

**COST AND RETURN COMPARISONS
OF ROUNDUP READY
AND BOLLGARD COTTON VARIETIES**
**K.J. Bryant, C.T. Allen, F.M. Bourland
and L.D. Earnest**
University of Arkansas, Division of Agriculture

Abstract

Nineteen-ninety-eight marked the first year of a three year study designed to examine the cost and returns associated with alternative pest control systems using transgenic and conventional cotton varieties. Nine varieties of conventional and transgenic seed were grown using Best Management Practices with the goal of maximizing profits. Per acre cost of insect and weed control and returns were determined for each treatment. The conventional varieties performed very well against the transgenic varieties in 1998. The Roundup Ready varieties resulted in some of the lowest returns.

Introduction

The development of transgenic cotton varieties give cotton producers more options for controlling pests. Insects can be controlled by conventional insecticide sprays or by using cotton varieties containing the Bollgard gene. Likewise, weeds can be controlled using conventional herbicide programs or by implementing a Roundup Ready variety and program. The objective of this study was to examine the cost and returns associated with alternative pest control systems using transgenic and conventional varieties in an effort to identify the most economical alternatives.

Methodology

This study was composed of 9 treatments, each replicated four times. The treatments were conventional and transgenic seed from 2 parental lines, Paymaster 1220 and DPL 5415 (Bt/Roundup Ready, Bt/conventional herbicide, conventional insecticide/Roundup Ready, and conventional insecticide/conventional herbicide). Stoneville 474 was used as a conventional insecticide/conventional herbicide check. This arrangement was planted at Rohwer in Southeast Arkansas and at Keiser in Northeast Arkansas in plots 40 feet long by 4 rows wide arranged in a Randomized Complete Block Design.

Each treatment was farmed with the goal of maximizing profits. Best Management Practices were used for each individual treatment. Standard fertilization and irrigation programs were used on all plots at both locations. The Roundup Ready plots at Rohwer received Prowl 3.3 EC at 1.8 pts/ac PPI on 5-6-98. Roundup Ultra was then

applied at 2 pts/ac (1.0 lb ai/ac) broadcast on 5-28-98. Roundup Ultra was applied a second time at 1.5 pts/ac (0.75 lb ai/ac) post-directed on 6-16-98.

The Roundup Ready plots at Keiser received Trifluralin 4EC at 1.5 pts/ac (0.75 lb ai/ac) + Cotoran 80DF at 1.0 lb/ac (0.8 lbs ai/ac) PPI on 5-4-98. Roundup Ultra was then applied as a broadcast spray at 2 pts/ac (1.0 lb ai/ac) on 5-13-98. Staple was then applied at 0.8 oz/ac (0.045 lb ai/ac) in a 19 inch band on 6-8-98.

The conventional herbicide plots at Rohwer received Prowl 3.3 EC at 1.8 pts/ac PPI on 5-6-98 followed by Cotoran 80DF at 0.75 lbs/ac (0.6 lbs ai/ac) PRE on 5-8-98. Staple was then applied at 0.6 oz/ac (0.032 lbs ai/ac) post-directed on a 19 inch band on 5-28-98. Bladex 4L at 1.5 pts/ac (0.75 lbs ai/ac) + MSMA L at 2.6 pts/ac (1.3 lbs ai/ac) were applied as a layby.

The conventional herbicide plots at Keiser received Trifluralin 4EC at 1.5 pts/ac (0.75 lb ai/ac) + Cotoran 80DF at 1.0 lb/ac (0.8 lbs ai/ac) PPI on 5-4-98. Staple was then applied at 0.8 oz/ac (0.045 lb ai/ac) in a 19 inch band on 5-21-98 and 6-8-98.

Early season insect control applications (thrips, boll weevil and plant bug) were made at both locations across all plots. At Rohwer, Vydate C-LV at 8.5 oz/ac and Provado 3.75 oz/ac were applied twice, 6-4-98 and 6-14-98. At Keiser, Orthene 90S at .25 lbs/ac was applied on 6-2-98, Dimethoate 400 at 6.4 oz/ac was applied on 6-15-98, and Vydate C-LV at 6.5 oz/ac was applied on 6-29-98.

Late season insecticide applications were applied as needed to both Bt and conventional insecticide (non-Bt) plots. At Rohwer, a single application was made to all plots (Bt and non-Bt). Baythroid at .028 lbs ai/ac + Lannate LV at 1.33 pt/ac (0.4 lbs ai/ac) were applied on 8-15-98. At Keiser, four applications were made on all plots (Bt and non-Bt). Baythroid was applied at .03 lbs ai/ac on 8-10-98. Vydate C-LV was applied at 10 oz/ac on 8-13-98. Karate Z was applied at 0.03 lbs ai/ac on 8-17-98. And, Guthion 2L was applied at 1 pt/ac on 8-20-98.

No mid-season applications were made to Bollgard plots in either the Rohwer or the Keiser tests. Insects in the Bollgard plots did not reach threshold levels in either test during mid-season.

Mid season insect control treatments were made on the conventional insecticide (non-Bt cotton) plots during mid-season. At Rohwer, Karate Z at 0.03 lbs ai/ac was applied on 7-17-98 and Karate Z at 0.03 lbs ai/ac + Tracer at 0.053 lbs ai/ac were applied on 7-27-98. At Keiser, Karate was applied at 0.031 lbs ai/ac on 7-30-98 to the conventional insecticide (non-Bt) plots.

All other cultural practices were held constant across all plots for a given location. For more specific information on cultural practices, weed control program by treatment and location, and foliar insecticide program by treatment and location, see Allen et al.

Per acre cost of insect and weed control were determined for each treatment using the Mississippi State Budget Generator. Technology fees of \$30/acre for all treatments using a Bollgard variety and \$9.00/acre for all treatments using a Roundup Ready variety were included. Returns over insect and weed control cost were calculated assuming a \$0.68/lb price of cotton.

Results

Yields, revenue, control costs and returns for the nine treatments in Southeast Arkansas are displayed in Table 1. Insect control costs were comparable for the Bollgard and conventional systems. Weed control costs were \$9.00/acre less for the Roundup Ready systems than for the conventional systems. However, yield was the determining factor in returns. The three conventional varieties and one of the Bollgard varieties had the greatest returns and were not significantly different from each other at the 95% level of confidence. The systems containing the Roundup Ready gene had the lowest returns.

Yields, revenue, control costs and returns for the nine treatments in Northeast Arkansas are displayed in Table 2. Insect control costs were \$18/acre higher for the Bollgard systems. Weed control costs were \$13.00/acre higher for the Roundup Ready systems. Yield was again the determining factor in returns. At Keiser, however, seven of the nine treatments were not significantly different.

Results for the two locations combined are displayed in Table 3. Insect control costs were \$7/acre higher for the Bollgard systems while weed control costs were almost the same regardless of treatment. Yield was the determining factor in returns. A conventional variety produced the greatest return, and five of the treatments were not significantly different from the highest return treatment. Varieties containing the Roundup Ready gene resulted in the lowest returns.

Summary

Nineteen-ninety-eight marked the first year of this three year study. The results presented here are for one year only. In 1998, the conventional varieties performed very well against the transgenic varieties. Two more years of data will add considerable information to this study.

References

Allen, C.T., M.S. Kharboutli, K.J. Bryant, F.M. Bourland, L.D. Earnest and C. Capps. 1999. Transgenic and Conventional Insect and Weed Control Systems. Cotton Insect Research and Control Conference, Proceedings of the 1999 Beltwide Cotton Conferences, National Cotton Council.

Table 1. Per acre yield, revenue, weed control cost, insect control cost and returns for cotton production systems: Southeast Arkansas, 1998.

Variety	Yield	Revenue	Weed control costs	Insect control costs	Returns*
ST-474	911	\$619	\$67	\$110	\$442a
PM 1220BG	798	\$543	\$67	\$106	\$370ab
DP-5415	789	\$537	\$67	\$110	\$359ab
PM-H1220	781	\$531	\$67	\$110	\$354ab
NuCOTN-33B	712	\$484	\$67	\$106	\$312 b
DP-5415RR	696	\$473	\$58	\$110	\$305 b
PM 1220RR	690	\$469	\$58	\$110	\$301 b
PM 1220BGRR	637	\$433	\$58	\$106	\$270 bc
DP-5415BGRR	521	\$354	\$58	\$106	\$191 c

* Returns over weed and insect control costs. Assuming a cotton price of \$0.68/lb.

Table 2. Per acre yield, revenue, weed control cost, insect control cost and returns for cotton production systems: Northeast Arkansas, 1998.

Variety	Yield	Revenue	Weed control costs	Insect control costs	Returns*
DP-5415BGRR	1150	\$782	\$70	\$88	\$624a
NuCOTN-33B	1102	\$749	\$57	\$88	\$604a
DP-5415	1082	\$736	\$57	\$70	\$608a
DP-5415RR	1075	\$731	\$70	\$70	\$590a
PM 1220BG	1057	\$719	\$57	\$88	\$574ab
ST-474	1046	\$711	\$57	\$70	\$584ab
PM-H1220	984	\$670	\$57	\$70	\$542abc
PM 1220BGRR	918	\$624	\$70	\$88	\$466 bc
PM 1220RR	855	\$581	\$70	\$70	\$441 c

* Returns over weed and insect control costs. Assuming a cotton price of \$0.68/lb.

Table 3. Per acre yield, revenue, weed control cost, insect control cost and returns for cotton production systems: Northeast and Southeast Arkansas combined, 1998.

Variety	Yield	Revenue	Weed control costs	Insect control costs	Returns*
ST-474	980	\$666	\$62	\$90	\$514a
DP-5415	936	\$636	\$62	\$90	\$484ab
PM 1220BG	926	\$629	\$62	\$97	\$471ab
NuCOTN-33B	908	\$617	\$62	\$97	\$458ab
DP-5415RR	886	\$602	\$64	\$90	\$448abc
PM-H1220	884	\$601	\$62	\$90	\$449abc
DP-5415BGRR	837	\$569	\$64	\$97	\$408 bc
PM 1220BGRR	778	\$529	\$64	\$97	\$368 c
PM 1220RR	773	\$525	\$64	\$90	\$371 c

* Returns over weed and insect control costs. Assuming a cotton price of \$0.68/lb.