Comparison of Herbicide Programs in Conventional, Glufosinate, and Glyphosate/Dicamba-Resistant Soybeans Across Nebraska

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INTRODUCTION

- Facing low commodity prices soybean producers in Nebraska have shown interest in growing conventional soybeans to reduce seed costs.
- Many producers are concerned about the efficacy of conventional herbicide programs in comparison to programs in herbicide-resistant (HR) varieties.
- The use of strong PREs provide the best opportunity for season-long weed control, higher grain yield and net returns in both conventional and HR soybean varieties (Rosenbaum et al. 2013).

OBJECTIVES & HYPOTHESIS

OBJECTIVE: Evaluate different PRE fb POST herbicide programs for weed control, crop safety and yield reductions in conventional, glufosinate (LibertyLink) and glyphosate/dicamba-resistant (RR2X) soybean varieties.

HYPOTHESIS: Across PRE fb POST programs, soybeans receiving conventional POST herbicides will have lower weed biomass/density reductions and higher yield reductions.

MATERIALS & METHODS

LOCATIONS: Field experiments were conducted in 2018 at five University of Nebraska–Lincoln Research and Education centers **(Figure 1).**

- Weed pressure was predominately *Amaranthus* spp. (AMAPA, AMATA), *Abutilon theophrasti,* and *Chenopodium album.*

EXPERIMENTAL DESIGN:

Split-plot design with four replications.

- Main-plot– PRE herbicides with three sites of action **(Table 1).**
- Sub-plot– Soybean varieties with POST herbicides based on HR-trait **(Table 2).**

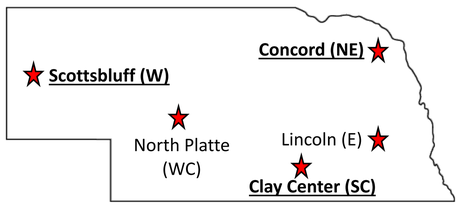

Fig. 1. State map depicting study locations.

DATA COLLECTION:

- 14 and 28 d after PRE/POST applications–
  - Visual assessment of weed control from 0 to 100%.
  - Weed biomass and density using two 0.5 m^{-2} quadrants.
  - Visual assessment of crop injury from 0 to 100%.

DATA ANALYSIS:

- Data were analyzed in R (3.5.2) using the sp.plot function in agricolae.
- ANOVA was conducted with means separated using protected Fisher's LSD.

Table 1. PRE Herbicide Programs

#	Herbicide	Trade Name(s)	Rate (g ai ha^{-1})
1	Nontreated control	--	--
2	Weed free check	--	--
3	sulfentrazone/s-metolachlor + metribuzin	Authority Elite + TriCor 4F	1960 + 700
4	chlorimuron/flumioxazin/thifensulfuron	Enlite	94
5	flumioxazin/pyroxasulfone + metribuzin	Fierce + TriCor 4F	160 + 210
6	chlorimuron/flumioxazin/metribuzin	Trivence	374
7	imazethapyr/pyroxasulfone/saflufenacil	Zidua Pro	215

Table 2. POST Herbicide Programs

#	Herbicide	Trade Name(s)	Rate (g ai ha^{-1})
1	dicamba + glyphosate (gly)	Xtendimax + Roundup	560 + 1540
2	glyphosate	Roundup	1540
3	glufosinate	Liberty	656
4	lactofen + acetochlor + clethodim	Cobra + Warrant + Select	220 + 1680 + 119

Photo 1-3. Performance of POST programs at Clay Center 42 d after POST

RESULTS

WEED BIOMASS REDUCTION:

- All PREs provided 95 to 99% reduction at 28 d after PRE.
- Most POSTs provided >95% reduction at 28 d after POST **(Figure 2)**.

WEED DENSITY REDUCTION:

- Within locations, most PRE programs preformed similarly on density reduction at 28 d after PRE **(Figure 3)**.
- Conventional POSTs provided 83% weed density reduction at 28 d after POST.
- Dicamba, glyphosate, and glufosinate provided 91 to 96% density reductions at 28 d after POST.

CROP INJURY:

- No injury to crop at 28 d after PRE.
- 12.5% and 18.7% injury at 28 d after POST for LibertyLink and conventional soybeans respectively at Clay Center and Concord.

SOYBEAN YIELD REDUCTION:

- Most PRE programs preformed comparably within locations **(Figure 4).**
- Dicamba plus glyphosate provided lowest yield reductions across locations **(Figure 5).**

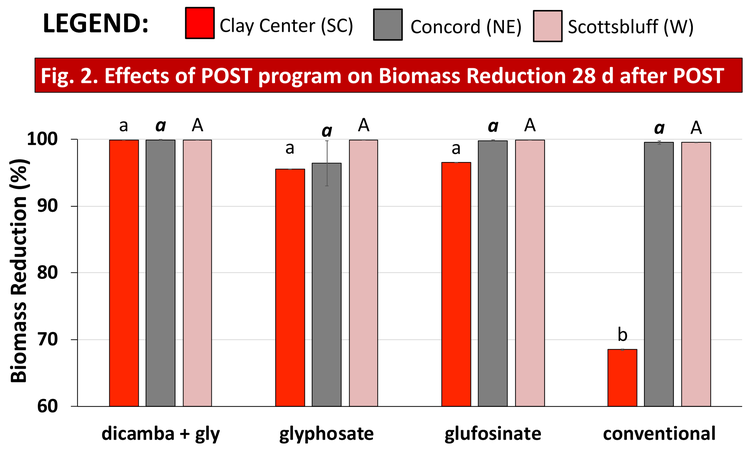

Fig. 2. Effects of POST program on Biomass Reduction 28 d after POST

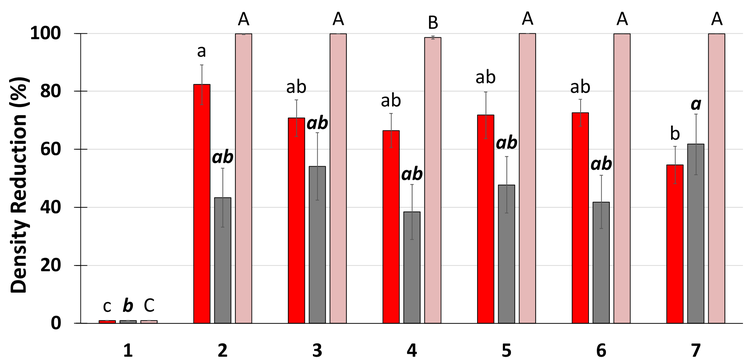

Fig. 3. Effect of PRE program on Density Reduction 28 d after PRE

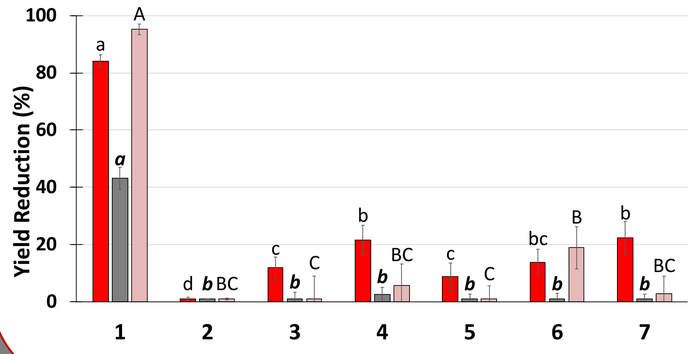

Fig. 4. Effect of PRE program on Soybean Yield Reduction

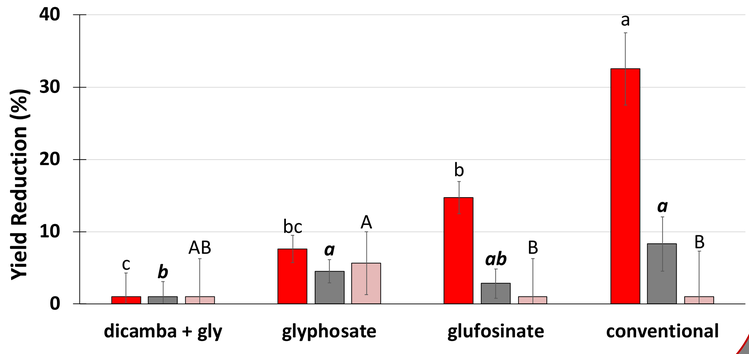

Fig. 5. Effect of POST program on Soybean Yield Reduction

CONCLUSIONS & DISCUSSION

- **PRE–** Most PRE programs provided similar weed biomass and weed density reductions within locations.
- **PRE–** All PRE programs decreased yield reductions by >75% in comparison to the weed free check.
- **POST–** Conventional program provided comparable weed biomass reduction and yield reductions at Concord and Scottsbluff, agreeing with Owen et al. 2010.
- **POST–** Conventional program provided lower density reductions across all locations and lower biomass reduction and higher yield reductions at Clay Center, agreeing with Rosenbaum et al. 2014.
- **OVERALL–** Fail to reject null hypothesis due to mixed location results. Further study is required.

FUTURE DIRECTION

- This study will be replicated again in 2019, and cost analysis on treatments will be conducted to determine the most economic and effective management strategies.

ACKNOWLEDGEMENTS

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REFERENCES

- Owen MDK, Pedersen P, Bruin JLD, Stuart J, Lux J, Franzenburg D, Grossnickle D (2010). Crop Science 50:2597–2604
- Rosenbaum KK, Massey RE, Bradley KW (2013). Crop Management 12:0