

RESPONSE OF SUGARBEET (*BETA VULGARIS*) VARIETIES AND POPULATIONS TO POSTEMERGENCE HERBICIDE TREATMENTS.

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Previous research has shown a differential response of sugarbeet varieties to herbicide treatments. Increased sugarbeet injury may result in reduced yield, sugar content, or both. Preliminary research indicated a differential response of sugarbeet varieties to postemergence herbicides. Our objective was to evaluate the growth response of fourteen sugarbeet varieties, and four USDA sugarbeet populations, to postemergence herbicides applied three times at the micro-rate. Commercial sugarbeet varieties, and USDA populations were grown in growth chambers with a photoperiod of 16:8 h (light:dark) and thermoperiod of 14:24 C (day:night). Sugarbeet was treated with the micro-rate of desmedipham plus phenmedipham plus triflurosulfuron plus clopyralid plus methylated seed oil at 0.045, 0.045, 0.004, 0.023 kg a.i./ha and 1.5% v/v, respectively, at weekly intervals beginning at the cotyledon growth stage. The experiment was arranged in a CRD with three replicates and was repeated. Treatments consisted of either treated or untreated sugarbeet. Leaf area and dry weights were recorded one week after the third micro-rate treatment. Sugarbeet varieties varied in their response to micro-rate treatments. Micro-rate treatments resulted in leaf area reduction from 5 to 43%, and dry weight reduction from 22 to 58% among the fourteen sugarbeet varieties. The micro-rate reduced leaf area by 33 to 45% and dry weights by 44 to 54% among the USDA populations. The commercial variety 'HM E-17' and USDA population '607XHS' were the most tolerant with a 5 and 33% reduction in leaf area, and 22 and 44% reduction in dry weight, respectively.

KEY WORDS:

MSO = Methylated Seed Oil (adjuvant)

GDD = Growing Degree Days

PRE = preemergence

POST = postemergence

INTRODUCTION

Sugarbeet growers have recognized that sugar beet varieties may differ in their response to herbicides. This differential response has been studied by many researchers (Smith and Schweizer 1983; Dexter and Kern 1977; Wilson 1999). Sugarbeet response to postemergence herbicides such as desmedipham&phenmedipham can range from very minimal leaf chlorosis to severe necrosis, lack of leaf expansion, and plant death. A reduction in sugarbeet leaf area reduces the competitiveness of sugarbeets with weeds. Furthermore, open spaces (gaps) within the sugarbeet rows reduces canopy shading and weeds that emerge in these areas compete with the sugar beets for moisture, nutrients, and light. Therefore sugarbeet injury may result in yield loss and lower sugar produced per acre.

Previous research has reported that sugarbeet response decreases as plant size increases, which is why greater sugarbeet injury is often observed when herbicides are applied to young sugarbeet plants. Often sugarbeets are treated with postemergence herbicides two or more times before they have attained six true leaves. In postemergence micro-rate herbicide applications, reduced rates of desmedipham&phenmedipham + triflurosulfuron + clopyralid + MSO are applied four or more times prior to the six to eight leaf stage of sugarbeet. This repeated herbicide application can reduce sugarbeet leaf growth, particularly during cool weather conditions. Since sugarbeet varieties differ in response to herbicides, some varieties may be more tolerant of these postemergence weed management practices than other sugarbeet varieties.

OBJECTIVES:

The objective of this research was to evaluate the growth response of fourteen sugarbeet varieties and four sugarbeet populations to postemergence applications of desmedipham&phenmedipham + triflurosulfuron + clopyralid + MSO in the growth chamber and field.

METHODS:

Sugarbeet varieties were planted in pots and placed in growth chambers. Four varieties were included in the first experiment, and 14 varieties and 4 sugarbeet populations were included in the second experiment. The fourteen sugarbeet varieties included the twelve varieties approved by the Michigan Sugarbeet Advancement Committee for their variety trials plus two older varieties, and the four USDA populations were selected based on the knowledge of their genome. Micro-rate herbicide applications of desmedipham&phenmedipham at 0.09 kg/ha + clopyralid at 0.026 kg/ha + triflurosulfuron at 0.004 kg/ha + MSO at 1.5% (v/v) were applied three times on a 225 GDD schedule. The GDD were calculated by summing the high and low temperature daily and dividing by two. Thirty-four degrees Fahrenheit (1.1 C) was then subtracted from this number to determine the GDD accumulated per day. Both experiments were conducted in a completely randomized design with four replicates and were repeated. Treatments were micro-rate treated and untreated sugarbeet. Leaf area and

wet and dry weights of each sugarbeet plant were recorded seven days after the third micro-rate treatment.

In the field, 14 sugarbeet varieties and 4 populations were planted in mid April. Individual plots were one sugarbeet row by 7.6 m. The first micro-rate treatment was applied when the weeds reached the cotyledon growth stage and every seven days thereafter. The experiment was arranged as a split-plot with three replicates. The whole plot was variety and the subplot was herbicide treatment. Sugarbeets were harvested and leaf area was measured for three treated and three untreated, randomly selected, plants per plot seven days after the third micro-rate treatment.

RESULTS/CONCLUSIONS:

In the preliminary growth chamber experiment, the reduction in leaf area of 'ACH 555' and 'Hilleshog E-17' from the micro-rate herbicide applications was less than 4% and did not differ from the respective untreated control. However, the leaf area of 'Beta 5400' and 'Beta 5736' was reduced by 21 and 30%, respectively, from the micro-rate herbicide treatment. In the following experiment, leaf area reductions ranged from 5% for 'Hilleshog E-17' to 45% for 'USDA 607HS'. The sugarbeet varieties 'Beta 5400' and 'ACH 555' were not included in the Sugarbeet Advancement variety trial so they were not included in the second growth chamber experiment. Leaf area of 'Beta 5736' was reduced by 39%. The average leaf area reduction from micro-rate treatments was 31% among all varieties and populations in this growth chamber experiment.

In the field, the micro-rate herbicide treatment reduced the leaf area of 'Hilleshog E-17' by 40%. This contradicts the growth chamber data where leaf area was reduced 3 to 5%. The sugarbeet variety 'Hilleshog E-17' is considered to have excellent early season vigor. The micro-rate reduced the leaf area of 'Beta 5736' by 30%. This supported the previous growth chamber research. The average leaf area reduction in the field from the micro-rate herbicide treatment was 27%. Some sugarbeet varieties responded differently in the field than in the growth chamber. The growth chamber was a more consistent environment for determining variety response to micro-rate applications since water, light, and nutrients were not limiting. The lack of consistency in variety response to micro-rate herbicides may be due to seed lot or conditions at the time of early season growth. It is important to understand sugarbeet variety response to early season stress, including herbicide application, so management practices can be adjusted to limit injury to sugarbeets early in the season.

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