U OF MN RESEARCH RESULTS FOR SOUTHERN MN

The "PRE Challenge" On-Farm Research and Demonstration Trials in Southern MN (2012 & 2013)

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INTRODUCTION AND OBJECTIVES

Preemergence (PRE) herbicide use dropped dramatically when glyphosate-resistant crops entered the marketplace. After years of exposing weed populations to oversimplified weed management programs that often relied soley on postemergence (POST) applications of glyphosate, decreased weed control and resistance to glyphosate has been reported across an increasing number of acres.

Use of a PRE herbicide is a key strategy in the prevention and management of resistant weed populations. Use of a PRE herbicide can result in many benefits including: increased yield due to reductions in early-season weed competition, introduction of another herbicide site of action, better control of weeds that emerge over an extended period of time, decreased weed size at the time of POST applications, and more timely POST herbicide applications (Figure 1).

Historically, PRE herbicide use has been lower in soybean than in corn as illustrated by surveys of Private Pesticide Applicators across southern MN. For example, in 2011 61% of growers indicated they used a POST-only system in soybean while 40% indicated the same in corn (1).

To help demonstrate the benefits of using a PRE herbicide in soybean, the "PRE Challenge" was intiated in 2012. Specifically, this research and demonstration project was developed to illustrate the effects of including a PRE herbicide application in soybean on weed control, yield, and economics compared to a POST glyphosate-only program.

Figure 1: Advantages PRE Herbicides Bring to Weed Management

Reduces:	Increases:
Weed density	Yield potential
Weed species diversity	Herbicide/adjuvant compatibility
Weed size at time of postemergence application	Early season weed canopy in soybean
	Nitrogen efficiency in corn
	Consistency of weed control
	Diversity in herbicide program by introducing different Sites of Action

Source: Jeff Gunsolus, U of MN Extension Weed Scientist

MATERIALS AND METHODS

Trials were established across southern MN at six on-farm locations in 2012 (Luverne, Pipestone, Windom, Albert Lea, Nerstrand, and Brownton) and four on-farm locations in 2013 (Luverne, Pipestone, Fairfax and Gaylord).

Treatments were arranged in a Randomized Complete Block Design with four replications. Plot length was a minimum of 400 feet. The center portion of each treatment was harvested with a field-scale standard combine. Treatments consisted of 1) a PRE herbicide application followed POST glyphosate and 2) a POST glyphosate application only. The POST application was made at the same time and rate across both treatments. All other factors across treatments were the same including fertilizer program, soybean variety, insecticide application (if applicable), and harvest date. Cooperators selected the herbicide program based on their needs.

Weed density and height by species was recorded at each site prior to POST application and again within about 14 days after POST application. Plots were evaluated prior to harvest for weed escapes. Yield was determined at harvest by using a weigh wagon to collect grain weight and a hand-held moisture meter was used to determine grain moisture. Yields were standardized to a 13.5% moisture content across plots and statistical analysis (ANOVA) was conducted on results when applicable.

RESULTS AND DISCUSSION

In 2012, significant rainfall events at the Brownton location resulted in areas of this plot drowning out so this site was not taken to yield. Planting issues at the Luverne location and PRE application issues at the Windom site also prevented these sites from being included in the yield results. Because of this, results shown are for the Albert Lea, Nerstrand, and Pipestone locations only in 2012. In 2013, data is shown for the Luverne, Fairfax and Pipestone locations due to POST application issues at Gaylord.

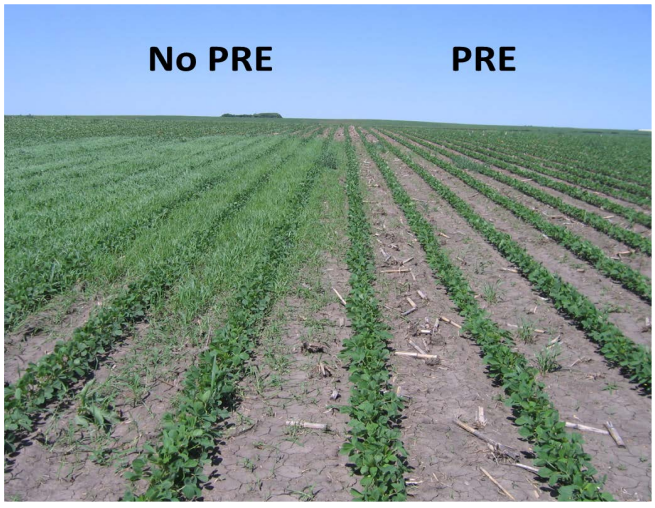

Figure 2: Pipestone location 6/18/12. The preemergence (PRE) herbicide used was Prefix @ 2 pt/acre. Increased early-season weed control in the PRE treatment was particularly noticeable in this area of the field where a patch of grassy weeds was present.

Soybean Stands and Soybean Population Loss:

Early in the season, soybean stands ranged from 90,000 to 141,200 plants per acre (Table 1). By the end of the season, soybean stands ranged from 86,900 to 136,000 plants per acre. Percent population loss ranged from a low of 1.7 % to a high of 9.4 %, but was similar across treated and untreated plots at each site. At each site, application of a PRE herbicide had no impact on soybean stand or stand loss.

Weed Populations: Common lambsquarters and waterhemp/pigweed species were the most common weeds at each site. Although weed populations were relatively low overall, weed populations were greater where no PRE

herbicide was applied (Table 2). Weed patches were often also observed where no PRE was used, such as at the Pipestone location in 2012 (Figure 2). Although POST applications controlled most weeds, waterhemp survivors were observed at a couple of the locations. At the Nerstrand site, for example, waterhemp plants were present at harvest where no PRE herbicide was applied while no escapes were observed in the PRE treatments (Figure 3). Although resistance to glyphosate in waterhemp had not been officially confirmed at any sites, glyphosate-resistance in waterhemp is an expanding problem in MN. Weed escapes that are allowed to go to seed help replenish the weed seedbank, leading to greater weed pressure in subsequent years, which in turn can lead to long-term weed control challenges.

Yield: Yield ranged from 45.7 to 67.3 bu/ac, with drought conditions contributing to lower yields at the Pipestone location in 2012 (Table 1). At all locations, yields were not affected by the inclusion of a PRE herbicide in the weed management program.

Figure 3. PRE herbicide treatments resulted in lower weed populations at harvest at the Nerstrand location. The weed escapes produced seed, which in turn would be expected to help replenish the weed seedbank and lead to potentially greater weed densities in future years. PRE = Verdict @ 5 oz/acre + Outlook @ 10 oz/acre

Table 1: Early soybean stand, pre-harvest soybean stand, percent population loss, and soybean yield across locations in 2012 and 2013.*

Year	Location and Product	Treatment	Early Stand	Pre-Harvest Stand	Population Loss	Yield
			------- Plants/ac -------		(%)	Bu/ac
2012	Pipestone (PRE = Prefix @ 2 pt/ac)	No PRE	127,300	125,200	1.7	46.0
		PRE	134,600	125,200	6.8	45.7
2012	Nerstrand (PRE = Verdict @ 5 oz/ac + Outlook @ 10 oz/ac)	No PRE	92,900	86,900	6.4	63.5
		PRE	90,000	88,000	2.2	63.4
2012	Albert Lea (PRE = Verdict @ 5 oz/ac + Outlook @ 10 oz/ac)	No PRE	131,400	119,100	9.4	57.0
		PRE	132,900	120,500	9.2	54.9
2013	Pipestone (PRE = Prefix @ 2 pt/ac)	No PRE	122,300	111,800	8.5	60.1
		PRE	129,200	119,400	7.5	60.4
2013	Luverne (PRE = Authority First @ 3.2 oz/ac)	No PRE	140,100	136,000	2.9	67.3
		PRE	141,200	132,600	6.1	66.1
2013	Fairfax (PRE = Dual II @ 2 pt/ac)	No PRE	132,400	129,000	2.5	58.5
		PRE	138,100	130,000	5.9	58.2

*At all locations, all variables were NS at p = 0.05.

Table 2: Total number of weeds prior to postemergence application across subsamples and replications.*

Year	Location and Product	Treatment	COLQ	WH/PW	GRASS	TOTAL
			---------- Number per 80 square feet ----------			
2012	Pipestone	No PRE	44	11	14	126
	(Prefix @ 2 pt/ac)	PRE	3	0	1	4
2012	Nerstrand	No PRE	75	24	3	105
	(Verdict @ 5 oz/ac + Outlook @ 10 oz/ac)	PRE	0	0	0	0
2012	Albert Lea	No PRE	36**	0	0	36**
	(Verdict @ 5 oz/ac + Outlook @ 10 oz/ac)	PRE	3**	0	0	3**
2013	Pipestone	No PRE	10	3	0	26
	(Prefix @ 2 pt/ac)	PRE	0	0	0	0
2013	Luverne	No PRE	3	7	0	23
	(Authority First @ 3.2 oz/ac)	PRE	0	0	0	3
2013	Fairfax	No PRE	1	26	2	28
	(Dual II @ 2pt/ac)	PRE	1	1	0	2

*COLQ = Common Lambsquarters, WH/PW = waterhemp and pigweed, GRASS = grasses, and TOTAL = total number of weeds present, including less common weed species not listed separately on the table.

**Represents burndown and tillage escapes in the total area, equal to approximately one acre.

CONCLUSIONS

- Early-season weed control was greater where a PRE herbicide was used.
- Soybean plant stands were not affected by use of a PRE herbicide.
- Weed escapes at harvest were observed at a couple of sites where no PRE herbicide was used. Seed production from these plants can be expected to help replenish the weed seedbank which can lead to long-term weed control challenges. Preventing replenishment of the weed seedbank is also a key resistance-management strategy.
- Although yields were not greater where PRE herbicides were used in these trials, yield advantages have been observed in previous University of Minnesota research. If POST applications had been delayed due to complications such as the weather, for example, early-season weed competition would have had a greater likelihood to impact yield. PRE herbicides may not result in a yield benefit in a given year, but their use can provide numerous other benefits that enhance weed control in the long-term.
- For more information on weed management including the **"Corn and Soybean PRE and POST Herbicide Diversification Options"** publication that compares PRE herbicides in a glyphosate program, check out the U of MN Weed Management website at: http://www.extension.umn.edu/agriculture/crops/weed-management/.

ACKNOWLEDGMENTS

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REFERENCES

1. L. Behnken, F. Breitenbach, R. Miller, L. Stahl, D. Nicolai. IPM Assessment, 2011.