

Control of Glyphosate-Resistant Palmer Amaranth in Isoxaflutole/Glufosinate-Resistant Soybean in Nebraska

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Introduction

- Palmer amaranth (*Amaranthus palmeri* S. Wats.) is one of the most problematic and troublesome weed species in U.S. agronomic cropping systems.
- A Palmer amaranth biotype resistant to glyphosate was reported in a grower's field under corn-soybean rotation near Carleton, NE.
- Isoxaflutole is a soil residual PRE herbicide labeled for control of broadleaf weeds, including Palmer amaranth.
- Development of a soybean variety resistant to isoxaflutole and glufosinate has provided additional herbicide sites of action for control of herbicide-resistant weeds in soybean.



Glyphosate-resistant Palmer amaranth in a grower's field near Carleton, Nebraska

Objective

To evaluate isoxaflutole and glufosinate based herbicide programs for the management of glyphosate-resistant Palmer amaranth in isoxaflutole/glufosinate-resistant soybean.

Materials & Methods

- Treatments in the experiment were laid out in a randomized complete block arrangement with four replications including a nontreated control.
- PRE herbicides were applied at planting on May 10, 2018.
- Early-POST and late-POST herbicides were applied at 6 and 9 weeks after planting.
- Visual estimations of Palmer amaranth control, density, and soybean yield were recorded.
- PROC GLIMMIX procedure in SAS 9.4 was used to conduct multiple comparison ANOVA analysis

Table 1. Herbicide Programs

Code	PRE	Rate (g ai ha ⁻¹)	Early-POST	Rate (g ai ha ⁻¹)	Late-POST	Rate (g ai ha ⁻¹)	Trade Name
1	Nontreated control	--	--	--	--	--	--
2	isoxaflutole	105	--	--	--	--	Balance Bean
3	isoxaflutole	105	isoxaflutole	105	--	--	Balance Bean fb Balance Bean
4	--	--	glufosinate	657	--	--	Liberty
5	--	--	glufosinate	657	glufosinate	657	Liberty fb Liberty
6	isoxaflutole	105	glufosinate	657	--	--	Balance Bean fb Liberty
7	pyroxasulfone/sulfentrazone	292	glufosinate	657	--	--	Authority Supreme fb Liberty
8	pyroxasulfone/sulfentrazone+isoxaflutole	292+105	glufosinate	657	--	--	Authority Supreme+Balance Bean fb Liberty
9	glumioxazin/pyroxasulfone	160	glufosinate	657	--	--	Fierce fb Liberty
10	flumioxazin/pyroxasulfone+isoxaflutole	160+105	glufosinate	657	--	--	Fierce+Balance Bean fb Liberty
11	saflufenacil/imazethapyr/pyroxasulfone	215	glufosinate	657	--	--	Zidua PRO fb Liberty
12	saflufenacil/imazethapyr/pyroxasulfone+isoxaflutole	215+105	glufosinate	657	--	--	Zidua PRO+Balance Bean fb Liberty
13	--	--	isoxaflutole+glufosinate	105+657	--	--	Balance Bean+Liberty
14	isoxaflutole	105	glufosinate	657	glufosinate	657	Balance Bean fb Liberty fb Liberty
15	--	--	isoxaflutole+glufosinate	105+657	isoxaflutole+glufosinate	105+657	Balance Bean+Liberty fb Balance Bean+Liberty

Results

Figure 1. Control of resistant Palmer amaranth 14 d after PRE

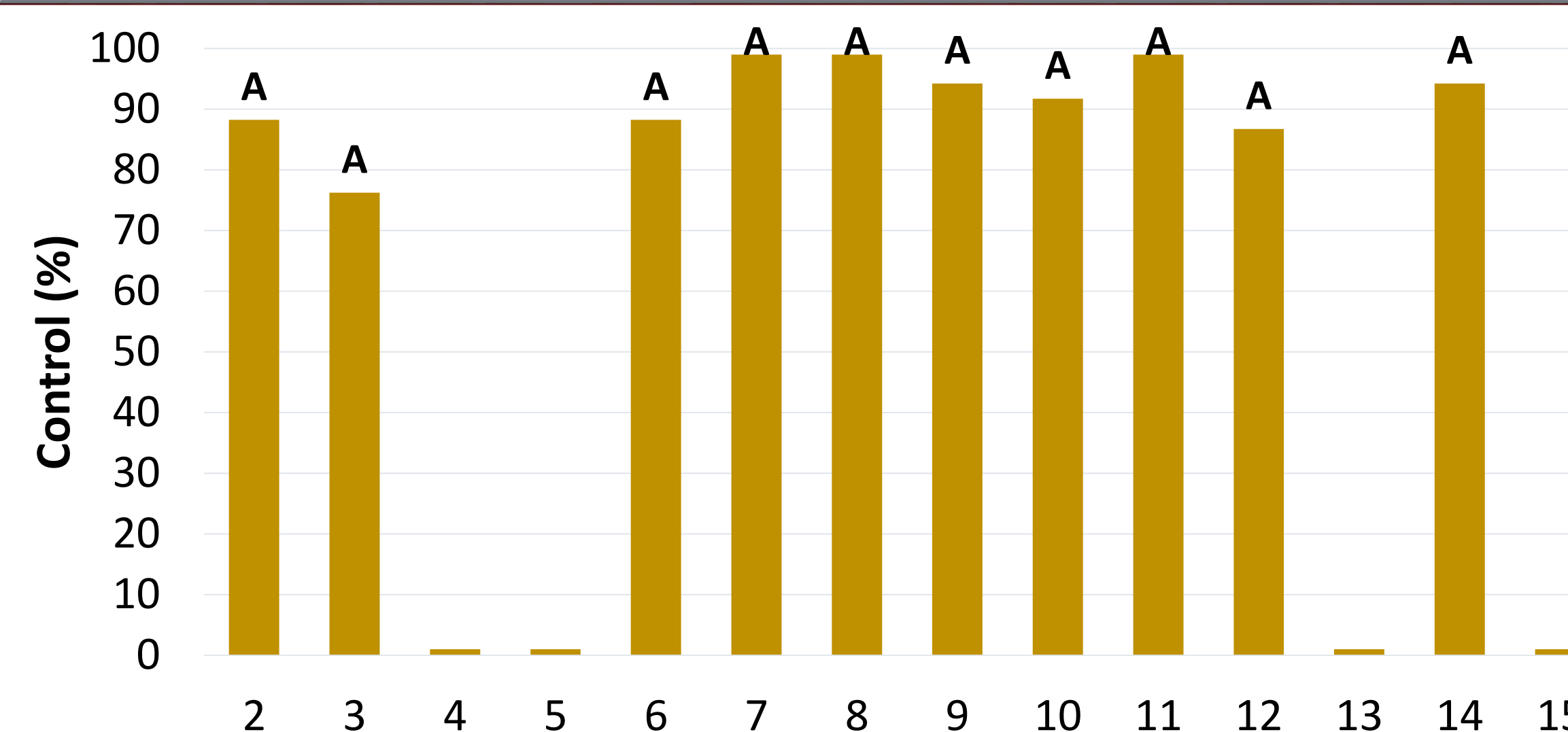


Figure 2. Control of resistant Palmer amaranth 14 d after early-POST

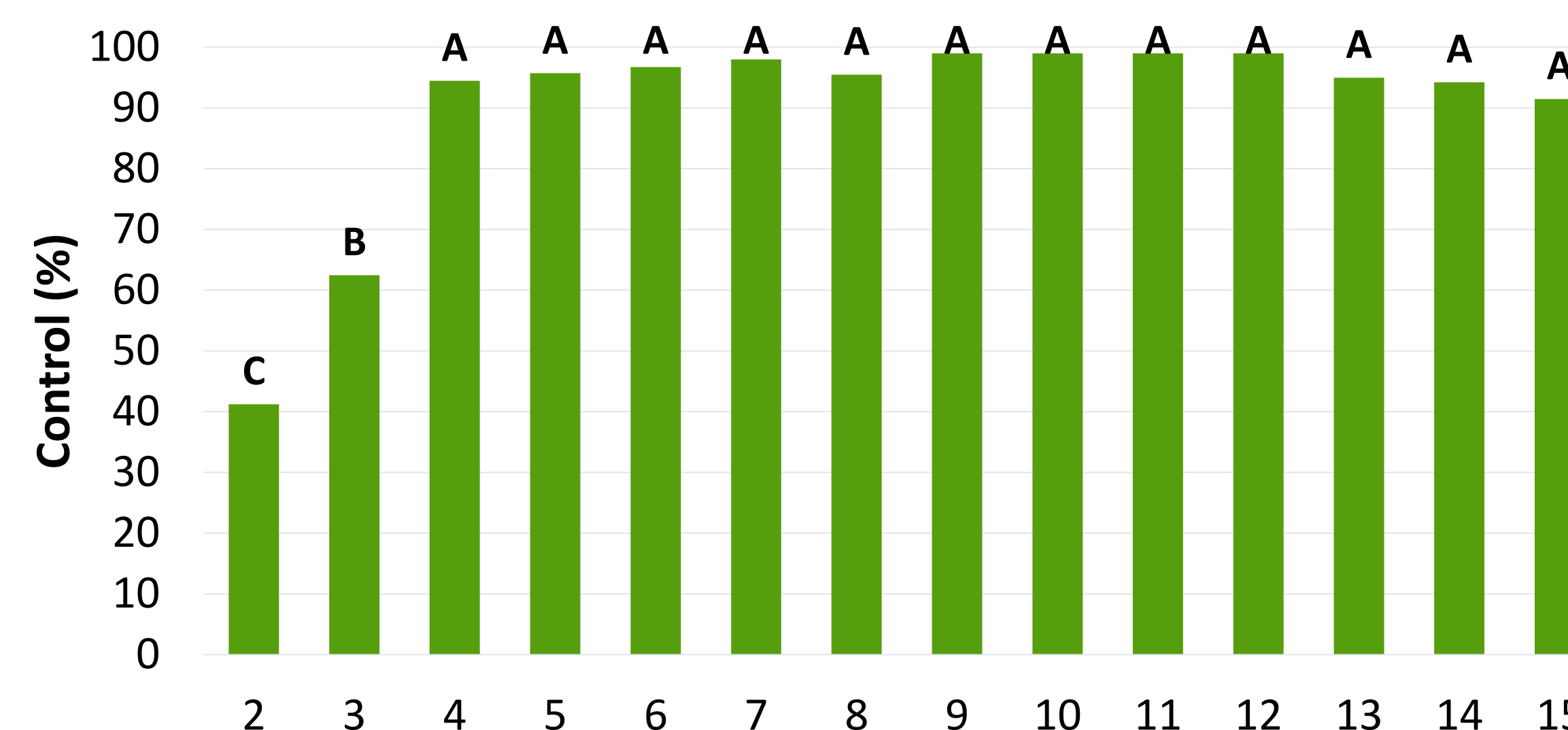


Figure 3. Density reduction 14 d after early-POST

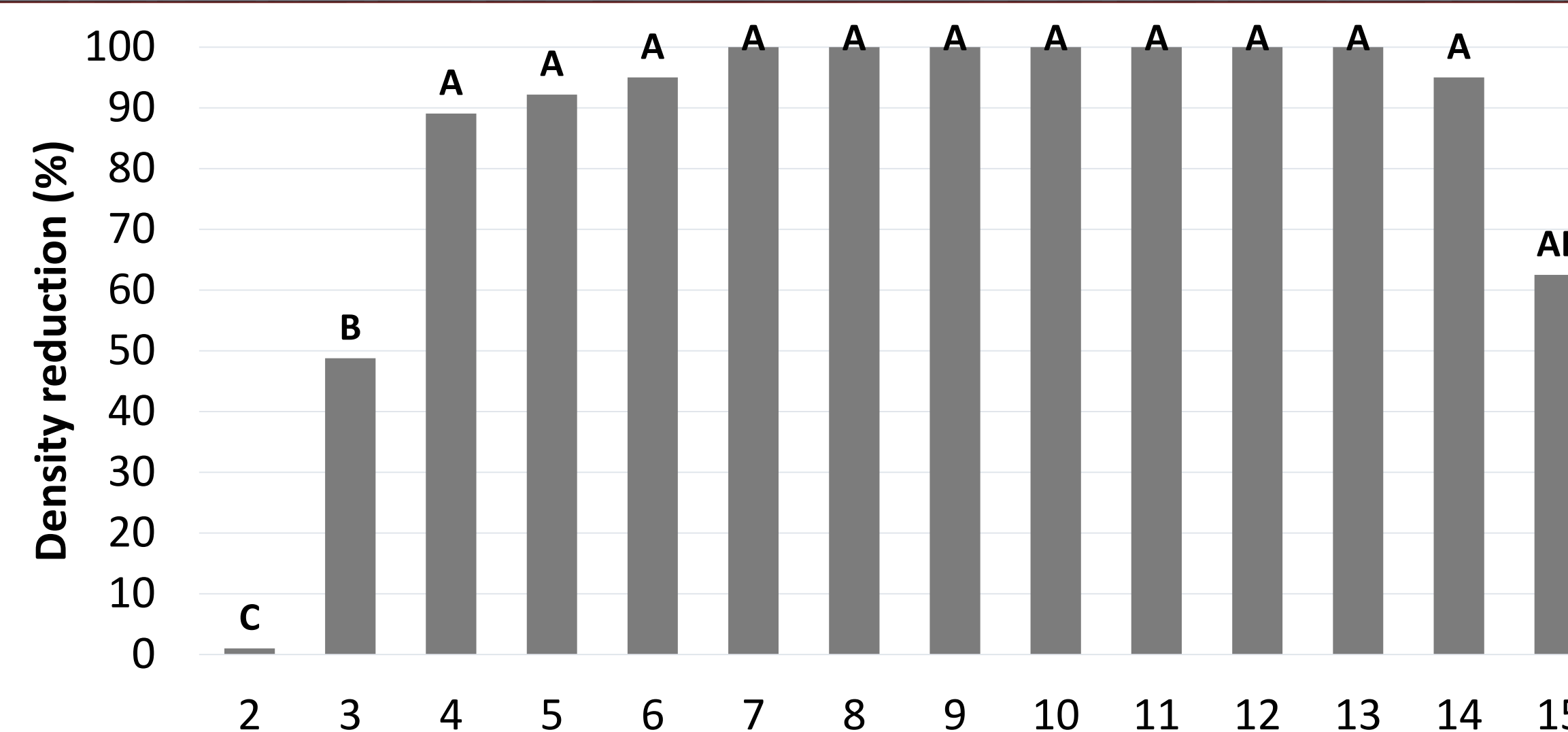


Figure 4. Control of resistant Palmer amaranth 21 d after late-POST

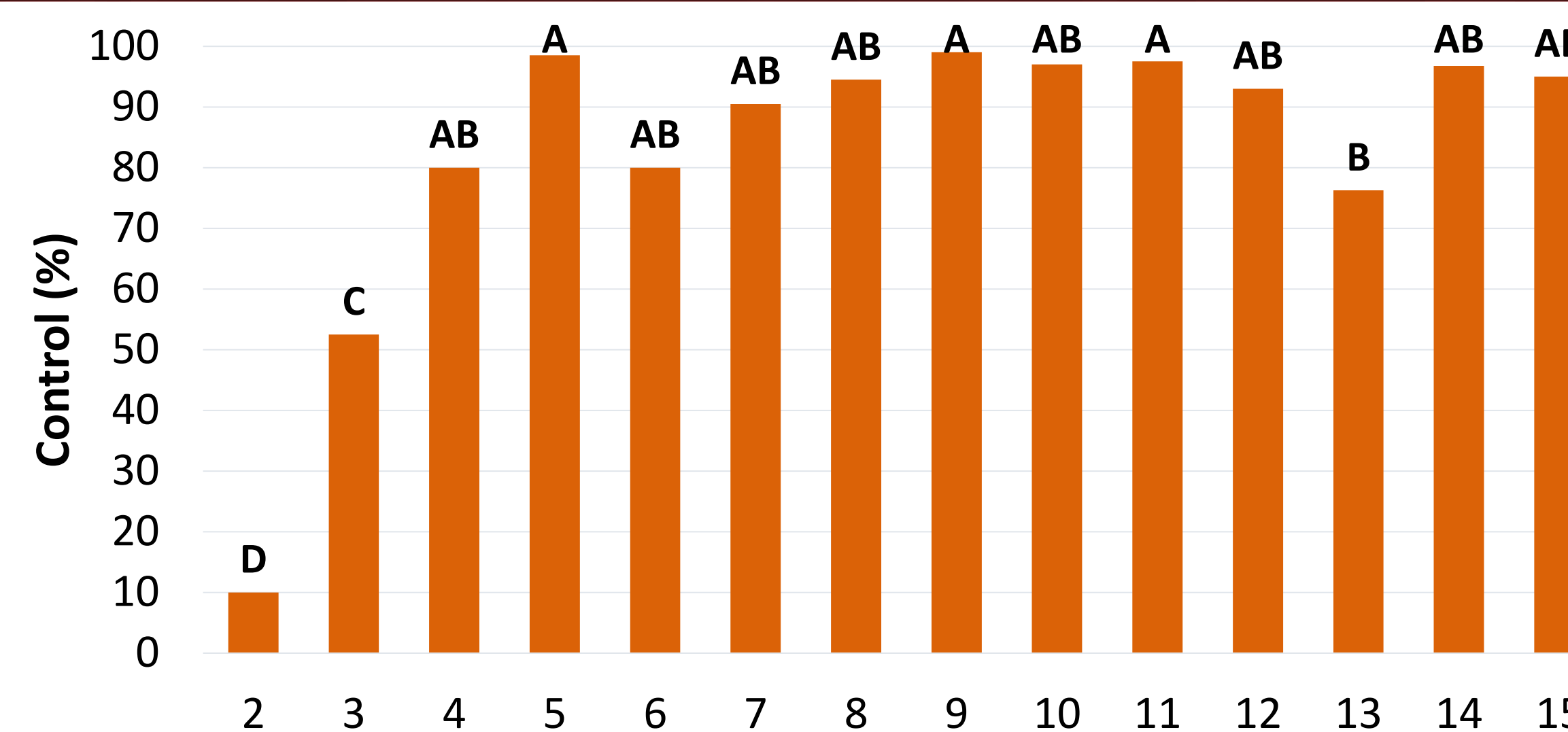
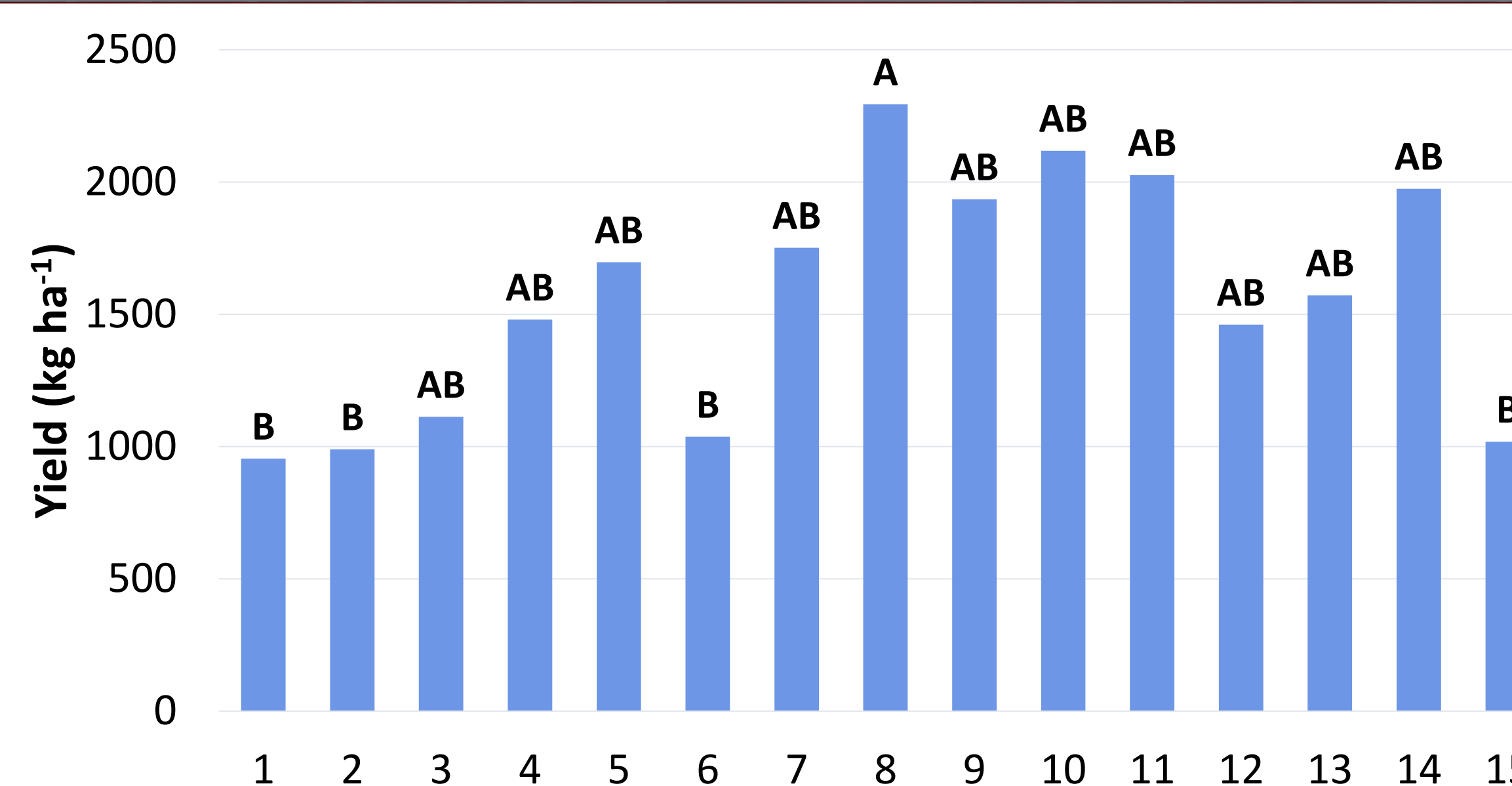


Figure 5. Soybean yield at harvest



Discussion

- 14 d after PRE:** isoxaflutole applied alone provided 88% control; isoxaflutole tank-mixed with sulfentrazone/pyroxasulfone, flumioxazin/sulfentrazone, or imazethapyr/saflufenacil/pyroxasulfone provided 76 to 99% control.
- 14 d after early-POST:** Herbicides in 14 d after PRE followed by POST of glufosinate provided similar control (91 to 99%) to a single POST of glufosinate (95% control).
- Density reduction 14 d after early-POST:** 63 to 100% when POST glufosinate was applied with or without PRE herbicide.
- All PRE herbicides followed by single or sequential applications of glufosinate provided 80 to 99% control.**
- 21 d after late-POST:** isoxaflutole PRE provided 10% control and isoxaflutole PRE followed by isoxaflutole early-POST provided 52% control; there was no application of glufosinate in these treatments.
- No soybean injury was observed from any herbicide program.
- Most herbicide programs provided similar yields to nontreated control.
 - Isoxaflutole tank-mixed with sulfentrazone/pyroxasulfone PRE followed by glufosinate early-POST provided a greater yield of 2,294 kg ha⁻¹ compared to other herbicide programs and the nontreated control (954 to 1,037 kg ha⁻¹).



Balance Bean (PRE only) 14 d after early-POST



No PRE fb Balance Bean + Liberty 14 d after PRE



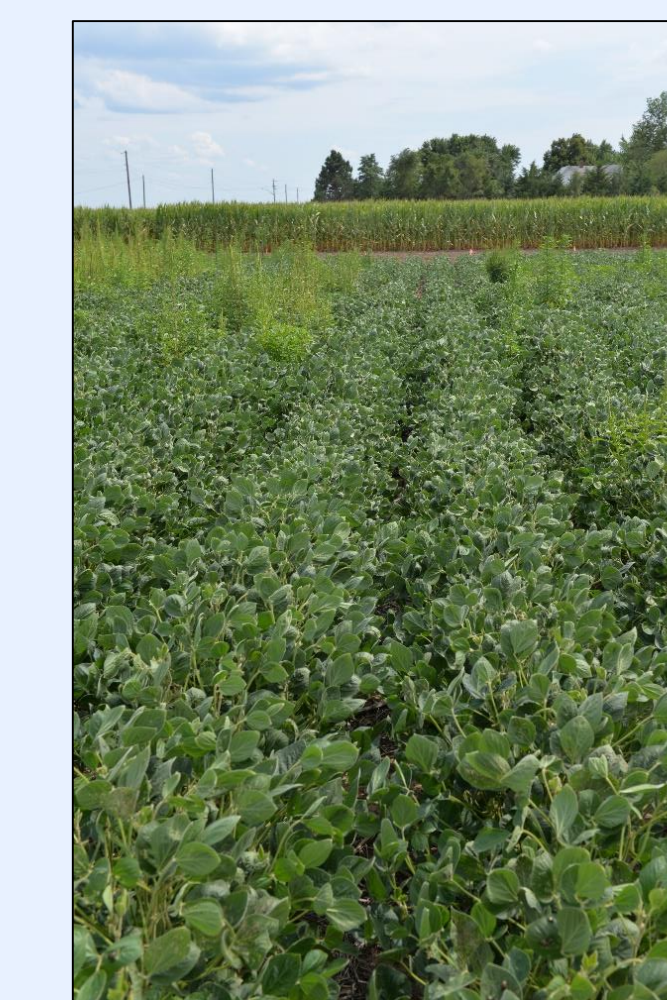
Nontreated control 21 d after late-POST



No PRE fb Balance Bean + Liberty 21 d after late-POST



Balance Bean fb Balance Bean 21 d after late-POST



Fierce fb Liberty 21 d after late-POST

Conclusions & Future Research

- Results from this study indicate that there are herbicide programs available for effective control of glyphosate-resistant Palmer amaranth in isoxaflutole/glufosinate-resistant soybean.
- Herbicide programs should include a PRE herbicide application and a single or sequential POST application of glufosinate for most effective control of glyphosate-resistant Palmer amaranth.
- This field study will be repeated in the 2019 growing season.