

WEED CONTROL AND COTTON TOLERANCE WITH GLUFOSINATE IN WIDESTRIKE COTTON**J.R. Whitaker****A.C. York****North Carolina State University****Raleigh, NC****A.S. Culpepper****University of Georgia****Tifton, GA****Abstract**

Roundup Ready (RR) technology revolutionized cotton production by allowing broad-spectrum weed control with convenient overtop applications of glyphosate. Widespread planting of these varieties and the extensive use of and reliance on glyphosate has led to selection for glyphosate-resistant Palmer amaranth (AMAPA). Glufosinate-based systems used in Liberty Link (LL) cotton could help manage this weed. However, current LL varieties have not performed well agronomically in the Southeast. Widestrike technology was developed for insect resistance and also contains a gene that imparts tolerance to glufosinate (Ignite). The Widestrike trait has been stacked with RR and RR Flex traits. This research was conducted to evaluate Widestrike cotton's tolerance to glufosinate. Moreover, this technology was used to compare weed control with glyphosate- and glufosinate-based herbicide systems along with combinations of these herbicides. We also investigated these herbicides used in traditional RR and LL varieties.

Four experiments were conducted in NC and GA between 2006 and 2008. Experiment 1 evaluated Ignite (IGN) and Roundup (R'up) based herbicide systems in Widestrike cotton (PHY 485 WRF) for control of glyphosate-resistant (GR) or glyphosate-susceptible (GS) AMAPA. Treatments included POST applications of either R'up (22 oz/A) or IGN (23 oz/A) applied alone, with Staple LX (1.7 oz/A), or with Dual Magnum (1 pt/A) to 1- to 2-leaf cotton and either R'up or IGN alone applied at the same rates to 5- to 6-leaf cotton. All plots received Direx (2 pt/A) plus MSMA 6.6 (2.4 pt/A) at lay-by. Experiment 2 also evaluated R'up and IGN herbicide systems for control of GR and GS AMAPA, but in traditional RR and LL cotton varieties (PHY 485 WRF and FM 1735 LLB2). Treatments were similar to Experiment 1, except that Prowl H₂O (2.1 pt/A) was applied alone or with Reflex (1 pt/A) PRE and Staple LX was applied at 3.2 oz/A. At all sites in both Experiments 1 and 2, AMAPA was the predominate weed species (densities of 120 to 180 yd²) and POST herbicide applications were made timely (2-inch or smaller AMAPA). Experiment 3 examined potential for weed control antagonism with tank mixtures of R'up and IGN. Treatments consisted of a two by three factorial arrangement in a RCB design. Factor A was herbicide (R'up or IGN) and factor B was rate {none, one-half the full rate (1/2X), or the full rate (1X)}. Full rates for R'up and IGN were 22 and 23 oz/A, respectively. Applications were delayed until weeds were near or above the maximum size for IGN to simulate situations growers would likely consider using a tank mix. Experiment 4 was conducted under weed-free conditions to determine Widestrike cotton tolerance to IGN. Three POST herbicide applications were made to 2-, 6-, and 10-leaf cotton (PHY 485 WRF). Treatments included IGN alone applied at 22 or 44 oz/A and IGN mixed with Staple, Dual Magnum, or R'up applied at 1.3 oz/A, 1 pt/A, and 22 oz/A, respectively. These were compared to a R'up only treatment for injury and yield. For all experiments, late-season weed control is discussed (21 d after application in Experiment 3). Data were subjected to ANOVA, and means were separated with Fisher's Protected LSD (P = 0.05).

At sites with GS AMAPA in Experiment 1, all R'up systems were at least 99% effective late-season. At the two sites with GR AMAPA, R'up alone was only 17 and 65% effective late-season. Mixing Dual with R'up did not increase control, however mixing Staple with R'up increased control to 30 and 85% at the two sites. At all sites, IGN alone was 77 to 90% effective. Mixing Staple or Dual with IGN increased control to at least 93 and 84%, respectively. Yields were similar among all systems in both varieties at sites with GS AMAPA; yields were generally higher with IGN systems compared to R'up systems at sites with GR AMAPA, especially when IGN or R'up was applied alone.

AMAPA control in Experiment 2 was similar to Experiment 1 although systems were somewhat more effective due to PRE applications. All RR and LL systems which received Reflex plus Prowl PRE were at least 98 and 85% effective at GS and GR AMAPA sites, respectively. At the GS AMAPA site, there were no differences in yield between herbicide treatments or cotton varieties (2670 to 3280 lbs seed cotton/A). At the GR AMAPA site, yields were similar in LL and RR cotton when Reflex plus Prowl was applied PRE. When only Prowl was applied PRE,

yields varied. R'up alone was unharvestable and IGN alone yielded 1450 lbs/A. Adding Dual increased yields in both varieties, although LL cotton yield was 29% higher than RR yield. Yields were similar when IGN or R'up was mixed with Staple. Staple increased yields over Dual in the RR system but not in the LL system.

In Experiment 3, the ½ and 1 X rates of R'up were at least 86 and 95% effective on GS AMAPA, common lambsquarters, and several annual grass species. Antagonism was observed in these weeds when either the ½ or 1 X rates of IGN were mixed with either rate of R'up. Compared to IGN alone, adding R'up generally increased the effectiveness of the tank mix. Antagonism was not seen in GR AMAPA or tall and pitted morningglory.

Minor cotton injury was observed when IGN treatments were applied to Widestrike cotton in Experiment 4. However, injury was relatively transient, such that injury was 3% or less from all IGN treatments 28 days after the 10-leaf cotton application. Also, no IGN treatment affected yield relative to that with R'up alone.

This research demonstrated that Widestrike cotton is tolerant to IGN, and that IGN-based systems, when applied timely, can control GR AMAPA. It also shows a case where a LL variety performed as well as a RR variety in the Southeast. With the release of Bayer's stacked glyphosate and glufosinate tolerant cotton, growers will have the option to use both R'up and IGN herbicide systems. However, growers should be hesitant to tank-mix R'up and IGN because of possible antagonism.