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PERFORMANCE OF BOLLGARD II ARKANSAS, 2003

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Abstract

Bollgard® II was compared to Bollgard® and conventional (i.e. non-Bt) cotton at the Hooker Farm in Jefferson County, AR in order to observe effectiveness against the Heliothine complex and various lepidopterous pests. In the trial Bollgard® II and Bollgard® performed marginally better when compared to conventional cotton with respect to square, bloom and boll damage. Bollgard® II performed significantly better than Bollgard® and conventional cotton with respect to soybean looper defoliation. Bollgard® and Bollgard® II statistically significantly out yielded conventional cotton. Further evaluations of Bollgard® II will be necessary to determine feasibility for Arkansas cotton production.

Introduction

Bollgard® cotton (*Gossypium hirsutum* (L.)) containing the CryIAc endotoxin of *Bacillus thuringiensis* Berliner, became commercially available to cotton producers in 1996. Since its introduction, Bollgard® varieties have provided cotton producers with effective control of tobacco budworm, *Heliothis virescens* F., in Arkansas. Control of bollworm, *Helicoverpa zea* (Boddie), and various other lepidopterous pest has achieved less reliable control and depended more on foliar insecticide treatments in conjunction with Bt variety (Lorenz et. al 2002).

Bollgard® II was developed to give additional control in the result of a second toxin, Cry2Ab. The purpose of this toxin was to increase control of lepidopterous pest and decrease the probability of population resistance of targeted pest. Previously conducted studies have shown Bollgard® II to be effective in controlling bollworm and soybean looper (Allen et. al 2000; Stewart et. al 2000; Ridge et. al 2000). The purpose of this study was to examine the efficacy of Bollgard® II to Bollgard® and to conventional cotton for control of lepidopterous pests. Additional observations were made to compare agronomic characteristics of these varieties.

Materials and Methods

The study was conducted on the Hooker Farm in Jefferson County, AR. The study was planted on May 23. The test consisted of a randomized complete block design with four replications. The four treatments were the varieties: Sure-Grow 521R (Non-Bollgard®), Sure-Grow 215 (Bollgard®), and Deltapine 424 (Bollgard® II) with each variety treated or untreated with a foliar insecticide. Each plot was 8 rows wide and 50 feet long. Insecticide used in the study was gamma-cyhalothrin (Karate Z). Applications were based on weekly samples taken from mid-June to early August. Application dates using Karate Z were July 9, July 23, and August 4. Sampling data included damaged terminal counts, damaged floral counts, and damaged fruit counts. Plots were machine picked November 3. All data were analyzed using Analysis of Variance and LSD (P=0.05).

Results and Discussion

Populations of tobacco budworm and cotton bollworm were lower than population in recent years. While pressure was evident in local area fields, the pressure in trial was somewhat lower.

Data showed no significant difference in terminal damage between Bollgard® II, Bollgard®, and conventional cotton. Data also showed no significant difference in square damage between Bollgard® II, Bollgard® and conventional cotton. However on the August 19 observation there was a significant statistical difference in the amount of large larvae (greater than 1/4 inch or greater than .635 cm) observed in conventional cotton when compared to Bollgard® II, and Bollgard®. Likewise on September 2 conventional cotton exhibited a significant difference in the amount of damaged fruit when compared to Bollgard® II and Bollgard® cotton. With pressure being lower in the trial data was unable to separate significantly.

On September 19 visual observations were conducted toward the end of a soybean looper, *Pseudoplusia includens* (Walker), moth flight and subsequent hatching. Data showed significant difference with respect to foliar feeding and defoliation percentage. Bollgard® II performed significantly better than Bollgard® and conventional cotton. Conventional cotton and Bollgard® did not significantly differ from one another.

Both Bollgard® and Bollgard® II out yielded conventional cotton, however Bollgard® II did not significantly out-yield Bollgard®. The automatic late season application treatment of Bollgard® II yielded statistically similar to conventional cotton, and therefor less than the threshold spraying of Bollgard® II.

Additional data is needed to determine the feasibility of Bollgard® II in Arkansas.

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References

Allen, C.T., M.S. Kharboutli, C. Capps, and L.D. Earnest. 2000. Effectiveness of Bollgard II cottton varieties against foliage and fruit feeding caterpillars in Arkansas. Pp. 1093-1094. *IN* Vol. 2:Proceedings Beltwide Cotton Conferences

Lorenz, G.M., D.R. Johnson, J. Hopkins, J. Reaper, A. Fisher, and C. Norton. 2002. Bollgard II performance in Arkansas, 2001. *IN* Proceedings Beltwide Cotton Conferences [CD-ROM].

Ridge, R.L., S.G. Turnipseed, and M.J. Sullivan. 2000. Field comparison of genetically modified cottons containing one strain (Bollgard) and two strains (Bollgard II) of *Bacillus thuringiensis kurstaki.* pp. 1057-1058. *IN* Proceedings Beltwide Cotton Conferences.

Steward, S.D. and K.S. Knighten. 2000. Efficact of BT cotton expressing two insecticidal protiens of *Bacillus thuringiensis* Berliner on selected caterpillar pests. pp. 1043-1048. *IN* Proceedings Beltwide Cotton Conferences.

Table 1. Seasonal Summary of Data – Jefferson County, AR, 2003.

Treatment	Seasonal Damaged Squares TOTALS	Seasonal Damaged Terminals TOTALS	Seasonal Damaged Blooms TOTALS	Seasonal Damaged Bolls TOTALS	Seasonal Larva TOTALS	Seasonal Eggs Terminal TOTALS	Yield lint lbs/a
Non-Bt	5.75 a	3.5 a	1.0 b	2.0 a	1.5 a	13.25 a	925.02 b
Bollgard	1.25 b	1.25 a	3.0 a	0 b	0.5 ab	10 ab	1022.21 a
Bollgard II (sprayed for Lep. on threshold)	0.75 b	0.5 a	0.5 b	0 b	0 b	4.75 b	1017.69 a
Bollgard II (automatic late season highest labeled rate pyrethroid)	1 b	1.25 a	0.5 b	1.25 ab	0.5 ab	5.75 ab	914.84 b

Table 2. Percent Defoliation by Soybean Looper.

Treatment	% Soybean Looper Defoliation
Non-Bt	22.5 a
Bollgard	26.3 a
Bollgard II (sprayed for Lep. on threshold)	2.5 b
Bollgard II (automatic late season highest labeled rate pyrethroid)	0 b