Overlapping Residual Herbicides for Control of Glyphosate-Resistant Palmer Amaranth in Dicamba/Glyphosate-Resistant Soybean

Adam Leise[1]*, Parminder Chahal[1], Ethann Barnes[1], Amit Jhala[1]
[1]University of Nebraska-Lincoln, Lincoln, NE, USA

EXTENSION Weed Science

University of Nebraska Lincoln

Introduction

- Palmer amaranth has evolved resistance to various herbicide site of actions in the US. A Palmer amaranth biotype was reported resistant to glyphosate on a grower's farm near Carleton, NE.
- Palmer amaranth has an extended period of emergence starting from March-October in the Midwestern and southern U.S. which makes it difficult to control in the later crop season.
- Palmer amaranth is the most troublesome weed in the corn-soybean production field.
- PRE herbicides generally lose their residual activity in the soil 2-3 weeks after application; however most POST herbicides commonly applied in soybean have little or no soil residual activity.

Late season emergence and growth of Palmer amaranth in Clay County, NE

Objective

- To evaluate the effect of soil residual PRE herbicides followed by tank mixture of foliar active POST and residual herbicides on glyphosate-resistant (GR) Palmer amaranth control in dicamba/glyphosate-resistant soybean.

Hypothesis

- A season long GR Palmer amaranth control will be achieved with soil residual PRE herbicides followed by POST tank-mixed with soil residual herbicides.

Table 1. Herbicide programs in dicamba/glyphosate-resistant soybean

Code	PRE	POST	Rate PRE*	Rate POST*	Trade name PRE	Trade name POST
1	--	--	--	--	--	--
2	(chlorimuron+ flumioxazin+ pyroxasulfone) + metribuzin	dicamba + acetochlor + glyphosate	320 + 1	565+ 454 +1,275	Fierce XLT + Tricor	Warrant + Roundup
3	flumioxazin+ chlorimuron	--	320	--	Valor XLT	--
4	flumioxazin+ pyroxasulfone	--	213	--	Fierce	--
5	chlorimuron+ flumioxazin+ pyroxasulfone	--	320	--	Fierce XLT	--
6	flumioxazin+ pyroxasulfone+ metribuzin	--	375	--	Fierce MTZ	--
7	flumioxazin+ chlorimuron	dicamba	320	565	Valor XLT	XtendiMax
8	flumioxazin+ pyroxasulfone	dicamba	213	565	Fierce	XtendiMax
9	chlorimuron+ flumioxazin+ pyroxasulfone	dicamba	320	565	Fierce XLT	XtendiMax
10	flumioxazin + pyroxasulfone + metribuzin	dicamba	375	565	Fierce MTZ	XtendiMax
11	flumioxazin+ pyroxasulfone	dicamba	320	565	Valor XLT	XtendiMax
12	flumioxazin+ pyroxasulfone	dicamba + acetochlor	213	565	Fierce	XtendiMax + Warrant
13	chlorimuron+ flumioxazin+ pyroxasulfone	dicamba + acetochlor	320	565+ 1,275	Fierce XLT	XtendiMax + Warrant
14	flumioxazin + pyroxasulfone + metribuzin	dicamba + acetochlor	375	565 +3,548	Fierce MTZ	XtendiMax + Warrant

*Rate (g ai/ae ha^{-1})

Materials and Methods

- Location: Carleton, NE
- The herbicide treatments in the study were arranged in a randomized complete block arrangement with three replications including nontreated control.
- Each plot was 3.0 m wide, and 9.0 m long and consisted of four rows of dicamba/glyphosate-tolerant spaced 0.76 m apart.
- PRE herbicide application was done on the same day of planting followed by POST herbicide application at 38 d after planting using a CO_2 pressurized backpack sprayer at a spray volume of 15 gallons/acre.
- Palmer amaranth visual control ratings were taken at 14 d after PRE, 14, 28, and 70 d after POST, and density ratings were taken at 14 d after POST , and soybean yields were taken at harvest.

Results

Figure 1. Control 14 d after PRE

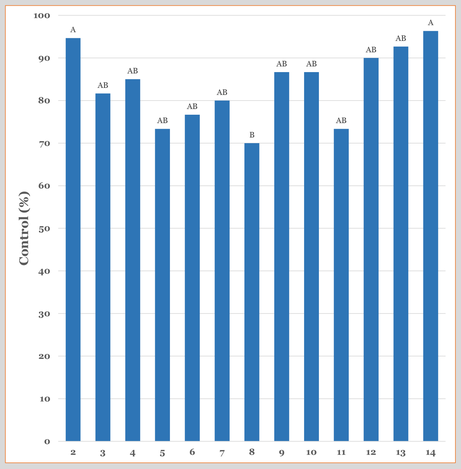
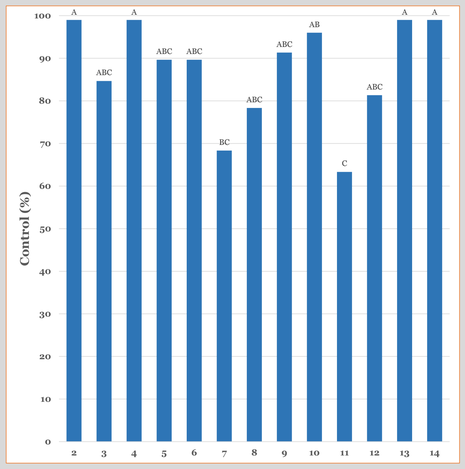


Figure 2. Control 14 d after POST



Fierce XLT + Tricor | Fierce MTZ

Fierce | Fierce+ Dicamba

Figure 3. Density Red 14 d after POST

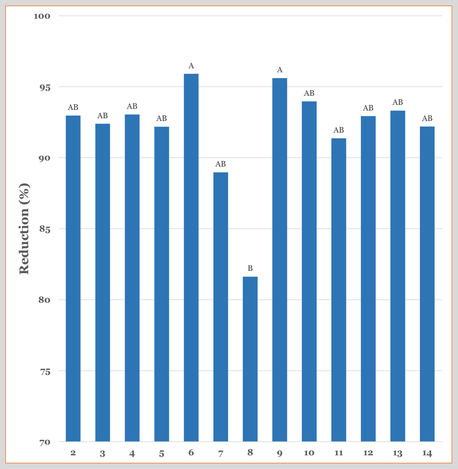
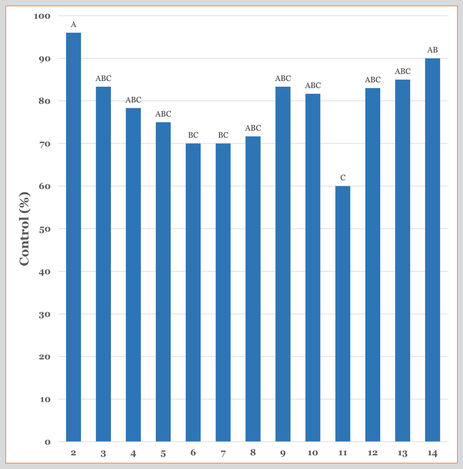


Figure 4. Control 42 d after POST

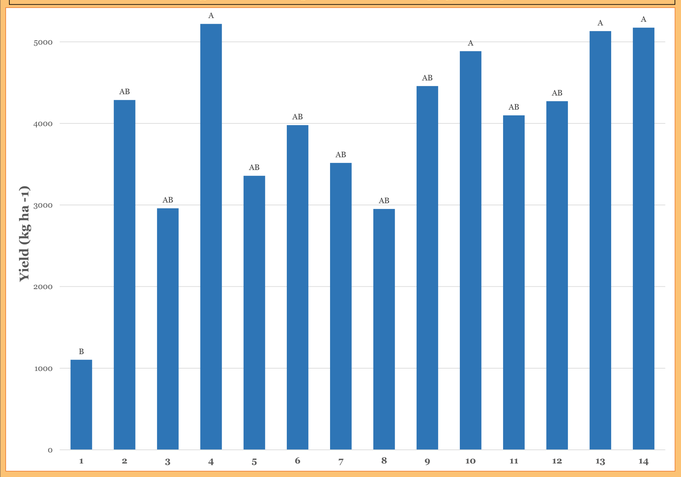


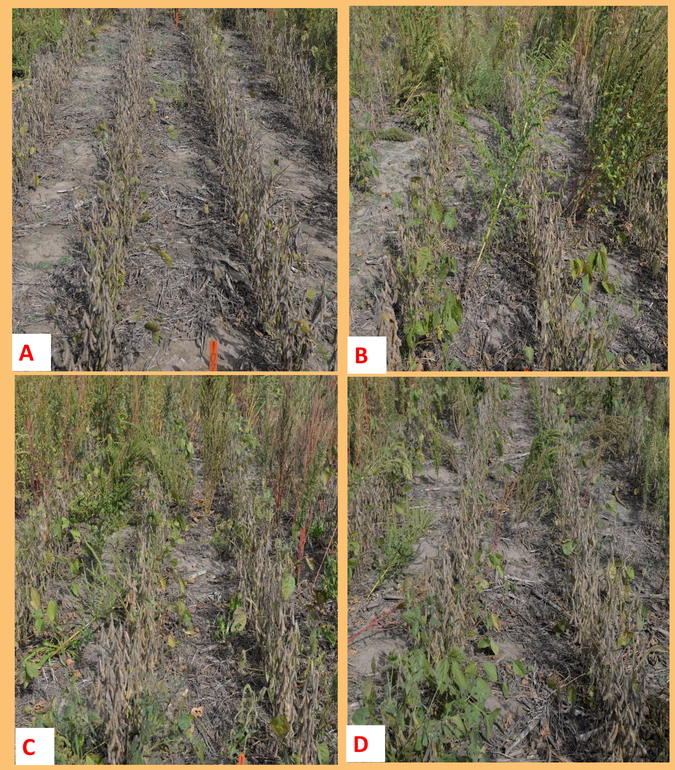
Fierce XLT | Fierce MTZ + XtendiMax

Fierce XLT | Fierce MTZ + XtendiMax

Results

Figure 5. Soybean Yield (kg ha^{-1})





Palmer amaranth control at harvest with (A) Trt 2, (B) Trt 11, (C) Trt 12, and (D) Trt 14

Discussion

- At 14 d after PRE, flumioxazin + pyroxasulfone, flumioxazin + pyroxasulfone + chlorimuron, flumioxazin + pyroxasulfone + metribuzin, or flumioxazin + chlorimuron provided 78 to 99% control.
- The abovementioned PRE herbicides followed by POST application of dicamba alone or dicamba tank-mixed with acetochlor controlled Palmer amaranth 73 to 96% at 14 d after POST.
- At 14 and 42 d after POST, PRE herbicides followed by dicamba alone POST or dicamba plus acetochlor did not show any difference in Palmer amaranth control (72 to 96%).
- Soybean yield was similar (2,952 to 5,220 kg ha^{-1}) among PRE alone or PRE followed by dicamba alone or dicamba plus acetochlor treatments in the study.

Conclusion and Future Directions

- The experimental site was under rainfed conditions without any irrigation facility and reduced late-season Palmer amaranth emergence occurred at the site this year which might have resulted in no difference in control or soybean yield when overlapping residual herbicides were tank-mixed with foliar active POST herbicides .
- Control of glyphosate-resistant Palmer amaranth in gr-soybean requires multiple modes of action throughout the growing season.
- A similar trial will be performed in 2019 at the same location.