WEED CONTROL WITH GLYPHOSATE AND GLUFOSINATE IN WIDESTRIKE FLEX COTTON Jared Ross Whitaker A. C. York North Carolina State University Raleigh, NC A. S. Culpepper University of Georgia Tifton, GA

Abstract

The transgenic, herbicide-resistant cottons Roundup Ready[®] and Liberty Link[®] have revolutionized cotton production by allowing broad-spectrum weed control with convenience of overtop application. However, extensive use of glyphosate has selected for glyphosate-resistant Palmer amaranth (AMAPA). Glufosinate-based systems used in Liberty Link cotton could help in management of glyphosate-resistant AMAPA. Liberty Link varieties have not performed well agronomically in the Southeast, but better adapted Liberty Link varieties, stacked with glyphosate resistance are expected in the future.

WidestrikeTM technology was developed by Dow Agrosciences for insect resistance. In the transformation of Widestrike cotton, the *pat* gene, which imparts tolerance to glufosinate, was used as a selectable marker. The Widestrike trait has been stacked with Roundup Ready and Roundup Ready Flex traits. Liberty Link cotton contains the *bar* gene, which also imparts resistance to glufosinate. Liberty Link cotton has excellent tolerance of glufosinate (Ignite), yet unpublished research has shown that Widestrike cotton is less tolerant and some injury may occur. Dow Agrosciences is not promoting use of glufosinate on Widestrike cotton. However, Widestrike/Roundup Ready stacked varieties were used in this experiment as a model system to more easily compare weed control with glufosinate and glyphosate and to evaluate combinations of glyphosate and glufosinate.

This conventional tillage experiment planted with PHY 485 WRF cotton was conducted at three North Carolina locations during 2007. One set of treatments included either Roundup Weathermax (R'up) at 22 fl oz/A or Ignite 280 (IGN) at 23 fl oz/A applied alone, with Staple LX at 1.7 fl oz/A, or with Dual Magnum at 1 pt/A to 1- to 2-leaf cotton (POST 1) and either WM or IGN alone at the same rates applied to 6-leaf cotton (POST 2). All plots then received Direx at 2 pt/A + MSMA 6.6 at 2.4 pt/A directed 30 days after POST 2. Another set of treatments received tank mixtures of R'up plus IGN at 1 + 1/2, 1/2 + 1, and 1 + 1 X rates, with 1X R'up = 22 fl oz/A and 1X IGN = 23 fl oz/A. The tank mixes were applied at POST 1 and POST 2 followed by Direx + MSMA directed. Treatments were replicated four times in a RCB design. Weeds and densities at Location 1 were fall panicum and large crabgrass (GGGAN collectively) at 50 per yd², common lambsquarters at 10 per yd², respectively. Location 3 had redroot pigweed, fall panicum, sicklepod, and common lambsquarters at densities of 7, 17, 1, and 11, per yd², respectively, and entireleaf and ivyleaf morningglory at 6 per yd². AMAPA at Location 2 was a mixture of glyphosate-resistant and -susceptible biotypes.

Weed control in both R'up- and IGN-based systems was exceptionally good late-season at Locations 1 and 3. Except for GGGAN at Location 1, all species were controlled 100%. GGGAN control at Location 1 was statistically similar and at least 94% in all systems. CASOB was controlled 100% by all treatments at Location 2. AMAPA was controlled only 64% by R'up alone because of survival of glyphosate-resistant plants. Ignite alone was 19% more effective than R'up. Mixing Staple with R'up or IGN increased AMAPA control, and there was a trend for Dual to also increase control. Within systems, IGN was more effective on AMAPA than R'up. Best control of AMAPA was obtained in systems with IGN plus Staple, where AMAPA was controlled 96%.

All species except GGGAN at Location 1 and AMAPA at Location 2 were controlled completely (100%) by R'up and IGN tank mixes. GGGAN at Location 1 was controlled 90 to 100%, with no differences between R'up or IGN alone and the tank mixes. AMAPA at Loc 2 was controlled similarly by IGN alone and tank mixes of IGN 1/2X + R'up 1X and IGN 1X + R'up 1/2X (83 to 87%). Greatest control was obtained with IGN 1X + R'up 1X at 94%. Control by all IGN plus R'up tank mixes exceeded control by R'up alone. Although one might anticipate antagonism with mixtures of IGN and R'up, there was no evidence of antagonism in this experiment.

Minor injury by IGN was observed, and mixing Staple or Dual with IGN slightly increased injury. Injury from tank mixes containing IGN 1X was greater than IGN alone. However, no differences in yield were noted among treatments.

The purpose of this experiment was not to encourage use of IGN on Widestrike cotton but rather to use Widestrike Roundup Ready Flex cotton as a model system to study weed control in anticipation of Liberty Link varieties stacked with glyphosate resistance becoming available. Similar to previous work, this research demonstrated that good weed control can be obtained in glufosinate-based systems. This experiment also showed that tank mixes (sequential applications would be expected to be similar) of R'up and IGN can be effective options for weed control in future varieties with stacked herbicide resistance. Moreover, with timely application, IGN can be used to control glyphosate-resistant AMAPA.