SPRAGUE, CHRISTY L.*, and GARY E. POWELL, Michigan State University, Plant and Soil Sciences Building, East Lansing, MI 48824. **Timing of postemergence standard-split applications based on growing degree days in sugar beet.**

ABSTRACT

Growing degree day recommendations can be used to time standard-split herbicide applications. Typical recommendations call for the first application of a standard-split program to be made when weeds are 0.63 to 1.25-cm tall and the second application of a standard-split program 7 to 10 days after the first application. In 2005 and 2006, two separate field studies were established in April and May to compare standard-split programs based on different growing degree days (base temperature 34 F) with a typical standard-split program. The herbicides applied included desmedipham & phenmedipham (Betamix) at 374 g ai/ha + triflusulfuron (UpBeet) at 17 g ai + clopyralid (Stinger) at 105 g ai/ha + methylated seed oil at 1% v/v for the first application and the same herbicides with an increased rate of desmedipham & phenmedipham (Betamix) to 560 g ai/ha for the second application. In two of the four studies, several of the growing degree day application programs provided greater weed control than the typical standard-split program timing. However, growing degree day programs with applications that extend over 425 growing degree days on the first or second application resulted in reduced weed control. The optimum timing for a growing degree day standard split program appears to be between 300 and 425 growing degree days.

SEE CHART THAT FOLLOWS.

TIMING OF POSTEMERGENCE STANDARD-SPLIT APPLICATIONS BASED ON GROWING DEGREE DAYS IN SUGARBEET

Christy L. Sprague and Gary E. Powell, Michigan State University, East Lansing, MI

INTRODUCTION

The use of growing degree days (GDD) has been used successfully to predict plant development in various crops. In 2001, the concept of using GDD to time micro-rate herbicide applications was introduced to Michigan sugarbeet growers by Renner and Dale. This concept was introduced to help reduce sugar beet injury and herbicide costs associated with micro-rate applications. Several Michigan sugarbeet growers have adopted GDD recommendations to time micro-rate herbicide applications. A survey of the Michigan Sugar Company Agriculturalists indicated that of the 65% of growers that used micro-rates for weed control, 45% of these growers timed their micro-rate applications based on GDD (2003 survey). Currently, there are several Michigan sugarbeet growers that use standard-split herbicide applications for weed control. Timing these applications by GDD instead of calendar days may shift the second application to later in the season to help control later emerging weeds. Later applications may also reduce herbicide injury.

OBJECTIVES

- Determine if POST standard-split applications for weed control in sugarbeets could be timed using GDD.
- Compare weed control and sugarbeet yield following POST applications based on GDD compared with applications based on calendar days.

MATERIALS AND METHODS

- Field experiments were conducted at the Michigan State University Agronomy Farm in E. Lansing, MI in 2005 and 2006
  - 'Crystal 963' sugarbeet seed was planted on April 6 and May 3, 2005 and April 11 and May 5, 2006
- Standard-split herbicide application timings were applied based on different GDD intervals and compared with a standard application timing of early-POST applied at ½"-weeds followed by (fb.) late-POST 7 d later
  - GDD were calculated from air temperature data collected from the Michigan Automated Weather Network (http://www.agweather.geo.msu.edu/mawn/)
  - GDD = ((max. temp + min. temp)/2) – 34F
- Herbicide treatment:
  - Early-POST:
    - Betamix (desmedipham + phenmedipham) at 2 pt/A
    - UpBeet (triflusulfuron-methyl) at 0.25 oz/A
    - Stinger (clopyralid) at 4 fl oz/A
  - Late-POST:
    - Betamix (desmedipham + phenmedipham) at 3 pt/A
    - UpBeet (triflusulfuron-methyl) at 0.25 oz/A
    - Stinger (clopyralid) at 4 fl oz/A
    - Non-ionic surfactant (NIS) at 0.25% v/v
- Evaluations:
  - Weed control 14 d after the last herbicide application in each trial
  - Sugarbeets were harvested for yield and samples were analyzed for sugar
- Analysis of data:
  - Randomized complete block design with 4 replications
  - PROC MIXED in SAS and means separated using Fisher's Protected LSD (P = 0.05)

ACKNOWLEDGEMENTS

Michigan Sugar Company

RESULTS AND DISCUSSION

Control of common lambsquarters, velvetleaf, pigweed, and common chickweed was similar between treatments when the early-POST application was made at 400 GDD and the late-POST application was made between 350 GDD and 425 GDD for sugarbeets planted in April 2005 (data not shown). Applications timings, weed control, and sugarbeet yield for sugarbeets planted in May 2005 and April and May 2006 can be found in Figures 1, 2, and 3 and Tables 1, 2, and 3.

Figure 1. Timings of early- and late-POST applications of standard-split treatments in GDD and days for sugarbeets planted May 3, 2005. Results are presented in Table 1.

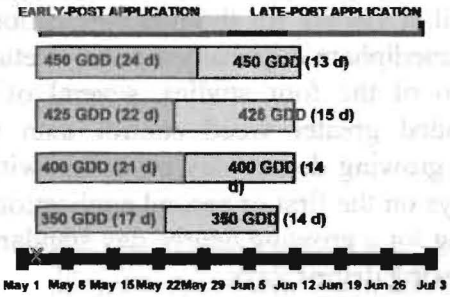

Figure 2. Timings of early- and late-POST applications of standard-split treatments in GDD and days for sugarbeets planted April 11, 2006. Results are presented in Table 2.

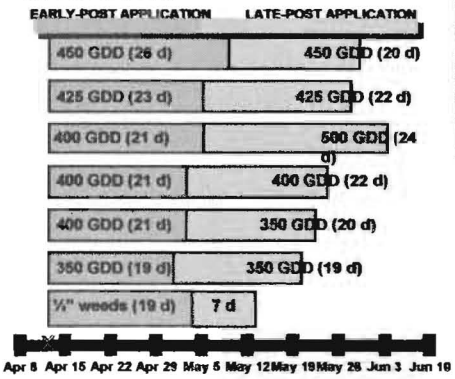

Figure 3. Timings of early- and late-POST applications of standard-split treatments in GDD and days for sugarbeets planted May 5, 2006. Results are presented in Table 3.

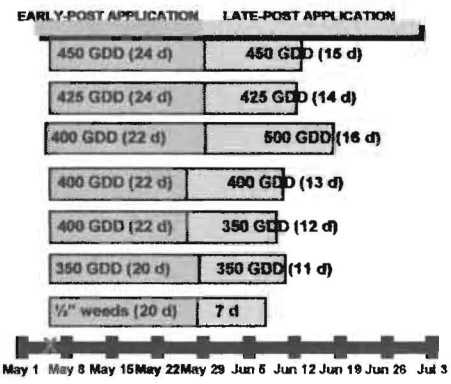

Table 1. Weed control and recoverable white sucrose yield from standard-split herbicide applications based on GDD for sugarbeets planted May 3, 2005.

Application Timing	Lambs-quarters	Pigweed	Velvetleaf	Jimson-weed	Yield (RWS)*
	% control				lbs/A
350 fb. 350 GDD	88	99	84	99	8596
400 fb. 400 GDD	89	89	73	99	8286
425 fb. 425 GDD	96	95	81	99	7813
450 fb. 450 GDD	68	75	69	99	6832
$LSD_{0.05}$	7	8	6	NS	1589

*Recoverable white sucrose yield for the untreated control was 0.0 lbs/A.

Table 2. Weed control and recoverable white sucrose yield from standard-split herbicide applications based on GDD for sugarbeets planted April 11, 2006.

Application Timing	Lambs-quarters	Velvetleaf	Jimson-weed	Large crabgrass	Yield (RWS)*
	% control				lbs/A
½" weeds fb. 7d	56	56	99	38	5139
350 fb. 350 GDD	76	68	99	84	5334
300 fb. 350 GDD	88	85	99	99	5501
400 fb. 400 GDD	83	84	99	99	5698
400 fb. 500 GDD	96	88	99	99	5996
425 fb. 425 GDD	95	76	99	99	6400
450 fb. 450 GDD	55	53	87	68	5142
$LSD_{0.05}$	14	15	10	20	1168

*Recoverable white sucrose yield for the untreated control was 783 lbs/A.

Table 3. Weed control and recoverable white sucrose yield from standard-split herbicide applications based on GDD for sugarbeets planted May 5, 2006.

Application Timing	Lambs-quarters	Pigweed	Velvetleaf	Giant foxtail	Yield (RWS)*
	% control				lbs/A
½" weeds fb. 7d	98	99	93	91	6740
350 fb. 350 GDD	95	99	91	96	6175
400 fb. 350 GDD	99	99	95	91	5779
400 fb. 400 GDD	99	99	99	94	5978
400 fb. 500 GDD	99	99	93	92	5736
425 fb. 425 GDD	97	92	90	87	6678
450 fb. 450 GDD	95	99	89	90	6400
$LSD_{0.05}$	NS	NS	9	NS	1678

*Recoverable white sucrose yield for the untreated control was 3815 lbs/A.

CONCLUSIONS

- Growing degree days can be used to time standard-split applications.
  - Using GDD can extend the time between applications without reducing weed control or yield, particularly with early planted sugarbeets.
- Over the four field experiments, applying the early-POST application at 400 GDD and following up with the late-POST application at 350 to 400 GDD provided the best weed control and yields that were similar to or better than the standard application timings.