

GLYPHOSATE TOLERANT SUGARBEET: WEED CONTROL, ECONOMICS, AND ENVIRONMENTAL IMPACTS. Andrew R. Kniss, Robert G. Wilson, Alex R. Martin, and Dillon M. Feuz, Graduate Research Assistant, Professor, and Professor, Department of Agronomy and Horticulture, and Associate Professor, Department of Agricultural Economics, University of Nebraska, Scottsbluff, 69391.

Weed control is a costly and necessary part of sugarbeet production, relying heavily on repeated herbicide application, cultivation, and hand labor. The development of sugarbeet tolerant to the broad spectrum herbicide glyphosate through genetic engineering could give growers a more convenient, cost-effective, and environmentally friendly alternative to conventional sugarbeet herbicides. Although several glyphosate tolerant sugarbeet varieties have gained U.S. regulatory approval, they are not currently grown due to lack of sugar company acceptance. The objectives of this research were to compare weed control, economics, and environmental aspects of glyphosate applied to two glyphosate-tolerant sugarbeet varieties to that of conventional herbicide programs applied to near-isogenic non-glyphosate-tolerant conventional varieties. Field experiments were conducted near Scottsbluff, Nebraska in 2001 and 2002. Glyphosate applied two or three times at two-week intervals beginning when weeds were 10 cm tall provided excellent weed control, yield, and net economic return regardless of variety. Three applications phenmedipham plus desmedipham plus triflurosulfuron plus clopyralid with or without preemergence ethofumesate provided the greatest weed control among conventional herbicide treatments, but did not always result in the highest yield. One application of glyphosate resulted in yields similar to conventional herbicide treatments. All conventional herbicide treatments resulted in similar net returns. Although the conventional sugarbeet varieties 'HM 1640' and 'Beta 4546' responded similarly to herbicide treatments with respect to sucrose content, 'Beta 4546RR' produced roots with over 1% more sucrose than 'HM 1640RR'. Due to this yield difference a producer planting Beta 4546RR could afford to pay nearly twice as much for glyphosate-tolerant technology as would a producer planting HM 1640RR. When averaged over varieties and herbicide treatments, it is estimated that a producer could afford to pay an additional \$150 ha⁻¹ for glyphosate-tolerant technology without decreasing net return. A switch to glyphosate tolerant sugarbeet would result in a modest increase in the amount of postemergence herbicide applied per hectare. However, output from computer modeling programs FIRST and GENEEC suggest that environmental concentrations of glyphosate would be less than those of most conventional sugarbeet herbicides 60 days after application.