COMPARING GLUFOSINATE HERBICIDE TOLERANCE OF WIDESTRIKE AND LIBERTY-LINK COTTON VARIETIES

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Abstract

The use of glufosinate herbicide (Liberty 280SL, 24.5% glufosinate-ammonium) in glufosinate-tolerant cotton varieties is a novel and effective strategy cotton producers have employed in managing glyphosate resistant weeds (namely *Amaranthus palmeri*). Transgenic cotton varieties expressing the phosphinothricin acetyltransferase enzyme (PAT) are tolerant to topical applications of glufosinate. Both Liberty-Link and Widestrike cotton express the PAT enzyme, but through insertion of gene constructs unique to each technology. Glufosinate tolerance in Liberty-Link varieties is conferred through insertion of the bialaphos resistance gene (*bar*) (Wallace et al., 2011). Widestrike technology is a dual *Bt* gene form of lepidopteron insect protection. To aid in the selection of plants successfully transformed with the Widestrike trait, a selectable marker known as the *pat* gene was inserted along with the insecticidal proteins derived from *Bt* (OGTR, 2009). The *pat* gene also confers tolerance to glufosinate, but with lower levels of PAT activity compared to that of Liberty-Link cotton (Steckel et al., 2012). Research has shown up to 35% phytotoxic injury of 'PHY 485 WRF' following topical applications of glufosinate (Culpepper et al., 2009); while Liberty-Link cotton appears to be "bulletproof" (Dodds et al., 2011). In order to determine the effect of glufosinate herbicide application on plant growth, fiber production, and fiber quality of Widestrike and Liberty-Link cotton, a replicated field study was conducted at PDREC in Florence, SC in 2011 and 2012. Two cotton varieties (PHY 375 WRF and FM 1773 LLB2) were planted in a split-plot design with four replications. Each variety received a single and two applications of glufosinate at the following rates: 0.53 lb ai/ac (1X), 1.06 lb ai/ac (2X), 1.59 lb ai/ac (3X), and 2.39 lb ai/ac (4X). Glufosinate applications were made at 1 to 3 leaves, and/or 7 to 9 leaves, or early bloom. Widestrike varieties are less physically tolerant to applications of glufosinate than Liberty-Link varieties. Despite greater susceptibility to injury than Liberty-Link cotton (up to 21% greater), Widestrike varieties are resilient and tolerate applications of glufosinate up to two times the labeled rate with no significant yield loss. However, yield was reduced 150 and 180 pounds following an application of 3 and 4 times the labeled rate of glufosinate, respectively. Numeric increases in yield were observed for both varieties following applications at the labeled rate. The RVR of cotton treated with glufosinate trended downward with increasing application rate.

References

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