Abstract for NCWSS Poster: Devin J. Hammer

Weed control, especially through the critical weed-free period, is important for maximizing corn yield. Additionally, achieving weed control through diversified herbicide site-of-action combinations helps prevent resistance evolution by reducing selection pressure. Moreover, when season-long weed control is obtained, crops have the best chance to produce their full yield potential and weed seed production is reduced. The greatest recent concerns regarding herbicide resistance in much of the Midwest is from the over-reliance on the postemergence (POST) use of glyphosate. To generate recommendations for herbicide diversity in corn [*Zea mays*], a trial was conducted in 2013 – and repeated in 2014 – to evaluate postemergence glufosinate based programs at the University of Wisconsin Arlington Agriculture Research Station. The objective of this study was to compare weed efficacy of POST glufosinate applications following preemergence (PRE) herbicide application in corn. There were 23 treatments evaluated which included a nontreated check for comparison. Among the treatments, there were one-pass PRE applications, one-pass early postemergence (EPOST) applications, and PRE+POST applications. All herbicides were applied with the recommended rates and surfactants. Control ratings were taken visually on a scale of 0-100 where 0 represented no control and 100 represented complete plant death. Ratings were collected each season starting the first week after the PRE application. The four main weed species evaluated were common lambsquarters [*Chenopodium album*], velvetleaf [*Abutilon theophrasti*], common ragweed [*Ambrosia artemisiifolia*], and giant foxtail [*Setaria faberi*]. The PRE + POST applications had better control for all weed species 2-3 weeks after the POST application (5-6 weeks after PRE application) compared to one-pass PRE programs ($P < 0.0001$). However, the EPOST treatments yielded 456.1 kg ha^{-1} more than the PRE + POST programs ($P = 0.0377$) and 497.7 kg ha^{-1} more than the one-pass PRE programs ($P = 0.0129$). Also, between the PRE + POST and EPOST programs there were no significant differences in control of common ragweed ($P = 0.5585$) or velvetleaf ($P=0.3136$). The PRE + POST programs did have significantly better control of common lambsquarters and giant foxtail than the EPOST treatments ($P < 0.0001$ and $P = 0.0001$, respectively). From an agronomic standpoint the data shows that using an EPOST program will gain you higher yields due to

timing of application. However, by using diversified herbicide applications there is an opportunity to reduce selection pressure for resistance evolution in weed populations.

Sequential Herbicide Evaluation in Glufosinate-Resistant Corn in Wisconsin

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Introduction

An over-reliance on postemergence (POST) applications of glyphosate has increased selection pressure for resistance for several weeds throughout the Midwest. Using a preemergence (PRE) along with POST application may help reduce selection pressure through the use of multiple modes of action.

Objective

Evaluate weed control and corn yield as influenced by three herbicide programs in a glufosinate-resistant corn system:

- PRE
- Early postemergence (EPOST)
- PRE + POST

Materials and Methods

- Field studies were conducted 2013 and 2014 at the Arlington Agriculture Research Station
- 23 total treatments were evaluated in a random complete block design:
  - 8 one-pass PRE which were duplicated to include a glufosinate POST
  - 4 EPOST
  - PRE + POST treatment that was duplicated to include a glufosinate POST
  - Nontreated check
- Plots were 7.6 m long and 3 m wide, and treatments were replicated four times

Table 1. Planting and herbicide application schedule

Year	Planting Date	PRE	EPOST	POST
		DAP[a]		
2013	May 1	0	33	54
2014	May 20	1	27	35

[a]Abbreviation: Days after Planting

- All applications were made using a CO_2 backpack sprayer with 11002 flat fan nozzles
- Weed control ratings were visually assessed 2-3 weeks after the POST application
  - Primary weeds present were common lambsquarters [*Chenopodium album*], common ragweed [*Ambrosia artemsiifolia*], velvetleaf [*Abutilon theophrasti*], and giant foxtail [*Setaria faberi*]
- Corn was harvested in late October both years.
- Rating and yield data from the two field experiments were combined and analyzed with SAS statistical software using a PROC Mixed procedure. Fixed effect: *treatment*. Random effects: *year*, *rep(year)*. Means separated by Fisher's Protected LSD at α=0.05
  - Control rating data were transformed using an arcsine-square root transformation

Materials and Methods cont'd

Treatment List

Trt. No.	Chemical Name	Rate (kg ai ha^{-1})	App. Type
1	Nontreated	-	-
2[†]	saflufenacil	0.07	PRE
	dimethenamid-P	0.66	PRE
3[†]	saflufenacil	0.07	PRE
	dimethenamid-P	0.66	PRE
	pendimethalin	1.28	PRE
4[†]	pyroxasulfone	0.15	PRE
	saflufenacil	0.07	PRE
5[†]	saflufenacil	0.05	PRE
	dimethenamid-P	0.44	PRE
	pyroxasulfone	0.15	PRE
6[†]	acetochlor	1.05	PRE
	clopyralid	0.08[a]	PRE
	flumetsulam	0.03	PRE
7[†]	mesotrione	0.18	PRE
	s-metolachlor	1.87	PRE
8[‡]	glufosinate	0.45	EPOST
9[‡]	thiencarbazone	0.01	EPOST
	tembotrione	0.08	EPOST
10[‡]	s-metolachlor	1.05	EPOST
	mesotrione	0.11	EPOST
	glyphosate	1.05[a]	EPOST
11[†]	pyroxasulfone	0.18	PRE
	fluthiacet-ethyl	0.01	PRE
12[†]	s-metolachlor	1.79	PRE
13[†*]	s-metolachlor	1.79	PRE
	diflufenzopyr	0.06	POST
	dicamba	0.14[a]	POST
14[‡]	glyphosate	0.87[a]	EPOST

† Treatment was duplicated and included a second-pass POST application of glufosinate at 0.45 kg ai ha^{-1} with 0.02 kg L^{-1} of ammonium sulfate (AMS)
‡ Treatments 8 and 14 included 0.02 kg L^{-1} of AMS; treatments 9 and 10 included 0.01 kg L^{-1} of AMS
* Treatment included 0.02 kg L^{-1} of AMS and 1% V/V crop oil concentrate (COC)
[a] Rates designated are in kg ae ha^{-1}

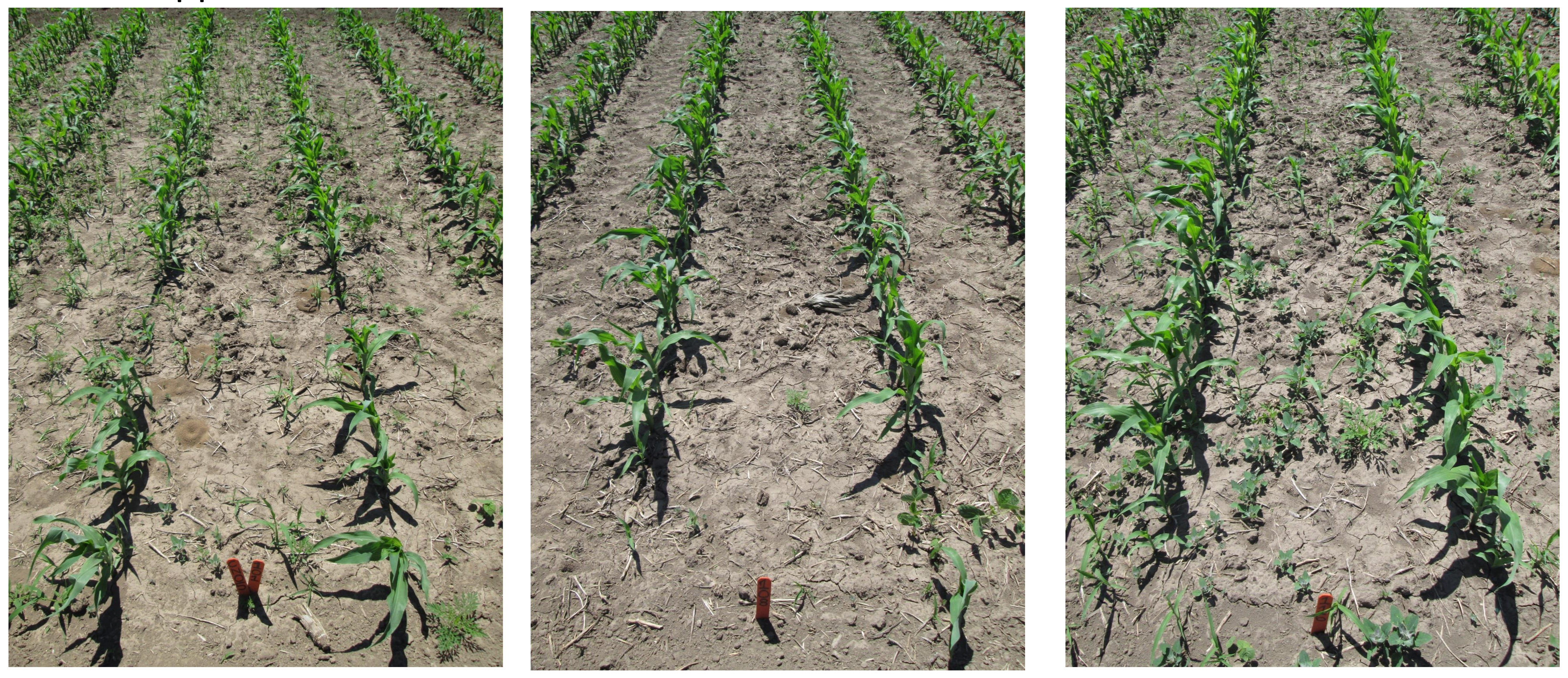
Results

Table 3. Significant p-values for comparisons of all herbicide programs for yield and weed control based on visual ratings collected at 2-3 weeks after second-pass POST application

Herbicide Program Comparison	Yield	Control: giant foxtail	Control: common lambsquarters	Control: common ragweed	Control: velvetleaf
PRE v. EPOST	0.0129	0.0466	-	< 0.0001	< 0.0001
PRE v. PRE + POST	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001
PRE + POST v. EPOST	0.0377	0.0001	< 0.0001	-	-

- PRE + POST programs had significantly better control than the PRE for all weeds
- EPOST treatments also had significantly better control of giant foxtail, common ragweed, and velvetleaf compared to the PRE
- There was significantly higher control of giant foxtail and common lambsquarters in PRE + POST compared to EPOST treatments
- EPOST treatments resulted in significantly higher yields over both the PRE (497.7 kg ha^{-1}) and the PRE + POST (456.1 kg ha^{-1})

Figure 1. Pictures of nontreated (left), PRE (center),and EPOST (right) plots at date of EPOST application in 2014.



Conclusions

In this study the one-pass POST application resulted in higher yields than PRE-only or PRE + POST programs, but over-reliance on POST-only applications severely limit the diversification of herbicide modes of action. To decrease selection pressure and attain a more complete control of multiple weed species it would be of more interest to use a PRE + POST herbicide program. As seen in Figure 1, there are fewer weeds exposed to a POST applied herbicide with a prior PRE application, thus reducing the potential for resistance evolution.

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