

**REVIEW OF ROUNDUP ULTRA (GLYPHOSATE)
EFFECTS ON FRUIT RETENTION, YIELD AND
MATURITY IN ROUNDUP READY (GLYPHOSATE-
TOLERANT) COTTON**

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Abstract

Roundup Ready® cotton (*Gossypium hirsutum* L.) was introduced commercially in the United States in 1997. Since introduction, adoption has increased each year and in 1999 Roundup Ready cotton was planted on over 5 million acres. Tolerance trial research and commercial experience have demonstrated that Roundup Ready cotton tolerance to Roundup Ultra® (glyphosate) applications is excellent. In 1999, cotton growers in the southeast reported concerns about misshapen bolls, boll rot, cavitation and hard lock bolls. After extensive field investigations, it was determined that these maladies are not related to transgenic varieties or application of Roundup Ultra to Roundup Ready cotton.

Introduction

Roundup Ready cotton technology offers broad spectrum control of both broadleaf and grass weeds, effective overall weed control, and improved opportunities for reduced tillage. Since its introduction in 1997, use of Roundup Ready cotton technology has expanded to over 5 million acres in the United States. Grower acceptance surveys and rapid adoption by growers demonstrate the utility, versatility and value of this technology.

Discussion

During the 1996, 1997, and 1998 growing seasons, replicated tolerance trials evaluating the effects of Roundup Ultra on Roundup Ready cotton were conducted at 51 locations across the cotton belt. Tolerance trials consisted of treatments with various Roundup Ultra application programs (treated) and treatments with no Roundup Ultra applied (untreated). Each treatment represented the mean of 6 replicates. Each experiment was planted entirely to a single Roundup Ready variety so that each direct comparison between treated and untreated means was made on the same Roundup Ready variety in the same experiment. All plots were uniformly maintained weed-free.

Detailed whole plant mapping was conducted in 23 of the 51 studies. First position fruit retention in the bottom five fruiting branches was reduced by Roundup Ultra applications only eight times out of 282 observations. When fruit retention was reduced, compensation for shed bolls occurred

with increased retention at positions immediately above and outward from the position shed. These reductions in fruit retention were confined to the lower portion of the plant.

At one location in Mississippi and one location in North Alabama, slight delays in maturity were observed with some treatments. In Mississippi, this was determined from plant mapping data showing that three treatments with reductions in bottom five first position fruit retention required an additional 1.4 to 1.8 nodes to set 95 percent of the bolls as compared to the untreated check. At the Alabama location, this was determined by measuring percent first harvest. In each case where slight delays in maturity were observed, the treatment consisted of multiple Roundup Ultra applications each at 1.5 times the maximum labeled rate.

Yield was evaluated in 520 direct comparisons between means of treated and untreated plots. Each direct comparison represents a Roundup Ultra treatment vs. untreated in the absence of weeds on the same Roundup Ready variety. In over 99% of these direct comparisons, Roundup Ultra treated plots produced yields equivalent to or greater than plots not treated with Roundup Ultra. Roundup Ultra treatments produced greater yields in 11 of the comparisons, equivalent yields in 505 of the comparisons and lesser yields in 4 of the comparisons. Roundup Ultra rates were in excess of the labeled rate in all four instances when yield was reduced. In three of these four, the treatment was four sequential applications of Roundup Ultra each at 1.5 times the maximum labeled rate.

In 1999, inquiries in the Southeast were made regarding cavitation, small boll shed, abnormal bolls, and hard lock bolls. After an extensive investigation, Monsanto determined that the problems observed in cotton grown in the Southeast were not due to Roundup Ready or Bollgard technologies. The same maladies observed in transgenic cotton also occurred in conventional cotton. The frequency of misshapen bolls, boll rot, cavitation, and hard lock bolls was similar in transgenic and conventional varieties.

Summary

The Roundup Ready technology provides excellent tolerance to labeled Roundup Ultra applications. Misshapen bolls, boll rot, cavitation and hard lock bolls have been observed in both conventional and transgenic varieties and are not linked to the presence of the Roundup Ready or Bollgard® technologies. Commercial experience with Roundup Ready cotton has been very positive, as demonstrated by continued use and growth of the technology.

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