ECONOMICS OF A TRACER/KARATE Z CONVENTIONAL COTTON PROGRAM VS. BT COTTON

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Abstract

In 1998, Dow AgroSciences and Zeneca proposed a study to compare the economics of a conventional cotton program with a Bt cotton program. The study would compare the costs of insect control, application, and technology fee with yields. Sites were selected throughout the South, with special emphasis on the Delta because of its high insect pressure and complex of worm species. Thirty-one consultants completed the trial and their data is presented here. Input costs were higher in the conventional cotton ($110.43/acre vs $85.80/acre) but the yield was higher. This extra yield (37 lbs of lint) provided an additional $27.75/acre. This additional yield provided an advantage of $3.12/acre for the Tracer/Karate Z program. In conclusion, in a year of heavy insect pressure, the Tracer/Karate Z program on conventional cotton provided a higher return than Bt cotton.

Introduction

Tracer™, the first product in the Naturalyte™ class of compounds, was recently registered in cotton for Lepidopterous insect control. The active ingredient in Tracer is spinosad, a naturally derived fermentation product. Tracer is unique in its activity on Lepidoptera (particularly with resistant budworm) while exerting little effect on beneficials. Karate™ Z is a new micro-encapsulated formulation of lambda-cyhalothrin which provides a broad spectrum of cotton insect control. The use of these two products in a season-long program was believed to compliment the strengths of both products; to wit: excellent Lepidoptera control, including late season outbreaks, early season beneficial conservation, and weevil/secondary pest control. These products could be used in a prescribed decision criteria that would provide good crop protection and allow the farmer to manage his resources as the season progressed.

Bt cotton, on the other hand, is an effective new technology that provides an alternative for Lepidoptera control. Bt cotton allows farmers to pay at plant for protection through the season. This situation provides a "piece of mind" to the farmer, but can force him to spend money in light insect years that would not be needed. Further, concern has been expressed regarding potential resistance development. As market shares increase, the pressure to develop resistance theoretically grows.

This study was conducted to see if the economics of a Tracer/Karate Z program were at least on par with a Bt cotton program. The marketplace must continue to evaluate the real costs of conventional vs. Bt cotton. Planting a mixture that is comfortable to the farmer of both conventional and Bt cotton should spread risk and provide return under the widest of growing conditions.

Materials and Methods

Dow AgroSciences and Zeneca co-sponsored large scale plots in 1998 to demonstrate the efficacy and economics of conventional season-long worm control. Fifty-one consultants were selected from the cotton growing region, with special emphasis on the Delta because of its higher pest pressure and spectrum. These consultants chose a preferred variety of conventional cotton. Located in an adjacent field would be a preferred variety of Bt cotton. The consultants, in arrangement with the farmer, selected the best varieties of both conventional and Bt cotton without regard to parent lines.

Each consultant was presented with a decision criteria chart (Table 1) to determine the correct spray regime under this program. The focus of the spray program was on rotation not tank-mixing. This situation would provide better resistance management and best use of the two product's different spectrums. Both conventional and Bt cotton would be scouted in the normal way. In addition, Bt cotton would be treated for any pests that occurred according to state recommendations and local practice. Both would receive weed control, Pix™, and other non-insect control inputs as needed.

During transition times, certain additional criteria should be followed. For the change from early to mid-season, the following should be observed:

- if beneficial preservation is a continuing goal in early July, recommend Tracer.
- if a mixed population of Heliothine from eggs to 5 days old are present in the field, recommend two applications of Karate Z at 4-5 days apart.

For the transition from mid- to late-season then:

- if an application of Karate Z fails to bring TBW below economic threshold during the mid- to late-season transition, Tracer should be used immediately to clean-up the situation. This will insure the best possible control and most appropriate usage of Tracer.

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- Karate Z tank mixes should not be used to attempt the clean-up during this time period.

Following the criteria in Table 1, tank mixes could be called for. These tank mixes would be used to control a late-season mixed complex of worms plus stink bugs, boll weevils, and/or plant bugs. Tanks-mixes must include a labeled rate of both Tracer and Karate Z (no below label applications should be made).

Results and Discussion

The study generated great consultant response and follow-through, and successfully demonstrated that conventionally managed cotton can compete with Bt cotton on an economic basis. Fifty-one trials were planned at the beginning of the season. A break down of the participation follows:

- 31 consultants provided performance data and yield information and their data is presented below.
- Nine (9) consultants provided performance data only. Without yield data a full economic evaluation could not be completed and, therefore, their results are not included in this data set.
- Two (2) consultants provided data and yield information but did not compare Tracer and Karate Z vs. Bt cotton.
- Six (6) consultants provided no information.
- Four (4) consultants did not conduct the trial, usually because of drought conditions.

As additional data from the 1998 trials is received, it will be entered into a data base for 1999 and rolled together with the data collected from planned 1999 trials.

The 1998 cotton growing season presented many challenges to farmers. Throughout most of the cotton growing region, higher than normal insect pressure was experienced. Further, the worm complex was varied with resistant tobacco budworm and beet armyworm predominating over more of the season than normal. This required a higher number of sprays in both conventional and Bt cotton. Figure 1 provides summary pre-count and post- count Lepidoptera damage across all trials. There were very small differences in pre- and post-count eggs. As expected pre-count worms numbers showed the greatest difference, but the differential diminished at post-count and percent damaged square. There was only a 2% differential in percent damaged squares, showing that conventional chemicals provided excellent control of insect pests.

When comparing the input costs for Bt and conventional cotton, the higher than normal pest pressure is readily apparent. Figure 2 provides a graph of the input costs needed throughout the season. For the study, the consultant provided spray data for all insect applications. For the Bt cotton, consultants had discretion in what chemicals to use. In the Tracer/Karate Z plots, they followed the decision criteria outlined in Table 1. Some consultants provided their actual costs for these sprays and these figures were used to calculate Figure 2. Other consultants provided only the rate used and an average cost was calculated based on the use rate. For the Bt cotton, a $32/acre technology fee was used. Conventional cotton required on average $86.23/acre while the Bt cotton required only $69.25/acre. For conventional cotton this represented 8.06 sprays to the Bt cotton 5.52 sprays. An application cost of $3/acre was used to reflect the mixture of aerial and ground applications. The third column in Figure 2 is obtained by adding the insect control cost and application costs together.

From the study outline, the consultant and farmer selected the best varieties of both conventional and Bt cotton. The Tracer/Karate Z program, including high-yielding conventional varieties such as ST474 and SG125, on average, equaled or outperformed Bt cotton programs in terms of net return in a heavy worm pressure year. In Figure 3, the benefit of conventional varieties is shown by the increase in yield of 37 pounds extra lint. This increase in lint provided an additional $27.75/acre based on $0.75/lb. To show net return (Figure 4), the following was calculated:

Yield	Cost/Acre	Advantage Tracer/Karate Z
+$27.75	-$24.63	$3.12/acre

where $27.75 additional dollars were generated by the extra 37 pounds of lint. The total cost/acre was $110.43 in the Tracer/Karate Z program which included cost of all foliar insecticides and cost of application minus $85.80 which was the Bt cotton program cost/acre (Figure 2).

Summary

In summary, the Tracer/Karate Z program on conventional cotton equaled or outperformed Bt cotton programs in terms of net return in a heavy worm pressure year. The Tracer/Karate Z program provided an average of $3.12/acre extra return across 31 locations. Thus, conventionally managed cotton was produced economically even under the worst worm pressure since 1995.

Growers have an alternative to Bt cotton that will allow them to:

- better manage risk.
- plant responsible acreage of Bt cotton.
- plant favorite, high yielding, conventional varieties.
- avoid investing $32/are in worm control at the beginning of the season.

These data were generated under heavy insect pressure. Dow AgroSciences and Zeneca plan on repeating this study in 1999 with, hopefully, lighter insect pressure. This lighter pressure should provide an even greater benefit to conventional cotton plantings.

Acknowledgments

Dow AgroSciences and Zeneca would like to thank the consultants who participated in this study. The study could not have been completed without the help of the sales force within both companies to coordinate the trials.

Table 1. Tracer/Karate decision criteria for conventional cotton.

		Early Season		
TBW only	Mixed Heliothine TBW/CBW	CBW only	Heliothine plus Plant bug/boll weevil	
↓	↓	↓	↓	
Tracer	Tracer	Tracer	Tracer plus Provado/	
			Lorsban4E/ Methyl Endosulfan	Orthene/ Parathion/
		Mid Season		
TBW only	Mixed Heliothine TBW/CBW	Heliothine plus armyworm[1]	CBW only	Heliothine plus plant bug/ boll weevil/ stink bug
↓	↓	↓	↓	↓
Tracer[3] or Karate mix Tank-mix	Karate[2] or Karate Tank-mix	Karate[2] or Karate Tank-mix	Karate	Karate[2] or Karate Tank-
(Curacron or Tracer[3] or Larvin)		or Tracer[3]		(Plus Tracer[3] or Curacron or Larvin)
		Late Season		
TBW only	Mixed Heliothine TBW/CBW	Heliothine plus armyworm[4]	CBW only	Heliothine plus plant bug/ boll weevil/ stinkbug
↓	↓	↓	↓	↓
Tracer Karate	Tracer	Tracer	Karate	Tracer plus tank-mix

[1] Use Tracer, not Karate Z, for control of beet armyworm.
[2] Dependent on resistance level and TBW population.
[3] Only recommended Tracer during mid season if still within labeled resistance management parameters.
[4] Use Tracer, not Karate Z, for control of soybean loopers.

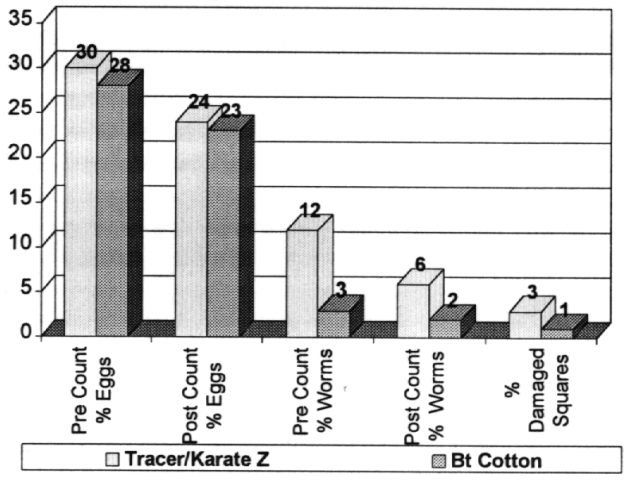

Figure 1. Tracer /Karate Z Performance vs. Bt Cotton (123 ratings).

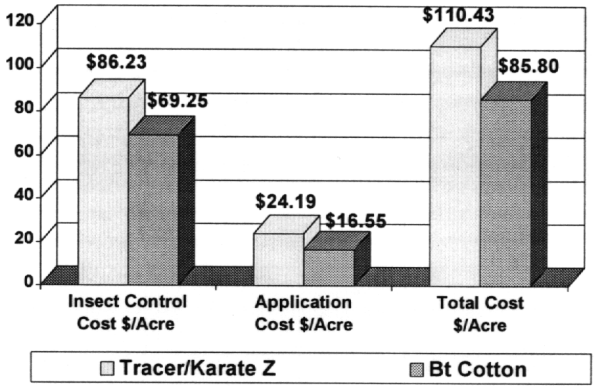

Figure 2. Tracer/Karate Z Cost vs. Bt Cotton (Average of 31 Consultant trials).

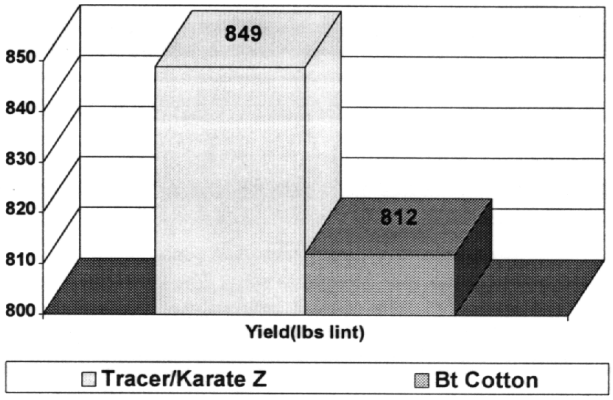

Figure 3. Tracer/Karate Z Yield vs. Bt Cotton Yield (Average of 31 Consultant trials).

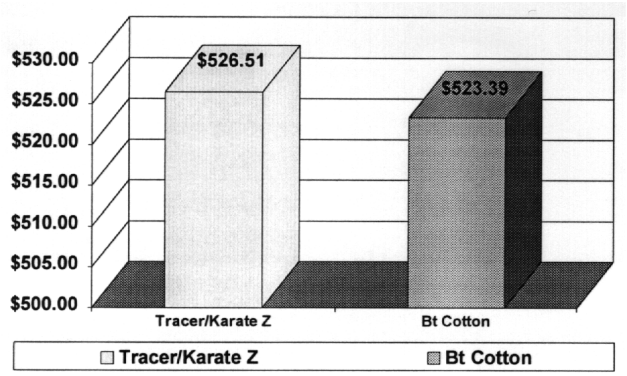

Figure 4. Net Return