

# TIMING OF POSTEMERGENCE MICRO-RATE APPLICATIONS BASED ON GROWING DEGREE DAYS IN SUGARBEET (*BETA VULGARIS*).

DALE, T.M.\* , AND K.A. RENNER

*Michigan State University, Department of Crop and Soil Sciences,  
Plant and Soil Sciences Building, East Lansing, MI 48824.*

In 2000 the "micro-rate", a combination of desmedipham & phenmedipham at 0.09 kg/ha or desmedipham & phenmedipham & ethofumesate at 0.09 kg a.i./ha + triflurosulfuron at 0.004 kg/ha + clopyralid at 0.023 kg/ha + 1.5% methylated seed oil (MSO), received registration in Michigan. The micro-rate provides good to excellent annual weed control and allows the grower to apply POST herbicides throughout the day and not just in the evening. The herbicide label states that micro-rate treatments should be applied every 5 to 7 days. Frequent micro-rate applications can result in excessive sugarbeet injury and greater herbicide/application costs. However, too few applications can result in poor weed control which can reduce sugarbeet yield and quality. Weed growth is dependent on temperature and moisture rather than calendar days. In 2001, an experiment was conducted to determine the micro-rate application timing that controlled weeds with the least sugarbeet injury. Treatments included application every 7 days, as needed, every leaf pair, or every 175 and 275 GDD (base 1.1 C). Sugarbeet was planted April 5, April 17, and May 3 in 2001. The three planting dates were considered an early, normal, and late planting date. Sugarbeet injury was similar across all treatments and planting dates with HM 'E-17'. However, differences in injury were observed with Beta '5400' for the April 5 and May 3 planting dates. Overall weed control was greater with the 175 GDD treatment compared to other treatments when averaged over the three planting dates. Redroot pigweed was not controlled as well when micro-rates were applied every 275 GDD. However, recoverable sucrose in the 275 GDD treatment was equal to or greater than in other treatments, and the number of micro-rate applications was reduced by 2 or 3 compared to the 7 day or 175 GDD timing. This research was repeated in 2002.

## KEY WORDS:

MSO = Methylated Seed Oil (adjuvant)

GDD = Growing Degree Days

PRE = preemergence

POST = postemergence

Common lambsquarters = *Chenopodium album*

Redroot pigweed = *Amaranthus retroflexus*

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

## **INTRODUCTION:**

Postemergence weed control in Michigan has consisted of two to three applications of desmedipham & phenmedipham at 0.56 kg/ha + triflurosulfuron at 0.017 kg/ha. The herbicide tank mixtures are applied each time weeds have two- to four true leaves and are less than 2.5 cm in height. In 2000, the micro-rate, a combination of desmedipham & phenmedipham at 0.09 kg/ha + triflurosulfuron at 0.04 kg/ha + clopyralid at 0.023 kg/ha + MSO at 1.5% (v/v) was registered for use in Michigan. Micro-rate herbicide rates are applied every five to seven days from the time of weed emergence until sugar beet canopy closure. The goal is to control weeds with low rates of herbicides when they are very small (less than 1 cm) by repeated applications. Micro-rate applications are currently based on calendar days and environmental conditions such as air temperature and soil moisture are not taken into consideration. Cool air temperatures slow weed growth. Applying herbicides repeatedly when temperatures are cool may injure sugar beet and increase cost to the grower. Conversely, applying micro-rates infrequently may result in poor weed control which would increase cost to the grower for hand labor. Postemergence herbicide applications should only be made when weeds have reached the maximum size that can be controlled by the micro-rate.

## **OBJECTIVES:**

The objectives of this research were to determine if weeds would be controlled if micro-rate treatments were applied based on growing degree days (GDD) instead of applying every 7 calendar days, and to determine if sugarbeet varieties varied in their response to micro-rate treatments.

## **METHODS:**

In the growth chamber, common lambsquarters, and redroot pigweed were planted in pots, and treated with the micro-rate on a 175, 225, or 275 GDD schedule (in centigrade, the target GDD treatments would be 97, 125, and 152C). The GDD for each day was calculated by summing the high and low temperature for each day and dividing by two. Thirty-four degrees Fahrenheit (1.1C) was then subtracted from this number to determine the GDD accumulated for one day. The GDD for each consecutive day were summed until the target GDD was reached. Sugarbeet and weed response to these treatments were evaluated seven days after the last herbicide application.

In the field, the sugarbeet varieties 'Hilleshog E-17' and 'Beta 5400' were planted at three different dates in 2001 and 2002 to represent early, mid-season, and late sugarbeet planting dates in Michigan. Planting dates were April 3, April 17, and May 3 in 2001; and April 5, April 17, and May 1 in 2002. Micro-rate treatments were applied a) every 7 days, b) as needed, c) every leaf pair (2001 only), d) every 175 GDD, e) every 225 GDD (2002 only), and f) every 275 GDD. Individual plots measured 3 by 9 m. The experimental design was a

randomized complete block in a split-split-plot arrangement with four replicates. The whole-plot was the planting date, the sub-plot was the sugarbeet variety, and the sub-sub-plot was the various micro-rate treatments.

## RESULTS/CONCLUSION:

In the growth chambers, common lambsquarters was controlled by all micro-rate treatments; however, redroot pigweed control at the 275 GDD treatment was reduced compared to applying micro-rates every 175 or 225 GDD.

In the statistical analysis of the field research, error mean squares for years, treatments, and varieties were homogeneous so the data was combined over planting dates for each year. The number of micro-rate treatments was reduced when treatments were applied based on GDD compared to calendar days. The number of micro-rate treatments in 2001 were not reduced for the early April planting date, but were reduced by two for both the mid-April and early May planting dates when micro-rates were applied every 275 GDD compared to every 7 days. In 2002, the number of micro-rate treatments were reduced by 2 for all planting dates when micro-rates were applied every 225 GDD compared to every 7 days. Visual injury to 'Beta 5400' fourteen days following the last micro-rate application was 10% greater than visible injury to 'Hilleshog E-17' but it was not statistically significant. During the growing season this was evident as slower leaf growth and delayed canopy closure. Common lambsquarters control was excellent in both years with all micro-rate treatments, supporting our growth chamber research. *Amaranthus* spp. control with all treatments was less than 90%. There was a trend for poorer *Amaranthus* spp. control as the GDD treatments lengthened but it was not statistically significant. In summary, applying micro-rates every 225 GDD in 2002 and every 275 GDD in 2001 and 2002 reduced the number of micro-rate treatments by lengthening out the time between herbicide applications, particularly in April and early May. Weeds were controlled similar to a calendar date approach and sugarbeet yield was not reduced.