2003 BELTWIDE COTTON CONFERENCES, NASHVILLE, TN – JANUARY 6-10

CURRENT RESEARCH WITH LEPIDOPTERAN PESTS OF BOLLGARD COTTON

Jeff Gore, John Adamczyk, and Dick Hardee
USDA-ARS-SIMRU
Stoneville, MS
Roger Leonard
LSU AgCenter, Northeast Research Station
Winnsboro, LA

Abstract

Bollgard cotton provides acceptable control of the tobacco budworm, *Heliothis virescens* (F.). Consequently, fields planted with Bollgard cotton have not required insecticide applications to control tobacco budworms since this technology was released in 1996. Control of the bollworm, *Helicoverpa zea* (Boddie), is less than adequate under some situations. When intense oviposition occurs over extended periods of time, bollworm larvae often are observed feeding in white flowers and on small bolls under dried bloomtags. Insecticide applications that target bollworms are made to many Bollgard fields annually in the mid-South. Experiments were conducted in Louisiana and Mississippi to determine the impact of bollworms on genetically engineered Bollgard and Bollgard II cottons.

Experiment 1 (Louisiana)
To determine the numbers of fruiting forms injured by bollworms, first instar larvae were placed into white flowers on individual non-Bollgard, Bollgard, and Bollgard II cotton plants. The sites of infestation were marked with yellow "snap-on" tags. Seventy-two hours after infestation, the sites of infestation were examined to determine larval survival and fruiting form injury. Whole plants were then inspected every 48 hours and the numbers of bollworm injured fruiting forms were recorded. An individual bollworm injured a mean of 5.3 fruiting forms on non-Bollgard cotton during the completion of all larval instars. Those structures included 2.5 squares, 0.1 white flowers, and 2.7 bolls. On Bollgard cotton, bollworms injured a mean of 3.4 fruiting forms including 0.5 squares, 0.3 white flowers, and 2.6 bolls. Injury was lower on Bollgard II than on Bollgard or non-Bollgard cottons. Bollworms injured a mean of 1.1 fruiting forms on Bollgard II cotton. Injury included 0.03 squares, 0.1 white flowers, and 1.0 boll.

Experiment 2 (Mississippi)
To determine the effects of injury from bollworm larvae on maturity and yield of Bollgard cotton, plots of Bollgard cotton were planted in a 0.125 acre field cage. Plot size was 2 rows (40 inch centers) by 1 meter. Treatments were in a split-plot arrangement within a randomized complete block design. The main-plot factor was duration of infestation and included 1, 2, 3, or 4 weeks during the flowering stages of cotton plant development. Infestations were initiated when all plots across the test area averaged nodes above white flower (NAWF) 9 to 8. When infestations were terminated, plant growth stages averaged NAWF 7, 6, 5, and 4, respectively, for the 1, 2, 3, and 4 week durations of infestation. The sub-plot factor was level of infestation and included 0, 50, or 100 percent of white flowers. White flowers were artificially infested with first instar bollworm larvae from a laboratory colony collected from sweet corn during the previous generation. Larvae were placed into white flowers daily for each level of infestation and duration of infestation using small paint brushes. Chemical desiccants were not used before harvest so that maturity differences could be measured between treatments based on percentage of open bolls. Plots were harvested by hand. At the time of harvest, the numbers of mature (open), immature (closed), and injured bolls were recorded. Seedcotton weights were recorded. Bollworm larvae delayed maturity of Bollgard cotton, based on percentage of open bolls, when 100% of white flowers were infested with bollworms for one week compared to the non-infested plots. In addition, maturity of Bollgard cotton was significantly delayed when 50 or 100% of white flowers were infested with bollworms for ≥2 weeks compared to the non-infested plots. When 100% of white flowers were infested with bollworms for ≥2 weeks, the percentage of open bolls was lower than when 50% of white flowers were infested with bollworms. Compared to the non-infested plots, yield reductions were observed when 50 and 100% of white flowers were infested with bollworm larvae for all durations of infestation. Seedcotton yields in the non-infested plots ranged from 4590 to 5280 lbs. per acre. At the 50% level of infestation, yield reductions ranged from 13 to 31% compared to the non-infested yields. Yield reductions ranged from 22 to 37% at the 100% level of infestation. Yields were lower when 100% of white flowers were infested with bollworm larvae than when 50% of white flowers were infested with bollworm larvae for the 1 to 3 week durations of infestation. When white flowers were infested for 4 weeks with bollworms, yields were similar regardless of infestation level (50% vs. 100%). In conclusion, bollworms are capable of delaying maturity and reducing yields of Bollgard cotton. Insecticide applications should target bollworm larvae in white flowers, especially when larval populations persist over extended periods of time with the presence of newly oviposited eggs. This study will be repeated in 2003 to further refine injury levels. Also, Bollgard II will be included in the study to determine if bollworms can cause yield losses.