EFFECT OF PREEMEGENCE AND POSTEMERGENCE HERBICIDES ON SUGARBEET (*BETA VULGARIS*) YIELD AND QUALITY.

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Previous research reported interactions among PRE and POST herbicide treatments resulting in increased sugarbeet injury, and a decrease in sugar yield. The objective of this study was to evaluate weed control, sugarbeet injury, yield, and quality following various herbicide programs. Herbicide treatments consisted of a factorial arrangement of five PRE herbicides, including no PRE, cycloate at 3.36 kg a.i./ha, pyrazon at 4.48 kg a.i./ha, ethofumesate at 1.68 kg a.i./ha, S-metolachlor at 1.42 kg a.i./ha, and five POST herbicides, including no POST, desmedipham & phenmedipham at 0.56 kg/ha + triflusulfuron at 0.017 kg/ha, desmedipham & phenmedipham & ethofumesate at 0.56 kg/ha + triflusulfuron at 0.017 kg/ha, desmedipham & phenmedipham at 0.09 kg/ha + triflusulfuron at 0.004 kg/ha + clopyralid at 0.023 kg/ha + 1.5% MSO, desmedipham & phenmedipham & ethofumesate at 0.09 kg/ha + triflusulfuron at 0.004 kg/ha + clopyralid at 0.023 kg/ha + 1.5% MSO. The experimental design was a RCB in a factorial arrangement with 4 replicates. Common lambsquarters control at one location in 2001 increased significantly from 95% with POST herbicides to 99% when PRE herbicides were followed by POST herbicides. Redroot pigweed control was excellent with all treatments at two locations in 2001. At the site with the highest pigweed density, redroot pigweed control with the standard split application provided 91% control, while the micro-rate provided 99% control when combined over PRE herbicides. Sugarbeet injury did not differ due to herbicide treatment when combined over locations in 2001. Sugarbeet stand and yield were reduced at one site from cycloate PRE compared to the no PRE treatment when combined over all POST treatments. This research was repeated at three locations in 2002.

KEY WORDS:

MSO = Methylated Seed Oil (adjuvant)

PRE = preemergence

POST = postemergence

Amaranthus spp. = *Amaranthus retroflexus* and *Amaranthus powellii*

Common lambsquarters = *Chenopodium album*

INTRODUCTION:

Sugarbeet growers face many challenges, including weed control. Weeds are controlled with PRE herbicides, POST herbicides, cultivation, and hand weeding (labor). With the cost of handhoeing increasing, interest in controlling more of the weeds with selective herbicides has increased (Wilson 1994). In Michigan, PRE herbicides were applied to 95% of the sugar beet hectares in 1990. However, by 2002 only 60% of the sugar beet hectares were treated with PRE herbicides, as growers adjusted their weed control practices to more frequent POST applications. In 2000, the micro-rate, a combination of desmedipham & phenmedipham + triflusulfuron + clopyralid + MSO, was registered for use in Michigan. The micro-rate herbicide program involves applying this herbicide combination every 5 to 7 days from the time that weeds begin to emerge until the time of sugar beet canopy closure. Advantages of the micro-rate compared to the standard rate are the ability to spray at any time of the day, improved weed control since weeds are very small (less than 1 cm) at the time of treatment, reduced cost, and a reduction in between-row cultivation. The herbicide application rates in the micro-rates are 60 to 80% lower than standard rates, but frequent applications and the addition of MSO may increase the potential for sugar beet injury. Furthermore, the use of PRE herbicides prior to POST herbicide applications may increase the risk of sugar beet injury and may have the potential to reduce sugar yield (Dawson 1975; Duncan et. Al 1982).

OBJECTIVES:

The objectives of this research were to determine if PRE herbicides improved weed control from standard-split or micro-rate herbicides applied POST, and if micro-rates were as effective controlling weeds as standard-split herbicide applications. The third objective was to determine if PRE herbicides increased sugar beet response to POST herbicide applications and to determine sugar beet yield and quality in plots treated with PRE only, POST only, and PRE followed by POST herbicide treatments.

METHODS:

Experiments were conducted at three locations in 2001 and two locations in 2002 in Michigan. The sugarbeet variety 'Hilleshog E-17' was planted at each location. Herbicide treatments were applied with a tractor mounted sprayer delivering 187 L/ha at 207 kPa using XR8003 spray tips. The experimental design was a randomized complete block in a factorial arrangement with four replicates. Individual plots were 3 (four rows) by 10.7 meters. Preemergence treatments were no PRE, pyrazon at 4.5 kg/ha, ethofumesate at 1.7 kg/ha, cycloate at 3.4 kg/ha, and s-metolachlor at 1.4 kg/ha. Postemergence treatments were no POST, desmedipham & phenmedipham at 0.56 kg/ha plus triflusulfuron at 0.017 kg/ha plus clopyralid at 0.105 kg/ha, desmedipham & phenmedipham & ethofumesate at 0.56 kg/ha plus triflusulfuron at 0.017 kg/ha plus clopyralid at 0.105 kg/ha, desmedipham & phenmedipham at 0.09 kg/ha plus triflusulfuron at 0.004 kg/ha plus clopyralid at 0.023 kg/ha plus MSO at

1.5% (v/v), and desmedipham & phenmedipham & ethofumesate at 0.09 kg/ha plus triflusulfuron at 0.004 kg/ha plus clopyralid at 0.023 kg/ha plus MSO at 1.5% (v/v).

Weed control and sugarbeet injury was evaluated 14 days after the final POST treatment. Sugarbeet populations were measured at harvest. The center two rows of each four row plot were harvested with a two-row lifter to measure root yield. Eleven kilogram samples were used to analyze sugar content.

RESULTS/CONCLUSION:

In the statistical analysis of the field research, error mean squares for locations within years were homogeneous so the data was combined over locations within years. Weed response to POST herbicides was similar for all POST herbicide treatments, as weed control from four micro-rate herbicide applications was equal to that of two standard split applications. Common lambsquarters and *Amaranthus* spp. control was greater where PRE herbicides were followed by POST herbicides, compared to the POST only treatments in 2001. However, in 2002 PRE herbicides did not improve weed control compared to POST only treatments. Sugarbeet leaf injury and stunting was greater in 2002 compared to 2001, but there were no significant differences among treatments in either year. Sugarbeet populations were reduced by cycloate in 2001; however no PRE herbicide treatment reduced sugarbeet populations in 2002. Recoverable sucrose was similar among all treatments in both 2001 and 2002. Therefore PRE herbicides reduced sugar beet populations in one of two years but PRE herbicides also improved weed control in one of two years. Micro-rate applications were no more injurious than standard split applications and provided comparable weed control.

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