

WILSON, ROBERT G.^{1*}, STEPHEN C. WELLER², DAVID R. SHAW³, MICHEAL D. K. OWEN⁴, BRYAN G. YOUNG⁵ and DAVID L. JORDAN⁶, ¹University of Nebraska, 4502 Avenue I, Scottsbluff, NE 69361, ²Purdue University, West Lafayette, IN 47907, ³Mississippi State University, Mississippi State, MS 39762, ⁴Iowa State University, Ames, IA 50011, ⁵Southern Illinois University, Carbondale, IL 62901 and ⁶North Carolina State University, Raleigh, NC 27695. **Benchmark study: impact of glyphosate-resistant crops on weed populations, weed management tactics, and farm profitability – can this study provide insight into the future of glyphosate-resistant sugarbeets?**

ABSTRACT

The Benchmark Study was initiated in 2006 and involves 156 producers in the states of Iowa, Illinois, Indiana, Mississippi, Nebraska, and North Carolina to assess the impact of weed management strategies on the sustainability of glyphosate-based crop production systems. Producers were randomly selected and provided a 16 ha field which was divided in half, the producers continued their weed management program on half of the field and a scientist at each university used their expertise to recommend herbicide resistance management practices. Fields selected for the study in 2006 had a minimum of a three-year field history in glyphosate-resistant (GR) cropping systems. Fields were divided into three categories: 1) a single continuous GR crop, 2) a rotation of two GR crops, and 3) a GR crop rotated with a non-GR crop. Forty observation sites were established in each field and at each site the soil seedbank was sampled and weed density assessments by species; before or at planting; before the first postemergence herbicide application; 2 weeks after the last postemergence herbicide treatment; and before harvest for a total of 125,000 observations over 4 years. Academic weed control recommendations included much greater herbicide diversity including increased use of residual herbicides compared to tactics practiced by growers. Academic recommendations reduced the population density of problematic weeds, horseweed (*Conyza canadensis* (L.) Cronq.), common waterhemp (*Amaranthus rudis* Sauer), and giant ragweed (*Ambrosia trifida* L.), before and after postemergence glyphosate applications. Weed control recommendations made by academics increased weed control costs from \$14 to \$25 per hectare but the overall economic return for grower and academic sections of the field were similar. Grower perceptions on GR weeds have changed in the past 5 years. Growers reported increased use of specific management methods such as tillage and the use of post-applied and residual herbicides to manage GR weeds. Growers in the southern U.S. were more aware of GR weeds and were employing specific actions to manage problematic weeds compared to growers in other regions. The prevalent sources for acquiring information on weed resistance were farm publications (57%), dealers/retailers (30%), university extension (27%), other farmers (16%), and the internet (3%).

The results of the Benchmark Study suggest sugarbeet growers need to incorporate more herbicide diversity into sugarbeet weed control programs. This can be accomplished by incorporating soil applied residual herbicides such as ethofumesate, S-metolachlor or dimethenamid-p and tank mixing glyphosate with clopyralid, triflurosulfuron or phenmedipham + desmedipham. In addition it is important to increase the frequency of herbicide diversity in other GR crops grown in rotation with sugarbeet such as corn and soybean.