

Protecting Cotton from Lygus Bugs

IPM program reduces insecticide, controls pest

By Susan McGinley

Arizona cotton growers still remember 1998, when Lygus bugs caused \$28 million in crop losses statewide. During that year, weather, crop, and insecticide use factors came together to create an ideal breeding ground for an exploding population of Lygus that reduced yields in some areas to as low as three quarters of a bale per acre. Growers in both central and southwestern Arizona suffered substantial crop losses, plus skyrocketing control costs for some totaling over \$150 per acre.

Since then, a concentrated effort among growers, University of Arizona researchers and extension agents, and commodity groups has helped control the insect that has been Arizona's number one pest on cotton for the last five years. Cotton management programs have focused on managing Lygus populations at less damaging levels while at the same time reducing the amount of pesticide applied. The long-term integrated pest management (IPM) strategy, based on early planting dates, regular monitoring for Lygus, reduced spraying based on insect thresholds, and other measures, has reduced both Lygus populations and insecticide applications while maintaining yields.

Lygus bugs, with their piercing-sucking mouthparts, damage cotton plants by puncturing and feeding on cotton squares and young bolls. Lygus-infested cotton can drop many of these squares, meaning there are fewer fruiting sites, while older bolls may produce discolored and lower quality lint. The plants grow tall and spindly, with more leaf trash and less lint, making it difficult to harvest what's left of the crop. Oil content of the seeds is reduced, along with their ability to germinate. All in all, cotton takes a beating from Lygus.

In Arizona's warm climate the insects can breed most of the year and move from one crop to another, attacking not only cotton, but also alfalfa, vegetables, seed crops and other plants. Control calls for careful planning and coordinated efforts among all of the growers in an area



Lygus nymphs on leaf. Larger stages are most damaging in cotton crops.

to prevent Lygus from migrating so readily. Among growers, typical control measures for Lygus in the past have involved tank mixing combinations of broad spectrum insecticides in the unfounded hope that this practice would give more control over the pest. Yet managing lygus and other crop pests successfully is a long-term process that includes more than chemical controls, according to Peter Ellsworth, an entomologist at the University of Arizona's Maricopa Agricultural Center, part of the College of Agriculture and Life Sciences (CALs).

"In 1992 we had a disaster with the whitefly in cotton," Ellsworth says. "By 1996 we had a solid, research-based pest management program in place that relegated the whitefly to minor pest status." With industry support, the College was able to focus its resources on developing an integrated pest management (IPM) package that responded to community needs. In 1997, funding from the Arizona Cotton Grower's Association and the Arizona Cotton Research and Protection Council enabled Ellsworth and a team of cooperating scientists to

begin a program addressing integrated Lygus management in cotton.

The continually updated, research-based cotton IPM program for Lygus includes field sampling, adherence to

2002 Faculty of the Year

Peter Ellsworth, an area IPM specialist for the University of Arizona College of Agriculture and Life Sciences, was honored with the 2002 Faculty of the Year Award in spring 2002. Presented by the Ag 100 Council, the award recognizes Ellsworth's outstanding work in cotton IPM over many years, and his key role in dramatically reducing pesticide use in Arizona Cotton. The Ag 100 Council is a group of agricultural producers dedicated to supporting CALS and improving agriculture in Arizona.



Lygus bugs reduce cotton yield. Note healthy plants on left, compared with Lygus-infested rows on the right.

insect threshold guidelines, and using the right compound for the job. Above all, it emphasizes avoiding pest pressures wherever possible. These measures have been incorporated into the larger cotton pest management program, and focus on reducing spray applications from mixed broad spectrum insecticides to more selective, targeted single insecticide applications. One key to the success of the program has been the accurate identification of single spray compounds that perform consistently against Lygus and knowing precisely when to use them.

Arizona extension cotton specialists have been able to teach and demonstrate to growers that these single compounds are as effective or even more effective than broad-spectrum combination sprays, and that when coupled with specific timing based on Lygus threshold levels, this practice helps reduce the risk of resistance in Lygus and other insects while minimizing negative impacts on beneficial insects.

The Cooperative Extension education component of the program has assisted growers in implementing this strategy during the last five cotton seasons through organized meetings, workshops, field demonstrations and applied research.

In response to this IPM program, in 1999 growers applied the fewest number of sprays statewide against Lygus

in cotton since 1993, and the fewest number of sprays overall against all pests in 25 years, thus reducing their costs per acre while protecting the environment. Over the past three years, more than 50% of the region's cotton growers have changed their chemical tactics against Lygus by switching to single compounds used strategically and at appropriate rates as part of an IPM system. This has resulted in a two-thirds reduction in the number of acres receiving spray mixtures for Lygus, while increasing effective rates by about 20%.

"Statewide we're averaging between one and three sprays for all our pests, for a long-season crop that's planted in March and harvested in October," Ellsworth says. "In the past, there was not a single cotton field in Arizona that escaped the need for sprays. Now it's not uncommon for every grower to have a set of fields that don't require insecticidal sprays."

Ellsworth has also been working with UA entomologist Yves Carriere and others on landscape approaches to crop management in a community in central Arizona. This technique uses geopositioned (satellite) crop maps and measured Lygus levels to help quantify the Lygus risk that a particular grower may face, and/or identify areas where sampling and control efforts should be concentrated.

"With another El Niño-influenced winter approaching, we will need to be prepared for conditions that foster Lygus populations area-wide," Ellsworth says. El Niño conditions produce excess winter moisture and encourage the lush growth of host plants that can sustain heavy insect populations.

In the future, the GIS mapping will assist greater coordination among growers of other crops as well.

"Agriculture in the desert West is becoming more diverse as growers attempt to adapt to a competitive global economy," Ellsworth says. "Producers plant a wider variety of crops to take advantage of niche markets, but also find they're attracting more insect problems that are often shared among multiple crops within communities."

In response to the needs of such cross-commodity growers, efforts began three years ago to control Lygus across multiple crops. Growers have begun meeting with extension personnel to develop cooperative plans involving cropping sequences and cultural controls to reduce damage from Lygus. Cooperative Extension has also responded by organizing a cross commodity research and outreach program (CROP) team dedicated to developing intercrop and interdisciplinary solutions for growers.

The cotton IPM program has been so successful in Arizona that CALS faculty exported the program on request to Mexicali, Mexico in 2001. Education efforts resulted in nearly 40% of the cotton growers there adopting threshold and other IPM guidelines for Lygus management. In December, 2002, Ellsworth met with cotton growers in Australia to assist them in developing a comprehensive cotton IPM program suited to their needs. ●

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