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INTRODUCTION

• XtendFlex® soybean is the first technology with tolerance to dicamba, glyphosate and glufosinate herbicides which will be an additional tool when managing tough-to-control and herbicide-resistant weeds

Reasons for the research:

- It is likely a drift reducing adjuvant (DRA) will be required for those applications.
- No information can be found in literature on how these herbicides and adjuvants will interact when applied in combination as well as their effectiveness.

• **Previous research:** Studies have been conducted to evaluate the performance and interaction of these herbicides in tank mixtures^{1, 2}; however:

- No studies adding DRAs
- Older dicamba formulations

• **Objective:** To observe the response of troublesome weeds to tank mixtures containing two or more herbicide sites of action as affected by DRAs

• **Hypotheses:** DRA will affect weed control but results are weed species-dependent. It is expected antagonistic interactions when using dicamba in tank mixture with glyphosate on grasses. Glufosinate and glyphosate will potentially antagonize but response is species-dependent

MATERIALS & METHODS

• **Experimental design:** Randomized Complete Block Design (RCBD) in XtendFlex® soybean located in North Platte, NE with four replications

Treatments structure

Tank-Mixtures		Herbicide Rates	
Trt#	Herbicides ^a	DRAs ^b	(g ae or ai ha ⁻¹)
1	Untreated		0
2	Dicamba (Dic)		560
3	Glyphosate (Gly)		1260
4	Dic + Gly		560 + 1260
5 or 6	Dic + Gly	A or B	560 + 1260
7 or 8	Dic + Gly + Clethodim	A or B	560 + 1260 + 136
9 or 10	Dic + Gly + Clethodim + Acetochlor	A or B	560 + 1260 + 136 + 1260
11 or 12	Dic + Gly + Clethodim + S-metolachlor	A or B	560 + 1260 + 136 + 1067
13 or 14	Dic + Gly + Glufosinate	A or B	560 + 1260 + 656
15 or 16	Dic + Gly + Glufosinate + Clethodim	A or B	560 + 1260 + 656 + 136

^a Herbicide trade names: Dicamba = XtendiMax; Glyphosate = Roundup PowerMax; Clethodim = Select Max; Acetochlor = Warrant; S-metolachlor = Dual Magnum.

^b Drift reducing adjuvants: DRA A = Trapline Pro II; DRA B = Intact. The rate used was 0.5 v v⁻¹

• **Spray application:** Backpack sprayer calibrated to deliver 140 L ha⁻¹ at 276 kPa and 1.8 m s⁻¹ using the TTI11002 nozzle on a 50-cm nozzle spacing

• **Experimental plots:** Four rows (3 x 7.6 m). Two rectangles (77 x 32 cm) in each plot (in-row and between-row)

• **Weed species:** Bristly foxtail [*Setaria verticillata* (L.) Beauv.]; Large crabgrass [*Digitaria sanguinalis* (L.) Scop.]; Palmer amaranth (*Amaranthus palmeri* S. Watson)

• **Data collection:** Visual estimations of injury of entire plot at 28 DAA. Number of weeds in each rectangle was counted, measured, harvested, and placed in a dryer until reaching a constant mass

• **Statistical analysis:** Data were subjected to ANOVA and means were separated using Fisher's Protected LSD test with the Tukey adjustment at $\alpha = 0.05$

RESULTS

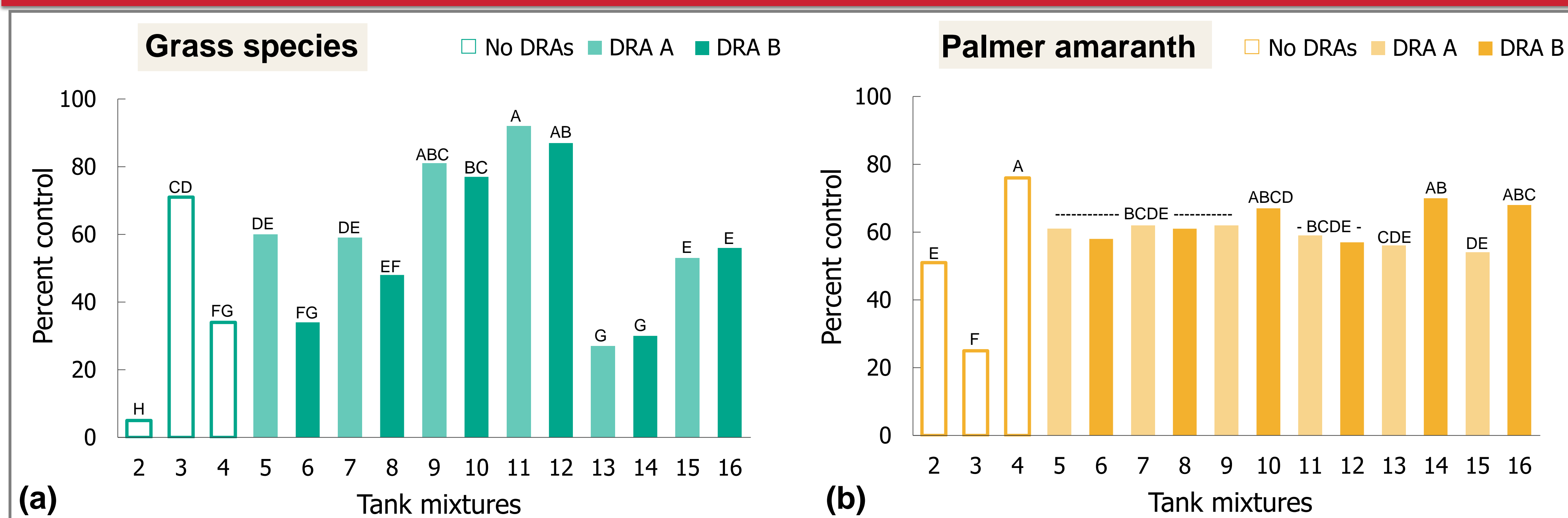


Figure 1. Percent of (a) grasses or (b) Palmer amaranth control based on visual injury treated with different herbicide tank mixtures. Bars with the same letter do not differ using Tukey's test at $\alpha = 0.05$.

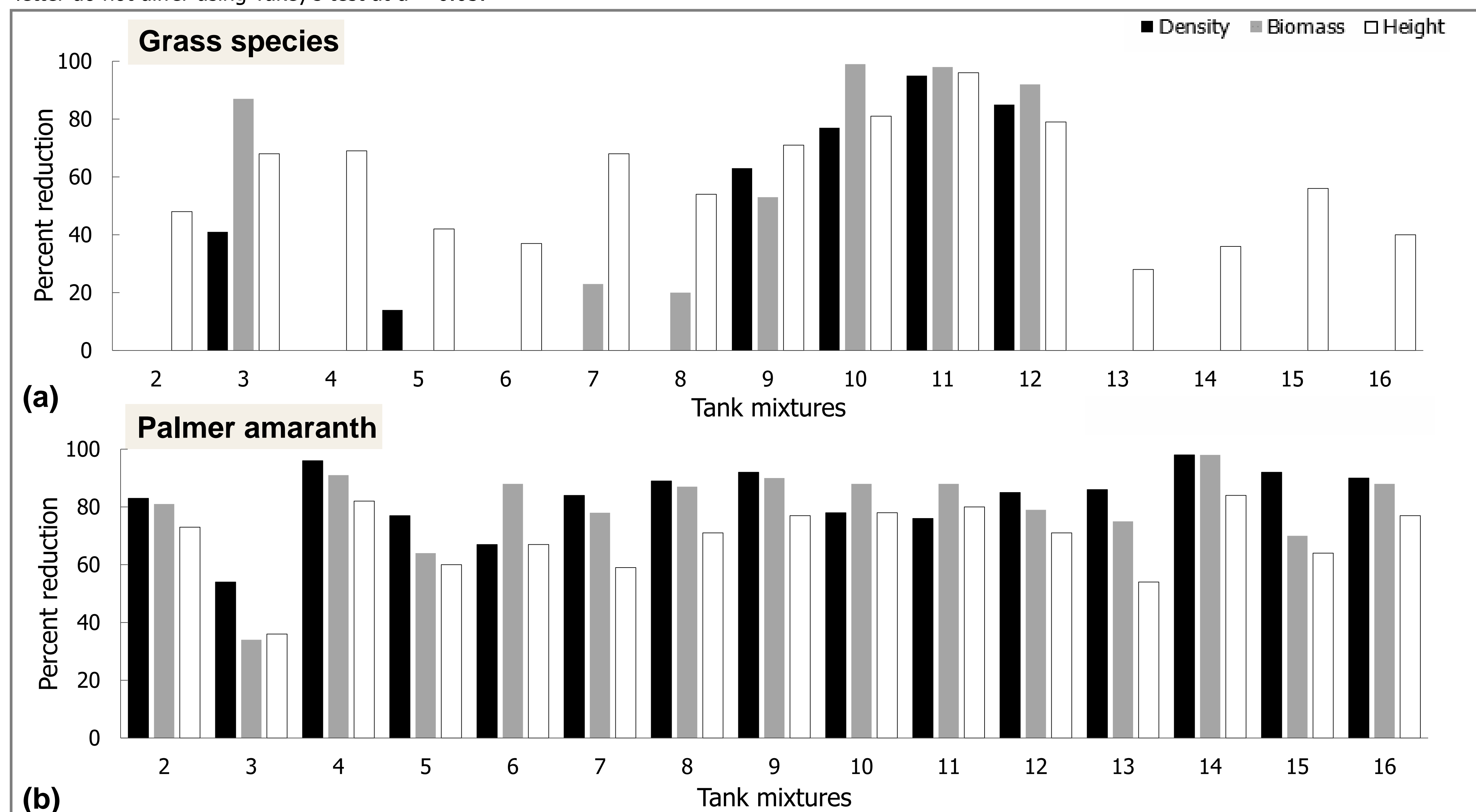


Figure 2. Percent of density, biomass, or height reduction of (a) grasses or (b) Palmer amaranth from between-row rectangles treated with different herbicide tank mixtures.

DISCUSSION

Grasses:

- Antagonistic interaction was observed when dicamba was applied in combination with glyphosate^{1,2} or glyphosate plus glufosinate
- DRA A can help overcome the antagonism, except when glufosinate is present in the tank mixture
- Residual herbicides improved grass control

Palmer amaranth:

- Dicamba applied in combination with glyphosate with no DRAs increased control¹
- DRA B improved control when added to the tank mixtures containing acetochlor, glufosinate, or glufosinate plus clethodim

CONCLUSIONS

- Dicamba and glufosinate are important for management of glyphosate-resistant Palmer
- Type of interaction was weed species-dependent
- DRAs can help overcome potential antagonism but response was adjuvant-, herbicide-, and species-dependent
- Residual herbicides were needed to control grasses

WHAT IS NEXT?

- Apply treatments to different weed species including populations resistant to dicamba in field and greenhouse

REFERENCES

- ¹ Meyer CJ and Norsworthy JK (2019) Influence of weed size on herbicide interactions for Enlist™ and Roundup Ready® Xtend® technologies. Weed Technol 33:569–577.
- ² Flint JL, Barrett M (1989) Antagonism of glyphosate toxicity to johnsongrass by 2,4-D and dicamba. Weed Sci 37:700–705.