

# FORUM

## Success in Controlling Some Cotton Pests Opens the Door to Others

The saying that nature abhors a vacuum could well apply to our nation's cotton fields and to the insects that infest them. While some insect pests are disappearing, others are moving into the spotlight. Efforts to eradicate the boll weevil in cotton over the years have been largely successful. The use of *Bt* cotton has also proved to be an effective way to control many caterpillars and beetles without the need for spraying broad-spectrum insecticides. Some 11.2 million acres of the 12 million acres of cotton planted in the United States in 2012 contained the *Bt* trait. These success stories have reordered the ranking of insect pests in many cotton fields, bringing to the forefront a long list of piercing-sucking insects, and at the top of that list are the lygus bugs.

While cotton growers are using less broad-spectrum insecticide these days, many of them must now spray more narrowly tailored insecticides specifically to combat lygus bugs. One type of lygus, the tarnished plant bug, *Lygus lineolaris*, is a particular problem for cotton growers in the Mid-South, while another type, the western tarnished plant bug, *L. hesperus*, is more of a threat in Arizona and California.

The stakes are high. Cotton and cottonseed had a combined farm value of \$7.5 billion in 2012. Insect-related crop damage and control costs are the lowest they have been in at least 33 years, but insects still cost cotton growers \$71 per acre in crop losses and control costs, according to the 2012 Cotton Insect Losses survey published by the

National Cotton Council. While lygus bugs aren't the only insects included in those cost figures, they are a major concern, ranking at the top of the survey's list of 33 insect pests. They cost growers about \$8 per acre to control, according to the survey conducted each year by Mississippi State University.

In this issue, you will read about efforts by Agricultural Research Service scientists to combat this onslaught. Studies done in Shafter, California, focus on the feeding habits of *L. hesperus* on the two species of cotton grown in the United States, American upland (*Gossypium hirsutum*) and American pima (*G. barbadense*), or extra-long-staple cotton. The research is designed to help growers determine when infestations have reached levels that require insecticide spraying. The article also describes research by ARS scientists in Maricopa, Arizona, focusing on two of *L. hesperus*'s survival mechanisms: its production of "heat shock proteins" to cope with high temperatures and its ability to go into diapause when winter approaches and day length becomes shorter. Knowing when plant bugs enter and break diapause and being able to predict when they begin to prepare for overwintering will allow growers to apply insecticides more efficiently.

ARS researchers are also working to find environmentally friendly ways to control lygus bugs in other cotton-growing areas. In Stoneville, Mississippi, for example, teams are probing the tarnished plant bug's biochemistry and genetics, studying the timing of its diapause patterns, developing ways to

manage pesticide resistance, and evaluating sterile insect control techniques. Lygus bugs also attack strawberries, alfalfa, and other crops, and the research could one day help control infestations in those crops.

The work also could translate into new methods for controlling other insect pests as well. That is critical because lygus bugs are part of a large group of piercing-sucking insects that cause tremendous damage. Beyond cotton, piercing-sucking insects are a particular concern because they vector major plant diseases, such as Pierce's disease in grapes and Huanglongbing, also known as "citrus greening," in citrus. Since just a few insects are usually enough to transmit such diseases, pest numbers have to be reduced to extremely low levels to stop disease transmission. It's a daunting challenge. But by studying the feeding habits, survival tactics, and genomes of lygus bugs, we could open doors to developing controls not only for these cotton pests, but for other crop pests as well.

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