km). Approximately 500 samples collected weekly during growing season will be analyzed to develop landscape level pest management guidelines.
- Lab studies were conducted to determine biotic and abiotic factors affecting Lygus movement.
- A series of six capture-release studies using protein markers were conducted to examine Lygus movement between crops in a cotton, lesquerella, guayule, and alfalfa agroecosystem. Assayed over 14,500 insect samples for 3 separate protein markers (n=43,400 ELISAs).

IV. Extension / Evaluation

- Researchers presented preliminary results, descriptions of research and RAMP objectives at a variety of meetings, including the 2007 Beltwide Cotton Conferences, 2 UC Extension cotton production meetings and at least 8 field day trainings (6 in CA, 1 in AZ). About 800 people were reached at all venues reported by project participants, including over 200 CA growers and over 200 Pest Control Advisors from cotton-producing states, and dozens of scientists and Extension personnel.
- We coordinated the Second International Lygus Symposium Pacific Grove, CA, April 15-19. This forum brought together researchers, Extension specialists and industry representatives to discuss Lygus research findings across a variety of crops in the US, Canada, Australia, Italy other countries. Ten out of 13 RAMP project PIs (and several collaborators) attended the meeting and many presented preliminary findings related to their RAMP research.
- Held a RAMP planning session at the Lygus Symposium to allow PIs and collaborators to formalize plans for collaborative experiments, project communications, outreach and evaluation related to the RAMP effort.
- Weekly updates on Lygus status were produced by UC Extension throughout the field season and distributed to ca. 150 growers and PCAs via MiteFax.

- Delivered Lygus management information to growers and pest management advisors at 4 field day demonstrations (35 participants)
- Presented results of on-going field studies on evaluation of the selectivity of reduced-risk approaches to Lygus control at the Second International Lygus Symposium (55 participants).
- PIs gave 9 presentations on landscape-level projects and results, reaching 203 growers, crop advisors, scientists and Extension personnel.
- Sweep sampling technique was discussed and taught to over 200 PCAs beltwide in a meeting format, as well as to over 200 PCAs in CA in a series of small mtgs. Demonstration and one-on-one teaching were done in TX with TX project leaders and technicians.
- Created home page on the APMC site for Lygus RAMP project information (<http://cals.arizona.edu/apmc/RAMP.html>).
- Established email listserv for project partners and used it to communicate on project progress and outcomes.
- Posted plant bug presentation by Peter Ellsworth on ACIS website (<http://ag.arizona.edu/crops/presentations/presentations.html>).
- Met with evaluation project team to develop plan for evaluation of Extension activities across all 4 states.
- Developed and implemented a RAMP activities and outcomes tracking matrix to collect information from PIs on research and Extension activities.
- Developed draft General Evaluation Instrument (GEI) for measuring changes in end-user knowledge and behavior and use of existing resources. This draft is currently being revised and finalized and will be implemented at Extension meeting and other venues starting in 2008.
- Published 13 RAMP-related Abstracts from the Second International Lygus Symposium, in Pacific Grove, CA, April 15-19 in the Journal of Insect Science.

Outcomes and Impacts

- One Arizona grower managed 1200 A of cotton late season with a reduced-risk insecticide based in part on this research and the pilot guidelines.

- Two Arizona PCAs reported using nymphs exclusively for timing Lygus chemical controls on cotton, overturning a long-standing practice of spraying based on Total Lygus and/or adult Lygus counts only.
- Carbine was used by the majority of Arizona PCAs who had to manage Lygus in 2007, replacing the standard in Lygus control, acephate. Secondary outbreaks were rare as a result, and 2007 may prove to have had the fewest number of foliar insecticides used in cotton statewide.

Leveraged Resources

Funding Agency	Lead PI	Related RAMP Project(s)	Amount
Cotton Incorporated	Ellsworth	Development of yield : density relationships for terminating chemical control in cotton	seed money prior to start of RAMP project
Cotton Incorporated Texas State Support	Parajulee	Boll Susceptibility to <i>L. hesperus</i> in TX cotton; Compensation of Lygus and fleahopper-induced fruit loss in cotton	\$25,000
Cotton Incorporated	Bundy	Economic injury evaluations for Lygus in New Mexico Cotton	\$9,000
Texas Tech University	Parajulee	Compensation of Lygus and fleahopper-induced fruit loss in cotton	\$13,000
Cotton Incorporated	Parajulee	Compensation of Lygus and fleahopper-induced fruit loss in cotton; Influence of non-cotton hosts, host preference, and inter-crop movement of Lygus on landscape-level dynamics	\$20,000
Cotton Incorporated	Goodell	Strengthening research and extension for Pima cotton; Influence of surrounding crops on Lygus infestation in cotton	\$6,500
UC Statewide IPM Program	Goodell	Strengthening research and extension for Pima cotton; Developing pest management guidelines for Lygus in eggplant; Influence of surrounding crops on Lygus infestation in cotton	\$5,000
Cotton Incorporated, California State Support	Godfrey	Evaluating efficacy of registered and experimental insecticides for Lygus management in cotton	15,000
Agrochemical Industry	Ellsworth	Determination of deployment options for reduced-risk and other effective chemistry for Lygus control in cotton	\$29,000

Agrochemical Industry	Naranjo / Ellsworth	Evaluation of the selectivity of reduced-risk approaches to Lygus control	\$14,000
CRIS Project # 5347-22620-017-00D	Blackmer	Influence of biotic and abiotic factors on Lygus movement	unknown
USDA-NRICGP	Rosenheim	Long-distance dispersal of Lygus and crop colonization from native plant overwintering sites	\$343,500
UC Statewide IPM Program	Rosenheim	Long-distance dispersal of Lygus and crop colonization from native plant overwintering sites	\$46,710
Cotton Incorporated	Rosenheim	Long-distance dispersal of Lygus and crop colonization from native plant overwintering sites	\$23,000
Arizona Pest Management Center	Fournier	Reaching Stakeholders with Project Outcomes: The Arizona Crop Information Site	\$3,000
Total Leveraged Funds			\$552,710

In-kind Support from:

New Mexico State University IPM Laboratory
UC Davis Agronomy Farm
UC Shafter Research and Extension Center
USDA-Agricultural Research Service
Yulex Corporation
UC West Side Research and Extension Center
University of Arizona Maricopa Agricultural Research Center
USDA-ARS Arid Lands Agricultural Research Center

Publications

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Project Modifications

McGuire changed positions after the grant application was submitted and will not be participating in this project. This has resulted in plans to drop one (unfunded) project that will not now be included in our outcomes. This was the development of a selective biopesticide for *Lygus*. David Kerns was added as a Principle Investigator in place of Vice-Leser at Texas A&M University.