

Ryan DeWerff and Vince Davis

Department of Agronomy, University of Wisconsin-Madison

Introduction:

Soybean has been planted earlier in the Midwestern United States in recent years; however, earlier planting subjects the crop to longer durations of weed interference. Weed management decisions may change as soybean growers continue to plant earlier in the growing season to achieve higher yields. For example, more intensive early-season weed control strategies, such as using a preemergence (PRE) residual herbicide, may be necessary for adequate season-long weed control and yield maximization. The optimum timing of a single postemergence (POST) herbicide application may also be impacted by soybean planting date and PRE herbicide use. Therefore the objective of this study was to determine the influence of four POST glyphosate application timings, with or without a PRE residual herbicide, following three different planting dates on:

- Weed control
- Yield

2012 Growing Season		
Early	Mid	Late
No PRE 11.8 a 0%	No PRE 5.1 b 57%	No PRE 0.4 d 96%
Authority® First 2.4 c 80%	Authority® First 2.7 c 77%	Authority® First 0.2 e 98%

Figure 1. Pictures representing 2012 data in Table 2.

Research Design:

This study was conducted in 2012 and 2013 at the Arlington Agricultural Research Station. Soybeans were planted in late-April, mid-May, and early-June at 120,000 seeds/a in 30 inch rows. Authority® First at 6 oz/a was applied PRE to half of the plots after soybean planting. Roundup PowerMax® at 22 fl oz/a + 17 lb/100 gal ammonium sulfate was applied POST at either the V1, V2, V4, or R1 soybean growth stages.

Results- Weed Control:

Total in-crop weed density was not affected by POST glyphosate application timing in either year ($P > 0.05$). There was a significant soybean planting date by PRE herbicide use interaction in both years (Table 1). The nature of this interaction varied between years, but generally the number of weeds emerging with the crop decreased as soybean planting date was delayed and following PRE herbicide application. Figure 1 shows the results for the first year (2012).

Table 1. Influence of soybean planting date and PRE herbicide application on weed density at the time of POST glyphosate application in 2012 and 2013¹.

Planting date	PRE herbicide	Total weed density plants/ft ²	
		2012	2013
Early	Authority® First	2.4 c	2.1c
	No PRE	11.8 a	19.0a
Mid	Authority® First	2.7 c	0.5d
	No PRE	5.1 b	14.2a
Late	Authority® First	0.2 e	0.5d
	No PRE	0.4 d	3.9b

¹Means with the same letter are not significantly different ($P < 0.05$).

Table 2. Influence of soybean planting date, PRE herbicide use, and POST glyphosate application timing on end-of-season weed density in 2012 and 2013¹.

Treatment	Total weed density plants/ft ²	
	2012	2013
Planting date		
Early	0.6 a	1.7 a
Mid	0.3 b	0.7 b
Late	0.1 c	0.3 c
PRE herbicide		
Authority® First	0.1 b	0.4 b
No PRE	0.5 a	1.4 a
Glyphosate timing		
V1	0.2 b	1.6 a
V2	0.1 c	0.8 b
V4	0.3 ab	0.5 bc
R1	0.5 a	0.4 c

¹Means with the same letter are not significantly different (P < 0.05).

Results- Weed Control continued:

The use of a PRE herbicide, across all planting dates, also reduced the size of weeds exposed to the POST herbicide application (Figure 2). The differences were often greatest for the earlier planting dates and could be a very important part of herbicide resistance management of difficult and competitive broadleaf weeds like common ragweed in this experiment (Figure 3).

PRE herbicide use and delayed soybean planting consistently reduced end-of-season weed density in both years (Table 2). A PRE application of Authority® First reduced total weed density by 83 and 74% in 2012 and 2013, respectively, relative to the POST-only treatments. When soybean planting was delayed until early-June total weed densities were reduced by 90 and 83% in 2012 and 2013, respectively, relative to the late-April planting date.

The response of end-of-season weed density to POST glyphosate application timing differed between years (Table 2), which was likely due to different rainfall and temperature patterns.

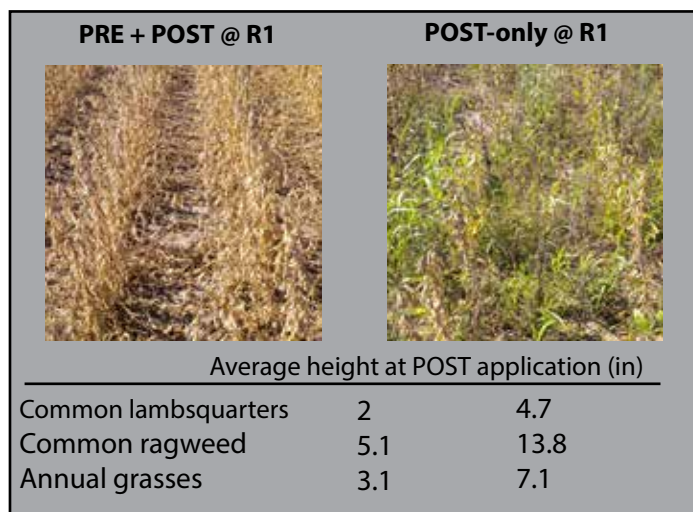


Figure 2. Difference in end-of-season weed escapes as influenced by POST application timing, and weed size at that application timing which directly influenced efficacy. POST applications were made at the R1 growth stage following a PRE, or no PRE.



Figure 3. Differences in the size of common ragweed was often very large between plots where a PRE was used, and where a PRE was not used. Differences were often greatest following the early planting dates.

Results- Soybean Yield:

Treatments including an application of Authority® First yielded 3.3 bu/a more than POST glyphosate only treatments (Figure 4). However, this difference in yield was primarily driven by the large positive response to Authority® First at the early planting date. At the early planting date, PRE herbicide treatments yielded 6.5 bu/a more than POST-only treatments, but at the mid and late planting dates differences in yield were not significant. This response suggests that early-planted soybean are more at risk to yield loss from weed interference, largely due to the fact that soybean planted earlier in the year is often subjected to higher in-crop weed densities.

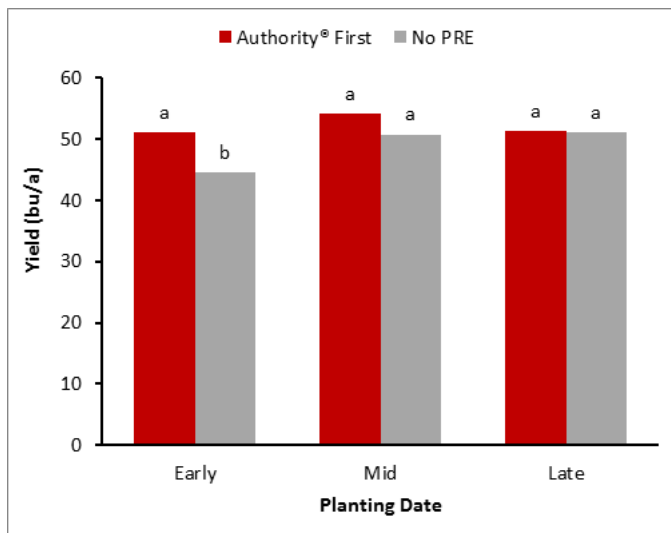


Figure 3. Effect of soybean planting date and PRE herbicide use on grain yield. Means with the same letter are not significantly different (LSD=0.05).

Conclusions and Recommendations:

Results of this experiment indicate that delayed soybean planting may be an effective method to reduce in-crop and end-of-season weed density. However, the yield potential of late-planted soybean is often less than earlier planting dates due to a shorter growing season; and therefore, the goal for soybean producers in the Midwest should be to plant soybean before the middle-of-May when conditions are favorable. However, the potential for yield loss due to weed interference is greater at earlier planting dates, and thus, the need to control weeds early is more important with earlier planting dates.

Moreover, the risk of developing herbicide-resistant weeds may be greater in systems with earlier planting dates because a greater number of weeds will be exposed to POST applications, and larger plant heights occur at the timing of POST applications. In addition, the PRE herbicide used in this experiment reduced the number of weeds present at soybean harvest, and reducing weed seed production at the end-of-season is another critical element of herbicide resistance management. Therefore, the use of an effective PRE herbicide is a much more important and valuable tool for both herbicide resistance management, and maximizing yield in early-planted soybean systems.

This publication is available on the Wisconsin Crop Weed Science program website.
For additional questions, please contact us at:

email: wiscropweedsci@gmail.com

phone: (608) 515-3224

website: <http://wcws.cals.wisc.edu/>

University of Wisconsin-Extension, College of Agricultural and Life Sciences. An equal opportunity employer, University of Wisconsin-Extension provides equal opportunities in employment and programming, including Title IX requirements.

