

**THE GLYPHOSATE-RESISTANT HORSEWEED  
STORY: A REAL MARE'S TALE**

**Robert M. Hayes**

**University of Tennessee  
Jackson, TN**

**Robert F. Montgomery and John B. Willis**

**Monsanto  
Union City, 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 horseweeds were 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 not 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).

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®), dimethipin (Harvade®), pyriithiobac (Staple®) and oxyflufen (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% control.

Water volumes greater than 10 gallons per acre tended to decrease activity on horseweed. Surfactant rates of 0.25 to 2% did not improve horseweed control with Roundup UltraMAX®. There was no difference in horseweed control with glyphosate among four different surfactants (R-11, Silwet L-77®, LI-700® and Induce®) evaluated.

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.

Recommendations for managing resistant horseweed in cotton are: 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 90 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. 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.