STARKE, ROBERT J., and KAREN A. RENNER, Department of Crop and Soil Science, Michigan State University, East Lansing, MI 48824. Velvetleaf Control with Triflusulfuron in Sugarbeet.

ABSTRACT

Triflusulfuron is a sulfonylurea herbicide applied postemergence for velvetleaf control in sugarbeet. An adjuvant is essential for velvetleaf control. Desmedipham and phenmedipham are the most widely used herbicides for broadleaf weed control in sugarbeet. A postemergence combination of triflusulfuron and desmedipham and phenmedipham would provide a broadspectrum postemergence weed control program. Sugarbeet response and velvetleaf control from postemergence applications of triflusulfuron alone and in combination with desmedipham + phenmedipham, non-ionic surfactant, and 28% liquid urea ammonium nitrate were evaluated in the field. All herbicide treatments were applied twice with seven days between applications. Herbicide treatments were in a factorial arrangement with the factors consisting of triflusulfuron (0.0 + 0.0, 0.0078 + 0.0078 or 0.0156+0.0156 lb ai/A), desmedipham + phenmedipham (0.0+0.0 or 0.33+0.33 lb ai/A), urea ammonium nitrate, (UAN), (0.0+0.0 or 4.0+4.0% v/v), and non-ionic surfactant (X-77) (0.0+0.0 or 0.25+0.25% v/v). The first application was made when sugarbeet were in the cotyledon stage and 70% of the velvetleaf emerged were at cotyledon and 30% at the first true leaf growth stage. All field herbicide treatments were applied with a compressed air tractor sprayer at 3 mph in a spray volume of 22 gallons per acre and at a spray pressure of 30 psi. The experiment had three replications and was repeated in 1993 and 1994.

Velvetleaf control was also evaluated with the same experimental design in a greenhouse experiment. Triflusulfuron rates were reduced to 0.002 + 0.002 or 0.004 + 0.004 lb ai/A and the study was also modified to include four replications and repeated three times.

A second field experiment determined if sugarbeet stand, visual injury, root yield or sugar quality was influenced by preemergence followed by postemergence herbicide application. The experiment was a split plot RCB with four replications repeated in 1993 and 1994. In both years, the site was a clay soil with 3.2 % organic matter and a soil pH of 8.0. The main plots were preemergence herbicide treatments including; no preemergence treatment, cycloate at 3.0 lb ai/A, pyrazon at 4.0 lb ai/A, ethofumesate at 2.0 ai/A, and pyrazon + ethofumesate at 4.0+2.0 lb ai/A. Cycloate was applied preplant incorporated. All other preemergence herbicides were applied to the soil surface after planting. The subplots were postemergence herbicide treatments and included no postemergence treatment, triflusulfuron at 0.0156 + 0.0156 lb ai/A + X-77 at 0.25% v/v, triflusulfuron at 0.0312 + 0.0312 lb ai/A + X-77 at 0.25 % v/v, desmedipham + phenmedipham at 0.33 + 0.33 lb ai/A + X-77 at 0.25% v/v, 0.0156 + 0.0156 lb ai/A triflusulfuron + desmedipham + phenmedipham + X-77, 0.0312 + 0.0312 lb ai/A triflusulfuron + desmedipham + phenmedipham + X-77, desmedipham + phenmedipham + ethofumesate at 0.15 + 0.15 lb ai/A, and desmedipham + phenmedipham + endothall at 0.25 + 0.25 lb ai/A. The sugarbeet stand was counted for 4.6 m of both center plot rows to determine differences in sugarbeet emergence. The area was marked with flags and recounted 7 days after the last postemergence application (DALP) to determine any change in sugarbeet population following postemergence herbicide applications. At 7 DALP, all plots were manually thinned to a

population of 125 plants 30 m^{-1} to negate any affect of stand reduction on root yield. Weeds were manually removed in all plots throughout the growing season.

In 1993, treatments containing desmedipham + phenmedipham + X-77 received injury ratings of 13-17%, 7 days after the last postemergence treatment (DALP). All other treatments resulted in visual injury of less than 10%. All visual injury was less than 8% by 14 DALP. In 1994, adding triflusulfuron to desmedipham + phenmedipham + X-77 increased sugarbeet injury. In 1994 sugarbeet injury was greater 14 DALP than 1993. The difference in herbicide injury between 1993 and 1994 may be explained by the temperature at the time of second application. It was 10° F cooler in 1994 at the time of second application compared to 1993. The injury in 1993 was mainly leaf tip burn, which is injury typical of desmedipham + phenmedipham. In 1994, the sugarbeet injury was a yellowing and inhibition of sugarbeet growth.

Triflusulfuron alone gave less than 40% velvetleaf control. X-77 increased velvetleaf control by .0078 + .0078 lb ai/A triflusulfuron to 71%, compared to UAN at 39%. Velvetleaf control was 70 to 79% with both rates of triflusulfuron in the presence of X-77. Triflusulfuron + X-77 ± UAN gave 71 to 79% velvetleaf control. Desmedipham + phenmedipham alone or in combination with UAN or X-77 did not control velvetleaf. Adding desmedipham + phenmedipham to triflusulfuron alone increased control of velvetleaf. Adding desmedipham + phenmedipham to triflusulfuron + X-77 did not affect velvetleaf control in the field.

Triflusulfuron ± UAN did not reduce velvetleaf dry weight in the greenhouse. Triflusulfuron at 0.004 + 0.004 lb ai/A + X-77 reduced velvetleaf dry weight by 46% in the greenhouse. Triflusulfuron + X-77 + UAN decreased velvetleaf dry weight by 71%. Adding desmedipham + phenmedipham to triflusulfuron + X-77 in the greenhouse decreased velvetleaf control. Adding desmedipham + phenmedipham to 0.004 + 0.04 lb ai/A triflusulfuron + X-77 + UAN did not affect velvetleaf control.

The triflusulfuron rates applied in the field were four times greater than the triflusulfuron rates used in the greenhouse. The greater concentration of triflusulfuron applied in the field may have resulted in sufficient triflusulfuron being absorbed into the plant for control even if absorption was reduced when desmedipham + phenmedipham was applied with triflusulfuron. Adding desmedipham + phenmedipham to triflusulfuron + X-77 may decrease velvetleaf control in the field if triflusulfuron rates are below 0.0078 + 0.0078 lb ai/A or environmental conditions such as drought reduce herbicide uptake and efficacy.

Sugarbeet response to preemergence herbicides was not affected by postemergence herbicide treatments, therefore the main effects are presented. Ethofumesate reduced sugarbeet emergence by an average of 18 plants per 100 ft row. Applications of pyrazon or pyrazon + ethofumesate reduced sugarbeet stand in 1994 by 19 and 34 plants/100 ft row, respectively. Stand was not affected by pyrazon or pyrazon + ethofumesate in 1993. In 1993, 0.75 inch of precipitation was reported during the fourteen days after planting. In 1994, 2.6 inches of precipitation was reported in the fourteen days after planting. The saturated soil in 1994 may have resulted in more herbicide available for uptake by the emerging sugarbeet seedlings resulting in greater seedling mortality. All preemergence herbicides except ethofumesate reduced sugarbeet yield in the weed free environment compared to the untreated control. Preemergence herbicides did not affect sugarbeet sucrose content.

Sugarbeet response to postemergence herbicides was not affected by previous treatment with preemergence herbicide treatments, therefore the main effects are presented. All postemergence herbicides increased sugarbeet injury 7 DALP compared to the untreated control. Desmedipham + phenmedipham plus X-77 was less injurious than desmedipham + phenmedipham plus ethofumesate 7 DALP. Injury by triflusulfuron was greater in 1994 than 1993. Sugarbeet injury was less than 7% in 1993, 14 DALP. In 1994, herbicide injury varied from 13 to 22%, 14 DALP. Lower temperatures in 1994 probably did not allow the sugarbeet seedlings to recover from postemergence herbicide injury as quickly as in 1993.

In 1993, sugarbeet stand was reduced by postemergence applications of 0.0312 + 0.0312 triflusulfuron plus desmedipham + phenmedipham plus X-77 and desmedipham + phenmedipham plus ethofumesate. All postemergence treatments reduced sugarbeet stand in 1994. The cooler temperatures in 1994 may have resulted in less root development by the sugarbeet seedlings allowing more seedlings to be uprooted by the wind. The preemergence herbicides may have also contributed to the stand loss in 1994, because, stand was reduced by 11 sugarbeet seedlings per 100 ft row in plots which did not receive a postemergence herbicide application.

All postemergence herbicides reduced sugarbeet yield by 1.5 to 2.5 ton/A in the weed free environment as compared to the untreated control. Postemergence herbicide applications did not affect sucrose concentrations in sugarbeet.