

ROTHER, INES, ALAN G. DEXTER AND JOHN L. LUECKE, North Dakota State University - University of Minnesota, Plant Sciences Department, Fargo, ND 58105-5051. **Postemergence weed control in transgenic sugarbeet.**

#### ABSTRACT

Weeds were identified as the worst production problem by 48% of the sugarbeet growers in eastern North Dakota and Minnesota in 2000. Glyphosate (Roundup) and glufosinate (Liberty) are postemergence non-selective and highly effective herbicides. Transgenic sugarbeet cultivars have been developed to be resistant to glyphosate (Roundup Ready) or glufosinate (Liberty Link). As compared to conventional herbicide programs in sugarbeet, glyphosate and glufosinate provide advantages such as improved crop safety, broader weed spectrum, the ability to control large weeds and the ability to control weeds resistant to herbicides with other modes of action. The objectives of these experiments were to determine if yellowing caused by late applications of glufosinate caused sugarbeet yield loss; to determine if transgenic sugarbeet cultivators were similar in yield and susceptibility to conventional herbicides as compared to near-isogenic non-transgenic cultivars; and to investigate possible growth stimulation of sugarbeet from glyphosate and glufosinate.

Glufosinate applied late in the growing season when sugarbeet rows were nearly closed caused a distinctive yellowing of the sugarbeet canopy. However, when sugarbeet were hand weeded until the first application of glufosinate to eliminate early season competition, sugarbeet yellowed by glufosinate yielded similarly to non-yellowed sugarbeet. Reduced sugarbeet yield previously observed in plots with delayed glufosinate treatment was probably due to early season weed competition and not due to sugarbeet injury from late application of glufosinate.

Liberty Link and near-isogenic non-transgenic sugarbeet cultivars were injured similarly by conventional herbicide treatments including desmedipham (Betanex), clopyralid (Stinger) and triflusaluron (UpBeet). However, Roundup Ready cultivars were injured more by conventional herbicides than the near-isogenic non-transgenic cultivars. Only one of the seven Roundup Ready cultivars yielded less than the near-isogenic non-transgenic paired cultivar. The lower yield was observed in herbicide treated and non-treated plots so the increased herbicide injury to the Roundup Ready cultivar probably was not the cause of the reduced yield. All five of the Liberty Link cultivars and six of the seven Roundup Ready cultivars yielded similarly to the near-isogenic non-transgenic paired cultivar.

Observations in 1997 and 1998 indicated that sugarbeet plots treated with glyphosate or glufosinate yielded more than hand weeded plots. To investigate if hand weeding was damaging sugarbeet plants and reducing yield or if the herbicides were stimulating growth, sugarbeet was hand weeded first and then treated with glyphosate or glufosinate in 1999 and 2000. Plots that were hand weeded and treated with glyphosate yielded more than hand weeded plots in 1999 but not in 2000. Plots that were hand weeded and treated with glufosinate yielded similarly to hand weeded plots in 1999 and 2000.

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**Glyphosate and glufosinate for weed control in sugarbeet.**

Field experiments were conducted in 1999 and 2000 to examine the optimum weed size, number of applications of glyphosate or glufosinate required for weed control, and the yield potential of the two sugarbeet weed control programs. Glyphosate at 0.8 kg/ha or glufosinate at 0.4 kg/ha were applied either once, twice or three times beginning when average weed height was 2.5, 10, 15 or 25 cm. Two applications of glyphosate applied when average weed height was 10 cm or three applications of glufosinate applied when average weed height was 2.5 cm provided excellent weed control. Sugarbeet sucrose yield with both weed control programs was near 11,000 kg/ha. Glufosinate weed control was influenced by humidity at the time of application, as percent humidity increased weed control from glufosinate increased. If weed control was delayed until average weed height was 15 or 25 cm sugarbeet root yield was reduced 8 and 18% respectively, because weeds competed with the crop.