

RELATIVE STATUS OF BOLL-DAMAGING INSECTS IN BOLLGARD VS. CONVENTIONAL COTTON IN NORTH CAROLINA, 1996 TO 2002

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Abstract

In a 7-year, large-scale evaluation of pest shifts resulting from the adoption of Bt (Bollgard) cotton by North Carolina's cotton producers (Figure 1), 574 pairs of Bollgard and conventional cotton fields were assessed from 1996 through 2002 for mid- to late-season boll damage. Bollworm damage to bolls (Fig. 2) averaged 4-fold higher in conventionally protected cotton vs. Bollgard cotton (4.8% vs. 1.2%), while stink bug damage to bolls (Fig. 3) averaged just over 3-fold higher in Bollgard cotton (3.1% vs. 1.0%). Overall boll damage during this period favored Bollgard cotton by 1.6% (4.7% vs. 6.3%). European corn borer and fall armyworm damage to bolls was very light from 1996 to 2002. Bollgard cotton was treated an average of 2 times less per year (2.6 vs. 0.8) than conventional cotton. When considering many of the factors which affect insect control costs, such as the technology fee for Bollgard cotton seed, late-season insect control costs, the penalty of boll damage, and recommended relative scouting costs, the overall economic returns of Bollgard cotton, averaged over 1996 to 2002, were approximately \$6.00 higher than of conventionally-protected cotton.

Introduction

With the introduction of Bollgard cotton in 1996, the relative importance North Carolina's major late season cotton pests has shifted dramatically, with *Helicoverpa zea* damage dropping significantly, and boll damage resulting from feeding by bug pests increasing several fold. The need for late season insecticide treatments has also dropped dramatically in Bollgard cotton. Because Bollgard cotton has impacted late season insect control so profoundly, it has been imperative to have developed sound information on the costs and returns of this new technology compared with conventional cotton to help North Carolina's producers with their technology choices.

The annual Cotton Insect Loss Estimates reported in the various Beltwide Cotton Conference Proceedings (Williams, 2002, and previous) provide state by state estimates of the acres infested by various cotton insect pests, acres treated for each pest, number of insecticide applications and associated costs, and yield losses for each reported insect, as determined by the respective state reporting coordinators and their contributors. Although the pest status, damage, yield losses and costs for Bollgard cotton are different in most cases from that found in conventional cotton, the Cotton Insect Loss Estimates provided by most states do not yet differentiate insect damage and losses between the two technologies. To develop a data base which would accurately reflect the year to year fluctuations in pest damage and changes in the status of North Carolina cotton pests, and to provide comparative information on insect control costs for Bollgard vs. conventional cotton, we have undertaken a late season damaged boll assessments and an insecticide use survey beginning with the commercial introduction of Bollgard cotton in 1996.

Materials and Methods

From 1996 to 2002, 100 randomly-selected bolls from each of 574 pairs of Bollgard and conventional grower-managed cotton fields were assessed for damage from bollworm (*Helicoverpa zea*) (Boddie), European corn borer (*Ostrinia nubilalis*) (Hubner), fall armyworm (*Spodoptera frugiperda*) (J.E. Smith) and stink bug, primarily *Acrosternum hilare* (Say) and *Euschistus servus* (Say). During this same period, a survey of insecticide use, representing over 1/3 of NC cotton acres, was undertaken. These data were used to compare the relative insect control costs for Bollgard and conventional cotton.

Results

The amount and percentage of Bollgard acreage grown by North Carolina's cotton producers is shown in Figure 1. As can be seen in the figure, both the number and the percentage of Bollgard cotton has increased yearly. Bollgard cotton sustained 4-fold less bollworm damage and 3-fold greater stink bug damage than conventional cotton (Figs. 2 & 3). Overall, boll damage on conventional cotton was approx. 1/3 greater than on Bollgard cotton. Insecticide use for late-season insects on Bollgard cotton was only 1/3 of that applied to conventional cotton, accounting for the shift toward greater bug damage with this technology (Figs 5 & 6). When averaged over 1996 to 2002, the relatively high technology costs of Bollgard cotton was more than offset by lower insecticide use and less boll damage with this technology (Fig. 7).

Conclusions

At present, the adoption of Bollgard cotton is slightly better than a break-even proposition in insect control costs for many NC cotton producers, although North Carolina's variability in insect pressure and resulting control costs make the profit potential better in some areas than in others.

Acknowledgment

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References

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Year	Acreage (x1000)		% Bollgard
	State	Bollgard	
1996	717	20	2.8
1997	668	20	3.0
1998	695	88	12.7
1999	861	174	20.2
2000	901	492	54.6
2001	956	621	65.0
2002	925	645	69.7

Figure 1. Bollgard Cotton Acreage in North Carolina, 1996-2002.

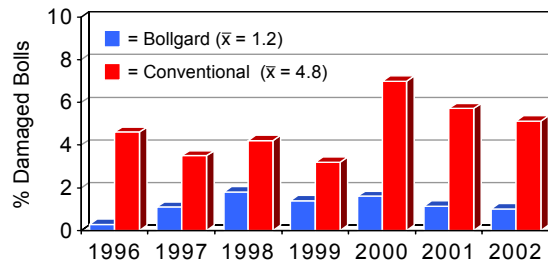


Figure 2. Bollgard vs. Conventional Cotton: Bollworm Damage to Bolls in NC, 1996-2002.

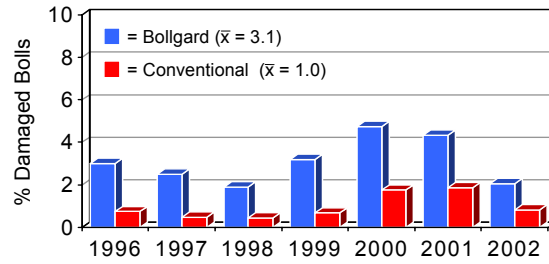


Figure 3. Bollgard vs. Conventional Cotton: Stink Bug Damage to Bolls in NC, 1996-2002.

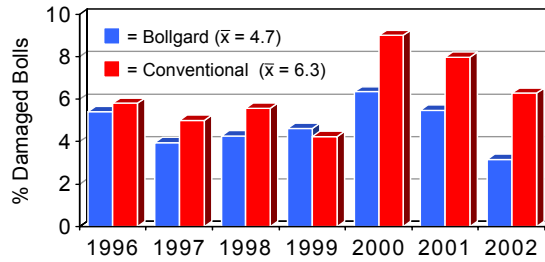


Figure 4. Bollgard vs. Conventional Cotton: Total Boll Damage in NC, 1996-2002.

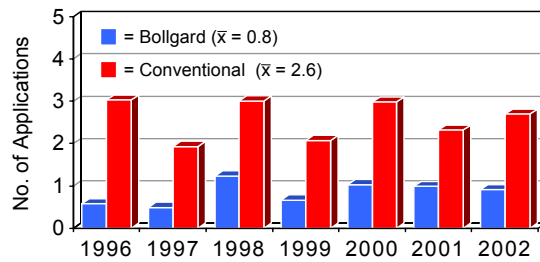


Figure 5. Bollgard vs. Conventional Cotton: No. of Late Season Insecticide Applications, 1996-2002.

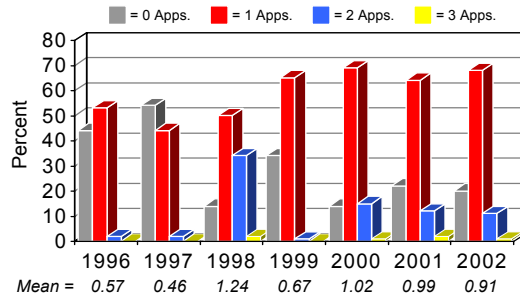


Figure 6. Application Frequency on Bollgard Cotton, 1996-2002.

Items	Bollgard	Conventional
Ave. Tech. Fee¹	19.14	0.00
Insect Control Costs²	6.30 (0.84 apps.)	19.35 (2.58 apps.)
Insect Damage^{3,4}	0.00 (4.7%)	12.48 (6.3%)
Scouting⁵	--	--
Total	\$25.44	\$31.83

- 1 - Varies according to seed rate and row spacing.
- 2 - Insecticide + Application = \$7.50
- 3 - Damage: 1% boll damage = 12 lb. lint/acre; cotton = \$0.65/lb.
- 4 - Used the difference in insect damage.
- 5 - Correct scouting of Bt cotton should be more labor intensive.

Figure 7. Cost of Late-Season Insect Control: Bollgard vs. Conventional Cotton in NC, 1996-2002.