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GLYPHOSATE-RESISTANT HORSEWEED STORY: A REAL NIGHTMARE

Robert M. Hayes, Thomas C. Mueller, and C. Chism Craig
University of Tennessee
Jackson, TN

Abstract

In 2000, a producer in Lauderdale County contacted the local extension office and Monsanto to report poor control of horseweed (*Conyza canadensis),* often called mare's tail, with 0.75 lb ae/ac glyphosate (Roundup Ultra®). Many plants were not killed after the field was retreated with 1.5 lb ae/ac glyphosate (Roundup Ultra®). Surviving plants were stunted and yellowish, but the apical meristem remained green. A field trial in 2001 confirmed observation of the previous year. The producer treated a portion of the field with Roundup Ultra® at 0.75 lb ae/ac plus 2, 4-D at 0.48 lb ae/ac in late February and achieved complete control. The balance of the field was treated with paraquat (Gramoxone Max®) at 0.38 lb ai/ac plus chlorimuron-metribuzin (Canopy®) at 0.18 lb ai/ac plus 0.25% surfactant when the horseweed was approximately 6 inches in height. Horseweed control in soybeans was nearly complete with this treatment. Neighboring producers reported poor control of horseweed with glyphosate (Roundup UltraMAX® and Touchdown IQ®). Other producers in Haywood, Crockett, and Gibson counties failed to achieve acceptable horseweed control with up to 1.5 lb ae/ac as single or sequential application. Most of these fields were not tilled and had a history of glyphosate use. In some cases glyphosate had been used exclusively for a number of years.

Initially, a comparison of glyphosate formulations was performed to determine if recent formulation changes had compromised efficacy on horseweed. Formulations included Roundup Original®, Roundup D-Pak®, Roundup Ultra®, Roundup UltraDry®, Roundup UltraMAX®, Touchdown 5 ® and Touchdown IQ® at 1.5 lb ae/ac plus 0.25% surfactant. None of the formulations controlled horseweed more than 65% at 31 days after treatment (DAT).

Flumioxazin (Valor®) and paraquat (Boa® or Gramoxone MAX®) plus diuron (Karmex® or Direx®) applied in early December 2001 controlled horseweed through April 2002. The former did not control annual bluegrass while the latter control all vegetation, leaving the soil vulnerable to erosion. Neither of these treatments was as effective when applied in the spring on 3 to 4 inch horseweed, while glyphosate, glufosinate (Liberty®) or paraquat plus 2, 4-D controlled horseweed >95% when glyphosate at 1.0 ae/ac was ineffective. At least thirty days are required following application of 2,4-D and planting of cotton. Similarly, glyphosate plus dicamba (0.125 lb ai/ac) also controlled horseweed when applied in the spring at least 21 days before planting cotton.

Twenty treatments labeled for use in cotton were evaluated for control of the glyphosate-resistant horseweed. At 36 DAT, dicamba (Clarity®) at 0.25 lb ae/ac alone or with glyphosate (Roundup UltraMAX®) and MSMA plus diuron (Karmex® or Direx®) controlled horseweed >97%. Diuron (Karmex® or Direx®), fluometuron (Cotoran®, Meturon®), and prometryn (Caparol®, CottonPro®) plus glyphosate (Roundup UltraMAX®) controlled horseweed from 80 to 92%. Carfentrazone-ethyl (Aim®), lactofen (Cobra®), flumioxazin (Valor®), metolachlor (Dual®), dimethpin (Harvade®), pyrithiobac (Staple®) and oxyflurfen (Goal®) alone or in mixtures with MSMA or glyphosate failed to control horseweed. Glufosinate (Liberty®•) at 0.42 lb ai/ac applied to horseweed #12 inches that had been previously treated with glyphosate at 0.75 lb ae/ac did not control horseweed more than 86%.

MSMA and trifloxysulfuron-sodium (Envoke®) postemergence overtop suppressed horseweed to facilitate control with post directed herbicides. The most effective post-directed herbicides for glypohosate resistant horseweed control in cotton were MSMA (85%) and MSMA plus diuron (Karmex® or Direx® >95).

In greenhouse studies, 2.5 lb ae/ac glyphosate was required to control the resistant(R) biotype at the two-inch growth stage while the susceptible biotype was controlled with 0.38 lb ae/ac. Three-inch rosettes of the R-biotype required 5 lb ae/ac and the S-biotype required 0.75 lb ae/ac. Both the R and S biotypes required greater glyphosate rates to achieve control as the plants become larger.

Horseweed, thought to emerge in late-winter or early spring, emerged throughout the summer and into the fall during 2002 in Tennessee. Therefore a season-long management strategy is recommended.

Recommendations for managing resistant horseweed in cotton are: flumiozazin (Valor) preplant at 0.5 to 1.0 oz ai/ac from November 15 until 30 days before planting on <2 inch horseweeds; glyphosate 0.75 lb ae/ac + dicamba (Clarity®) at 0.25 lb ai/ac at least 21 days before planting; or glyphosate 0.75 lb ae/ac + 2,4-D at 0.475 lb ae/ac at least 30 days before planting; or glyphosate 0.75 lb ae/ac early spring followed by paraquat (Gramoxone Max®, Boa®) 0.38 lb ai/a plus diuron (Karmex® or Direx®) or fluometuron (Cotoran®, Meturon®), (preemergence labeled rate for soil type before cotton emergence) or

MSMA preplant at 2 lb ai/ac plus diuron (Karmex® or Direx®) or fluometuron (Cotoran®, Meturon®) at PRE labeled rates. MSMA overtop before squaring or post-directed in combination with diuron are recommended for in-crop use. Early preplant control measures are most effective. Horseweed escaping PRE control should be post-directed as early as possible with MSMA + diuron (Karmex® or Direx®). Efficacy on other weeds and cost of treatment should be considered in selecting the control strategy.