EFFECTS OF GLUFOSINATE APPLICATION RATE AND TIMING ON COTTON GROWTH,
DEVELOPMENT, AND YIELD
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Abstract
Glufosinate-resistant cotton (Liberty Link) was commercialized in 2004 by Bayer Crop Sciences. Liberty Link cotton was developed through the insertion of the bialaphos resistance (BAR) gene, which provides resistance to glufosinate. WideStrike™ technology, which provides resistance to lepidopteron pests, was released in 2005 by Dow AgroSciences. The phosphinothricin acetyltransferase (PAT) gene, which also has confirmed resistance to glufosinate, was used as a selectable marker during plant formation. However, the PAT gene does not provide the same level of resistance to glufosinate as the BAR gene. In addition, limited data is available regarding the effect of glufosinate application rate and timing on WideStrike™ cotton. Therefore, the objective of this research was to evaluate the effect of glufosinate application rate and timing on the growth, development and yield of WideStrike™ and Liberty Link cotton cultivars. Research was conducted in 2010 and 2011 at 10 locations across 7 states including the R.R. Foil Plant Science Research Center near Starkville, Mississippi (2010 & 2011), the West Tennessee Research and Education Center in Jackson, Tennessee (2010 & 2011), the Lon Mann Cotton Research Center in Marianna, Arkansas (2010 & 2011), Onslow County, North Carolina (2011), the Dean Lee Research Station in Alexandria, Louisiana (2011), Plains, Georgia (2010), and at the Tennessee Valley Research and Extension Center in Belle Mina, Alabama (2011). Phytogen 375 WRF and FiberMax 1773 LLB2 were planted at all locations in 2010 and 2011. Glufosinate applications were made to 1 to 3 leaf cotton and/or 6 to 8 leaf cotton. A non-treated check was included for comparison purposes. Four application rates at each application timing included: 0.59, 1.06, 1.59, and 2.37 kg ai ha⁻¹. Phytotoxicity, plant height, and total node data were collected 14 days and also 28 days after each treatment. Node above white flower data was also collected 28 days after the 6-8 leaf treatment. End of season data included node above cracked boll, total nodes, final height, and lint yield. Data was subjected to analysis of variance using the PROC Mixed procedure in SAS 9.2 and means were separated using Fishers Protected LSD at P = 0.05. Visual injury significantly increased after the 1 to 3 leaf application with each increase in application rate on PHY 375 WRF. Visual injury ranged from 8% following application of 0.53 kg ai ha⁻¹ glufosinate to 36 % following application of 2.37 kg ai ha⁻¹ glufosinate. Less than 6% visual injury was observed on FM 1773 LLB2, regardless of application rate. Visual injury after glufosinate application at 1.59 and 2.37 kg ai ha⁻¹ to 6 to 8 leaf glufosinate was 12 and 21%, respectively. No significant differences in plant height due to glufosinate application were observed 14 days after the 1 to 3 leaf application in either variety. Significant height reductions on PHY 375 WRF were observed at glufosinate application rates greater than 0.53 kg ai ha⁻¹ following the 6 to 8 leaf application. Final plant heights were unaffected by glufosinate application rate or timing in either
variety. Nodes above cracked boll in PHY 375 WRF decreased with each increase in application rate. Significant yield reductions were observed in PHY 375 WRF following glufosinate application rates greater than 0.53 kg ai ha\(^{-1}\). No yield reductions were observed in Liberty Link cotton due to glufosinate application rate and timing. These results indicate that glufosinate application rates above 0.53 kg ai ha\(^{-1}\) may have a negative effect on the growth, development, and yield of Widestrike™ cotton. Increased glufosinate application rates, regardless of application timing, did not have a negative effect on the growth, development, and yield of Liberty Link cotton.