EFFECT OF GLUFOSINATE APPLICATION ON WIDESTRIKE™ AND LIBERTY LINK COTTON VARIETIES

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Abstract

Glyphosate-resistant Palmer amaranth has become a significant problem for cotton producers throughout the Southeastern and Mid-South regions of the United States. Palmer amaranth is particularly problematic due to rapid growth, tremendous seed production capabilities, the ability to withstand adverse growing conditions, and a very large stem diameter as well as deep root growth. As glyphosate-resistant Palmer amaranth has spread, growers have been forced to seek out alternative weed control options to glyphosate. One such option is glufosinate; however, variety offerings tolerant to glufosinate have historically been lacking. Although more Liberty Link varieties are available than ever before, many growers have chosen to pant cotton varieties containing Widestrike™ insect traits and applying glufosinate postemergence. The phosphinothricin acetyltransferase (*pat*) gene was used as a selectable marker during plant transformation. The pat gene also confers resistance to glufosinate; however, not to the degree as the bialaphos resistance (*bar*) gene which is used in Liberty Link cotton. Although previous research exists documenting the tolerance of select Widestrike™ cotton varieties to glufosinate, no previous research exists on the tolerance of multiple Widestrike™ cotton varieties to postemergence applications of glufosinate. Therefore, this research was initiated to evaluate the tolerance of multiple Widestrike™ and Liberty Link cotton varieties to postemergence applications of glufosinate.

Experiments were conducted in 2010 and 2011 at the R.R. Foil Plant Science Research Center near Starkville, MS, at the West Tennessee Research and Education Center in Jackson, TN, at the Lon Mann Cotton Research Center in Marianna, AR, at the Pee Dee Research and Extension Center in Florence, SC in 2011, and in Plains, GA in 2010. Standard small plot research techniques were utilized in these experiments. The following varieties were utilized during each year of the study: 'FM 1735 LLB2' in 2010 only; 'ST 4145 LLB2' in 2011 only; FM 1772 LLB2', 'FM 1845 LLB2', 'PHY 367 WRF', 'PHY 375 WRF', 'PHY 440 W', 'PHY 499 WRF', and 'PHY 565 WRF'. Each variety was treated with glufosinate at 0.53 lb ai/ac at the one- to three-leaf stage and again at the six- to eight-leaf growth stage. An untreated check for each variety was included for comparison purposes. Data were pooled over experimental locations and analysis of variance was performed using the PROC Mixed procedure in SAS 9.2 Means were separated using Fishers Protected LSD at $p = 0.05$.

Less than 4% visual injury was observed on any variety 14 days after the one- to three-leaf or six- to eight-leaf glufosinate application. Plant height was unaffected by glufosinate application at either growth stage. Regardless of glufosinate application, 'FM 1735 LLB2' and 'PHY 499 WRF' were significantly taller than other varieties 14 days after the one- to three-leaf application. In addition, 'ST 4145 LLB2, 'FM 1735 LLB2', and 'PHY 499 WRF' were significantly taller than 'FM 1773 LLB2', 'FM 1845 LLB2', 'PHY 367 WRF', 'PHY 440 W', and 'PHY 565 WRF' 14 days after the six- to eight-leaf application. 'ST 4145 LLB2' was significantly taller than 'FM 1773 LLB2', 'PHY 367 WRF', and 'PHY 440 W' at the end of the season. No differences in nodes above cracked boll were observed at the end of the season due to glufosinate application. Differences in nodes above cracked boll were due to variety and 'PHY 565 WRF' had significantly more nodes above cracked boll than 'PHY 440 W', 'FM 1773 LLB2', 'FM 1735 LLB2', and 'ST 4145 LLB2'. Lint yields were affected by glufosinate application. A significant reduction in yield following two applications of glufosinate was observed in 'PHY 375 WRF'. Conversely, a yield increase was observed in 'ST 4145 LLB2' following two applications of glufosinate.

In conclusion, minimal visual injury was observed following application of glufosinate on Widestrike™ or Liberty Link cotton. Differences in plant height, total nodes, and nodes above cracked boll were primarily due to varietal genetics. Liberty Link varieties possess robust tolerance to glufosinate. Although some yield reduction was observed in 'PHY 375 WRF' following two applications of glufosinate, further research is needed to further quantify this. Growers are encouraged to select a variety and trait package with which they can successfully manage problematic weed species and produce a profitable crop.