

COMPARISON OF GLYPHOSATE PRODUCTS IN ROUNDUP READY COTTON

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Abstract

Transgenic cotton resistant to glyphosate has been widely accepted throughout the Southeast. Growers rapidly adopted this technology because of its broad-spectrum weed control, good crop tolerance, and convenience. Today, there are many glyphosate products available for growers to choose from. Most of the products on the market today are formulated as isopropylamine salts, although Touchdown is a diammonium salt while Roundup Weathermax and Touchdown Total are potassium salts. It is generally assumed that all glyphosate products perform similarly when applied according to label directions. However, in the fall of 2001, we observed severe injury to Roundup Ready cotton in greenhouse studies with Clearout 41 Plus, an imported isopropylamine salt of glyphosate. That led us to conduct field experiments to compare Clearout 41 Plus and seven other glyphosate products in field experiments in 2002. In 2003 we increased the number of products in the experiments to ten.

Experiments were conducted in Goldsboro, Rocky Mount, and Plymouth, NC in 2002 and 2003, with a fourth location being added in 2003 in Beaufort, NC. ST 4893 BR and DPL 458 B/RR cotton varieties were used in 2002 and 2003, respectively. Cotton was planted on conventionally tilled seedbeds in 91-cm rows in both years. Treatments were replicated three or four times in a randomized complete block design. Treatments consisted of eight brands of glyphosate (Clearout 41 Plus, Glyfos, Glyfos X-TRA, Glyphomax, GlyStar, Roundup Original, Roundup UltraMAX, and Touchdown) in 2002 with the addition of Roundup WEATHERMAX and Touchdown Total in 2003. Each product was applied three times at 0.6 and 1.7 kg ae/ha. Non-ionic surfactant at 0.5% (v/v) was included with Glyfos, Glyphomax, GlyStar, and Roundup Original. Treatments were applied postemergence (POST) to 2- and 4-leaf cotton and precisely postemergence-directed (PDIR) to 10- to 12-leaf cotton. All applications were at 140 L/ha and 160 kPa. Crop injury was estimated visually 7 and 14 days after each application; weed control was estimated 14 days after each application. Late-season evaluations were made 6 wk after PDIR application. Yield was with mechanical harvest, and fiber quality was determined via HVI analysis. At three locations in 2003, plots treated with ClearOut 41 Plus, Roundup UltraMAX, Roundup WEATHERMAX, and Touchdown were plant mapped. Thirty plants/plot were mapped for total nodes, fruit retention and distribution, and whether or not bolls were open. Data were subjected to ANOVA with partitioning for the factorial arrangement of two application rates by eight or ten products; non-treated checks were excluded from the analysis. Means were separated using Fisher's Protected LSD test at $P=0.05$.

No cotton injury was observed from any of the glyphosate products in 2002, even when applied at 1.7 kg/ha. No differences among glyphosate products were noted for yield or fiber quality. In 2003, significant crop injury was observed in plots treated with ClearOut 41 Plus at both application rates and Roundup WEATHERMAX at the high rate. Clearout 41 Plus at 0.6 kg/ha injured cotton 3 and 6% following the 2- and 4-leaf applications, respectively. Crop injury for ClearOut 41 Plus and Roundup WEATHERMAX at 1.7 kg/ha was 27 and 12%, respectively, following the 2-leaf application and 31 and 11% following the 4-leaf application. Similar tests were conducted at the University of Georgia which gave similar results with Clearout at both rates, however, Roundup WEATHERMAX did not cause significant crop injury in their studies. Yield and fiber quality did not vary among glyphosate products at either rate. However, greater yields were obtained with 0.6 kg/ha than with 1.7 kg/ha.

In both years, each glyphosate product at 0.6 kg/ha controlled all weed species evaluated very well. Annual grass species, including broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash] and goosegrass [*Eleusine indica* (L.) Gaertn.], Palmer amaranth [*Amaranthus palmeri* S. Wats.], and sicklepod [*Senna obtusifolia* (L.) Irwin and Barneby] were controlled 99% or greater 14 days after the second application in both years. Common lambsquarters (*Chenopodium album* L.) and morningglory species (*Ipomoea spp.* L.) were controlled 94 to 99%, respectively, in 2002. In 2003, glyphosate at 0.6 and 1.7 kg/ha controlled morningglory species 95 and 98%, respectively.