

COTTON TOLERANCE AND VARIETY SENSITIVITY TO DIFFERENT FORMULATIONS OF GLYPHOSATE

Nathan W. Buehring, Daniel B. Reynolds, Normie W. Buehring,
L. Thomas Barber, Jason W. Walton, and Matthew T. Kirkpatrick
Mississippi State University
Mississippi State, MS

Abstract

The recent patent expiration on glyphosate has resulted in the availability of numerous new products, some of which are labeled for use in Roundup Ready cotton. This has led to more options for cotton producers; however, it has also increased concerns about Roundup Ready cotton tolerance to glyphosate products. The objectives of this research was to compare Roundup Ready cotton tolerance and cotton variety sensitivity to different formulations of glyphosate. The first experiments were conducted at the Black Belt Research Center in Brooksville, MS, North Mississippi Research and Extension Center in Verona, MS, and the Plant Science Research Center in Starkville, in 2003. The experimental design was a randomized complete block with four replications. Cotton, 'ST 4892 BR', was planted into 13 by 50 ft plots. The glyphosate products that were used are as follows: ClearOut 41, ClearOut 41 Plus, Glyphos, Glyphos X-tra, Glyphomax, Glyphomax Plus, Gly Star Original, Gly Star Plus, Roundup Original, Roundup D-Pak, Roundup UltraMax, Roundup WeatherMax, Touchdown IQ, and Touchdown K (A13013). For comparison purposes, an untreated check was also included in the experiment. The glyphosate products were applied at 0.75 lbs ae of glyphosate per acre in a spray volume of 15 GPA. If an additional surfactant was required by the label, Latron AG-98 at 0.5% v/v was added to the spray solution. All glyphosate products were applied topically at the 2-leaf stage followed by another topical application at the 4-leaf stage. Data were collected for visual injury (7, 14, 28 DAT), plant height reduction (14 DAT) and seed cotton yield. Plant mapping data were collected from ten plants within each plot just prior to harvest. Plant mapping data were analyzed by two different methods: percent boll retention at each fruiting position (1, 2, and 3); and percent boll retention at zone 1 (all positions between nodes 6 through 10), zone 2 (all positions between node 11 through 15), and zone 3 (all positions greater than node 15). The second experiment was conducted at the Black Belt Research Center in 2003. The experimental design was a randomized complete block with four replications. Four cotton varieties, 'DP 451 BR', 'PM 1218 BR', 'DP 555 BR', and 'ST 4892 BR', were used in this study. The plot size was 13 by 50 ft, where each variety was planted into a 38" row. The glyphosate herbicides used in this objective were ClearOut 41 Plus (Lot # CP0303), ClearOut 41 Plus (Lot # C1041P), Express Chem Glyphosate, Roundup WeatherMax, and Touchdown IQ. The glyphosate products were applied at 0.75 lb ae of glyphosate per acre in a spray volume of 15 GPA. All glyphosate products were applied at the 1- to 2-leaf stage. Visual injury ratings were taking at 3 and 7 DAT.

In the first study, visual injury was observed with ClearOut 41 Plus (12%), Glyphos (6%), Glyphomax (6%), Gly Star Original (6%), Roundup Original (8%), and Roundup UltraMax (5%) 7 days after the 2-leaf application. Visual injury was also observed with ClearOut 41(4%), ClearOut 41 Plus (11%), Gly Star Original (4%), and Roundup Original (4%) 7 days after the 4-leaf application. No visual injury was observed with any of the glyphosate formulations 14 and 28 days after the 4-leaf application. A height reduction was observed with Gly Star Plus, Roundup Original, and Roundup UltraMax 14 days after the 4-leaf application. All glyphosate formulations resulted in no decrease in percent boll retention from the untreated at position 1, 2, and 3. At zone 1, Gly Star Original resulted in lower percent boll retention (52.3%) than the untreated (59.3%). At zone 2, Glyphos and Gly Star Original resulted in lower percent boll retention (40.4 and 42.0%) than the untreated (46.8%). At zone 3, Roundup Original resulted in lower percent boll retention (22.4%) than the untreated (30.6%). All treatments responded similarly in yield when compared to the untreated.

In the second study, there was no difference in variety tolerance between the two ClearOut 41 Plus formulations. The cotton variety, 'PM 1218 BR', was more tolerant to ClearOut 41 Plus ($\leq 14\%$) and Express Chem Glyphosate ($\leq 21\%$) than the other cotton varieties. Visual injury ratings for 'DP 451 BR', 'DP 555 BR', and 'ST 4892 BR' were higher for Express Chem Glyphosate (30 to 60%) than ClearOut 41 Plus (15 to 35%), Roundup WeatherMax (0 to 9%), and Touchdown IQ (0 to 16%) at 3 and 7 days after treatment. These data suggest that varietal differences in tolerance to glyphosate herbicides exist. These data would also suggest that differences are due to formulation differences since all products contain the same parent acid.