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2002 BOLLGARD II™ PERFORMANCE IN THE SOUTHEAST

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Abstract

Cotton containing Bollgard II™ insect protection was evaluated across the southeastern states in 2002. Lepidopteran insect pressure ranged from low to extreme across the testing locations. Bollgard II was compared to Bollgard® and non-*B.t.* cotton in all trials. Some trials included sprayed versus unsprayed subplots. Averaged across all locations, Bollgard II protected cotton sustained less than one percent boll damage from cotton bollworm (*Helocoverpa zea)* through the season while Bollgard cotton sustained 2.4% boll damage in lepidopteran sprayed and 8.4% boll damage in un-sprayed plots. Non-*B.t.* cotton sustained an average of 44% boll damage in un-sprayed plots and 9.8% in sprayed plots. Bollgard II also provided excellent protection against beet armyworm (*Spodoptera exigua*) and soybean looper (*Pseudoplusia includens)* as compared to Bollgard and non-*B.t.* cotton. Insect protection provided by Bollgard and Bollgard II resulted in increased yields above non-*B.t.* cotton with Bollgard II showing the greatest potential for increased yields.

Introduction

Protection of cotton from lepidopteran insects has evolved over the past few years from use of synthetic insecticides to the use of genetically modified cotton containing *B.t.* derived genes, which produce proteins toxic to lepidopteran pests. The next major step in the evolution of worm protection in cotton is Bollgard II technology, which contains two *B.t.* genes, Cry1Ac and Cry2Ab. Bollgard II has the advantages of improved activity across a number of lepidopteran pests, provides advancements in insect resistance management to *B.t.* toxins and has potential to provide greater yield protection in cotton. The results presented here represent a summary of work conducted across the southeastern cotton belt states in 2002.

Materials and Methods

Data was collected from university, private cooperator and Monsanto trials in VA, NC, SC, GA, AL and FL. Trial types varied across locations but all were conducted with cotton from DP 50 or DP 5415 varietal backgrounds. All trials included comparisons of three traits: non-*B.t.,* Bollgard and Bollgard II. Treatments imposed across the traits included no insecticide sprays for lepidopteran pests, sprays as needed based on local thresholds or both scenarios in a split plot design. In the split plot design trials, spray applications were made to all traits when non-*B.t.* cotton reached threshold. Worm pressure varied across locations from low to extremely high. Several locations were over-sprayed early in the season with acephate to destroy beneficial insects and maximize worm pressure.

Results and Discussion

Results presented in Figure 1 depict seasonal average worm damaged bolls from 21 locations across the southeastern states in 2002. Bollgard cotton incurred much less damage than non-*B.t.* cotton. While spraying both noticeably reduced the levels of damage, less damage occurred in the Bollgard cotton showing the added benefit of this trait. Bollgard II cotton sustained less than one percent boll damage through the season even without over-spraying for lepidopteran pests. While a numeric difference was observed when Bollgard II cotton was over-sprayed, the difference was minor due to the low level of damage that occurred in un-sprayed Bollgard II cotton. One of the unanswered questions prior to 2002 was how Bollgard II cotton would perform under heavy, sustained worm pressure. As shown in Figure 2, even in a situation that experienced almost complete destruction of bolls in non-*B.t.* cotton, Bollgard II had only three percent damage. This suggests that Bollgard II technology will perform well under severe and sustained worm pressure and is a significant improvement over Bollgard cotton.

Results on other worm pests indicate Bollgard II activity is substantially better than Bollgard. Observations of beet armyworm show that while they feed less on Bollgard than non-*B.t* cotton, there was substantially less feeding on Bollgard II cotton (Figure 3). While beet armyworm feeding still occurred on Bollgard II, it was at a much lower level and smaller feeding holes were observed as compared to non-*B.t.* or Bollgard cotton. Similar responses were noted for soybean looper (Figure 4). Very little difference was observed between non-*B.t.* and Bollgard cotton, while Bollgard II cotton sustained very little soybean looper defoliation.

To make valid comparisons of yield potential, results from head to head comparisons are show in Figure 5. Data represented here are from trials with both sprayed and unsprayed treatments in the same study. Several things are obvious from this data. First, these trials experienced significant worm pressure as reflected in the low yield for the non-*B.t.*, unsprayed treatment. While over-spraying non-*B.t.* cotton did result in a yield response, it was still less than the yield response the Bollgard trait.

Spraying Bollgard cotton appeared to provide additional yield potential. Finally, yield results suggest that Bollgard II has even greater yield potential than Bollgard cotton, even when additional worm sprays are imposed, i.e. the yield for unsprayed Bollgard II cotton yield was higher than sprayed Bollgard cotton.

Summary

Results of trials in the southeastern cotton belt with Bollgard II cotton show this new technology provides enhanced levels of lepidopteran protection in cotton. Data on cotton bollworm, beet armyworm and soybean looper suggest that over-sprays for worm pests may be unnecessary. While these results suggest that cotton producers may not need to spray for lepidopteran pests, it is important to keep in mind the biological nature of the system and Bollgard II should be scouted and sprayed if thresholds are reached. Results from these trials also suggest there is enhanced yield potential due to the increased lepidopteran protection provided by the Bollgard II technology. The addition of a second gene not only improved the spectrum and level of activity against lepidopteran pests, but is also a better resistance management tool to help sustain *B.t.* technologies. Producers should always be encouraged to follow insect resistant management requirements.

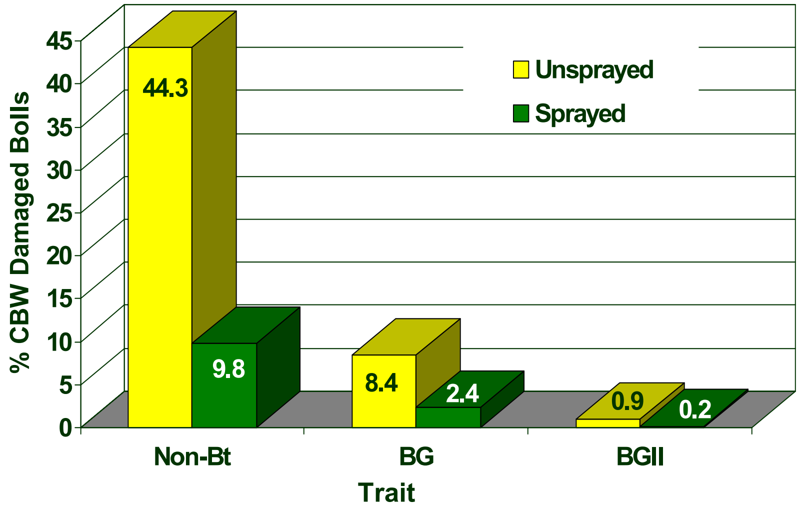

Figure 1. Southeast Seasonal Average – 21 Locations – 2002 Bollworm Damaged Bolls.

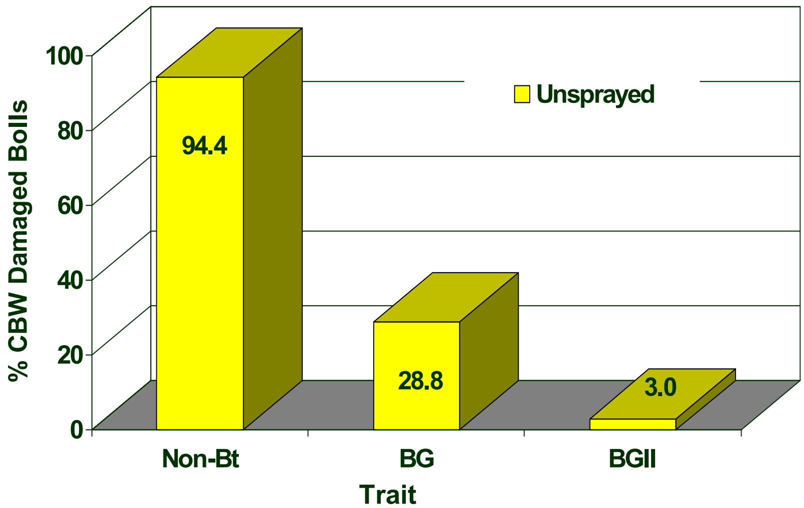

Figure 2. Seasonal Average J.R. Bradley Rocky Mount, NC 2002 Bollworm Damaged Bolls.

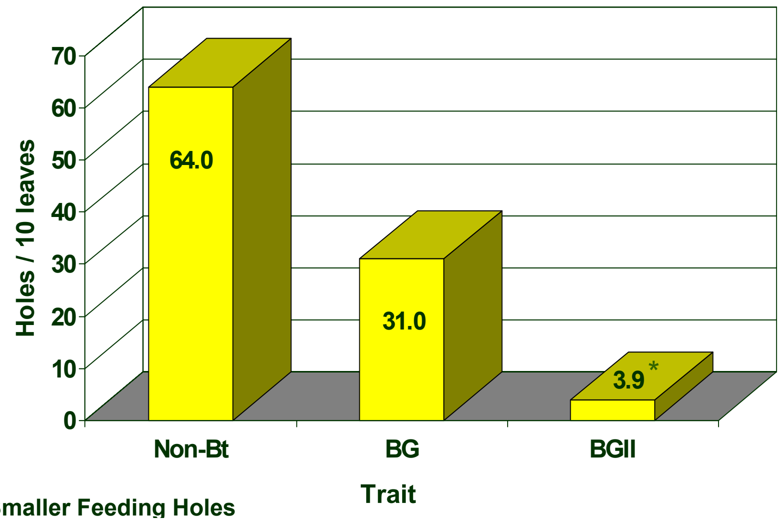

Figure 3. Jack Bacheler, Rocky Mt, NC 2002 Beet Armyworms No. of Holes / Leaves.

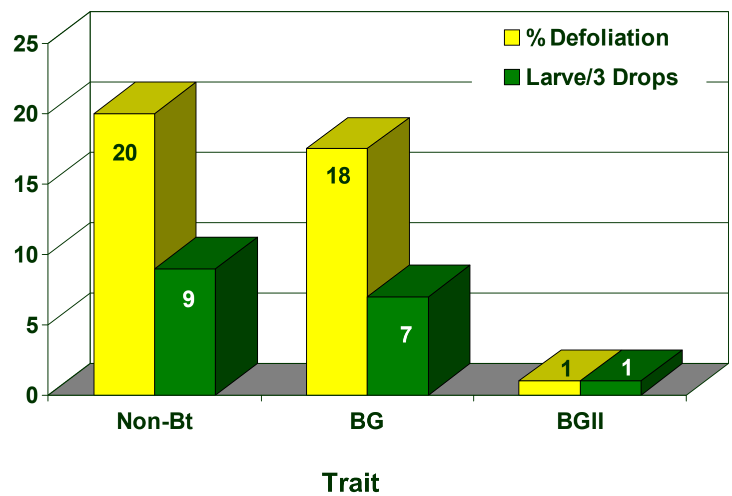

Figure 4. W. Briggs, Seminole, GA 2002 Soybean Loopers Defoliation and Larvae Numbers.

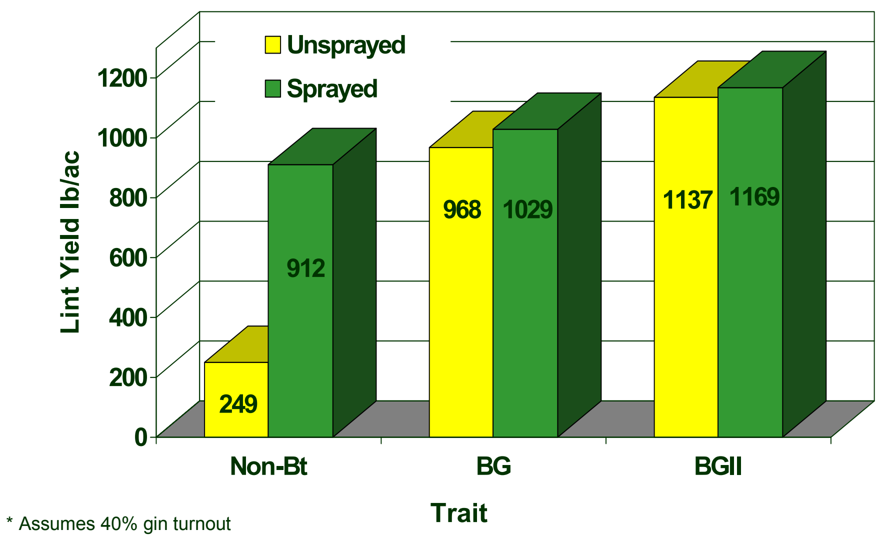

Figure 5. Southeast Average Yield – 6 Locations – 2002 Pounds of Lint / Ac* Head to Head Comparisons.