

Glyphosate-Resistant Palmer Amaranth Control in XtendFlex Soybean

R. Liu, V. Kumar, and T.L. Lambert

Summary

XtendFlex soybean is a triple-stacked trait technology that allows growers to use dicamba (XtendiMax) and glufosinate (Liberty) for in-season control of glyphosate-resistant (GR) weed species, including Palmer amaranth. A field study was conducted at the Kansas State University Agricultural Research Center (KSU-ARCH) near Hays, KS, to determine the effectiveness of POST applied XtendiMax and Liberty alone or in sequential applications for GR Palmer amaranth control in XtendFlex soybean. The study site had a natural infestation of GR Palmer amaranth. Results showed that early post-emergence (EPOST) applications of XtendiMax or Liberty followed by (*fb*) a late post-emergence (LPOST) application of Liberty provided an excellent control (98%) of GR Palmer amaranth compared to XtendiMax or Liberty alone at 30 days after treatment (DAT). All treatments provided >80% control throughout the season, except for Roundup PowerMax alone (59 to 78%). Consistent with percent visual control, all tested treatments significantly reduced GR Palmer amaranth biomass (0 to 96 g/10 ft²) compared to non-treated check (178 g/10 ft²). Soybean yield for majority of the tested treatments were significantly higher (ranging from 28 to 33 bu/a), compared to nontreated check (23 bu/a). In conclusion, these results suggest that sequential treatments of EPOST XtendiMax *fb* LPOST XtendiMax or Liberty and EPOST Liberty *fb* LPOST Liberty can provide effective control of GR Palmer amaranth in XtendFlex soybeans.

Introduction

XtendFlex soybean is a triple-stacked trait technology (tolerates glyphosate, dicamba, and glufosinate herbicides) that has recently been commercialized. This technology allows growers to use Roundup PowerMax, XtendiMax and Liberty for in-season weed control. GR Palmer amaranth is common in Kansas cropping systems (Kumar et al., 2020). The proper use of XtendiMax and Liberty can be helpful in managing GR Palmer amaranth in XtendFlex soybean. The objective of this study was to determine the effectiveness of POST applied XtendiMax and Liberty alone or in sequential applications for GR Palmer amaranth control in XtendFlex soybean.

Procedures

A field study was conducted at KSU-ARCH near Hays, KS, to determine the effectiveness of POST applied XtendiMax and Liberty alone or in sequential applications for the control of GR Palmer amaranth in XtendFlex soybean. XtendFlex soybean variety AG37XF1 was planted at 156,900 seeds/a on June 5, 2021. Study site had a natural infestation of GR Palmer amaranth. A randomized complete block design with

four replications was used. A total of 8 herbicide treatments were tested, including a nontreated check, stand-alone applications of Roundup PowerMax at 32 fl oz/a, XtendiMax at 22 fl oz/a, Liberty at 32 fl oz/a, or in sequential applications at early post-emergence (EPOST) at V3-4 soybeans (3- to 5-inch Palmer amaranth) on July 7, 2021, followed by (*fb*) a late post-emergence (LPOST) applied 10 days after EPOST to 6- to 8-inch Palmer amaranth on July 17, 2021. All treatments were applied with appropriate adjuvants as dictated by each label using a CO₂-operated backpack sprayer calibrated to deliver 15 gallons of spray solution per acre. Turbo Teejet Induction 110015 nozzles were used for treatments containing XtendiMax, and AIXR 110015 nozzles were used for Roundup PowerMax or Liberty treatments. Data on soybean injury (%) and GR Palmer amaranth control (%) at 7, 10, 30, and 80 days after LPOST treatment (DAT) were recorded. At soybean maturity, GR Palmer amaranth biomass was collected using an 10-ft² quadrat placed at the center of each plot. Soybean yield (bu/a) was also recorded. All data were subjected to ANOVA using PROC MIXED in SAS program. Means were separated using Fisher's protected LSD test ($\alpha = 0.05$).

Results

Palmer Amaranth Control

Results showed that EPOST applications of XtendiMax or Liberty *fb* a LPOST application of Liberty provided excellent control (98%) of GR Palmer amaranth compared to EPOST XtendiMax or Liberty alone at 30 DAT (Figure 1A, Figure 3C). Overall, all treatments provided >80% control of GR Palmer amaranth throughout the season, except for Roundup PowerMax (59 to 78%) (Figure 1A; Figure 3B).

GR Palmer Amaranth Biomass Reduction

Consistent with percent control, all tested treatments reduced GR Palmer amaranth biomass significantly (0 to 96 g/10 ft²) compared to nontreated check (178 g/10 ft²) (Figure 1B; Figure 3).

Soybean Yield

Soybean grain yields for the majority of the tested treatments did not differ but were significantly higher (ranging from 28 to 33 bu/a) compared to nontreated check (23 bu/a) (Figure 2; Figure 3).

Conclusions

Results suggested that sequential treatments comprising EPOST XtendiMax *fb* LPOST XtendiMax or Liberty and EPOST Liberty *fb* LPOST Liberty provided season-long control of GR Palmer amaranth compared with EPOST Liberty or XtendiMax alone treatments.

References

Kumar V, Liu R, Stahlman PW (2020) Differential sensitivity of Kansas Palmer amaranth populations to multiple herbicides. *Agron J*, <https://doi.org/10.1002/agj2.20178>.

Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. Persons using such products assume responsibility for their use in accordance with current label.

Table 1. List of POST treatments tested in XtendFlex soybean

No.	Herbicide program*	Rate (fl oz/a)	Timing
1	Nontreated	---	---
2	Roundup PowerMax	32	EPOST
3	Liberty	32	EPOST
4	XtendiMax	22	EPOST
5	XtendiMax <i>followed by (fb)</i> XtendiMax	22 <i>fb</i> 22	EPOST <i>fb</i> LPOST
6	XtendiMax <i>fb</i> Liberty	22 <i>fb</i> 32	EPOST <i>fb</i> LPOST
7	Liberty <i>fb</i> XtendiMax	32 <i>fb</i> 22	EPOST <i>fb</i> LPOST
8	Liberty <i>fb</i> Liberty	32 <i>fb</i> 32	EPOST <i>fb</i> LPOST

*All treatments were applied with appropriate adjuvants as dictated by each label using a backpack sprayer equipped with Turbo Teejet Induction 110015 nozzles (for treatments containing XtendiMax) or AIXR 110015 nozzles (for Roundup PowerMax or Liberty).

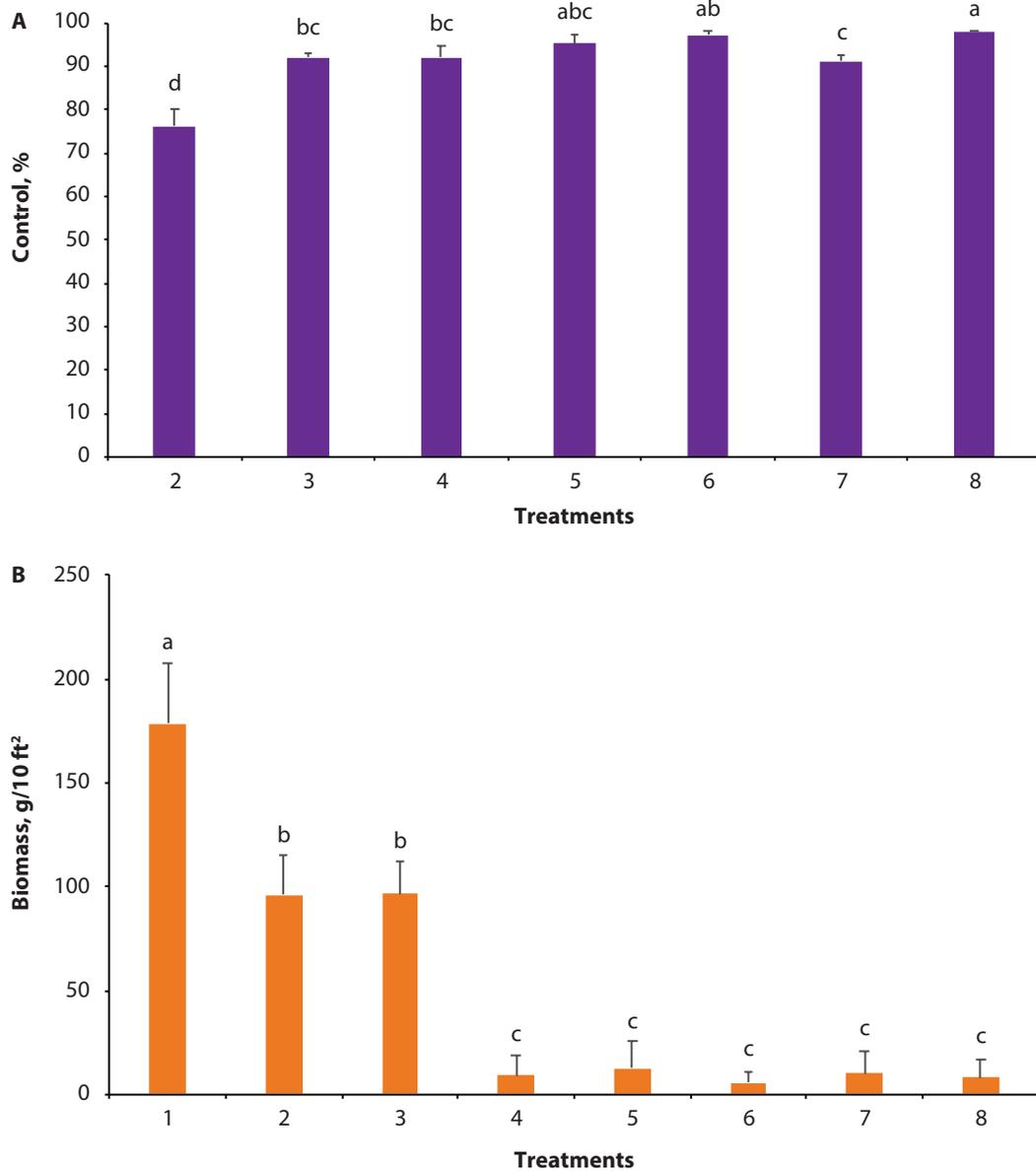


Figure 1. Glyphosate-resistant Palmer amaranth control at 30 days after treatment (A) and aboveground biomass at soybean maturity (B) with all tested POST treatments in Xtend-Flex soybean. Bars with same letters are not significantly different according to Fisher’s protected LSD test ($P < 0.05$). See Table 1 for treatment details.

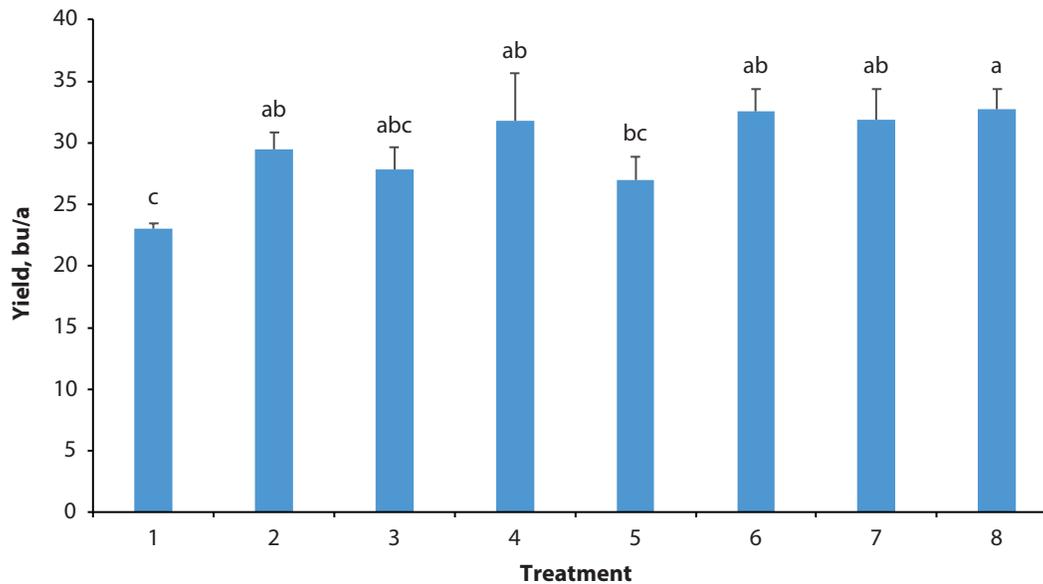


Figure 2. Effect of POST treatments on XtendFlex soybean grain yield at KSU-ARCH near Hays, KS. Bars with same letters are not significantly different according to Fisher’s protected LSD test ($P < 0.05$). See Table 1 for treatment details.

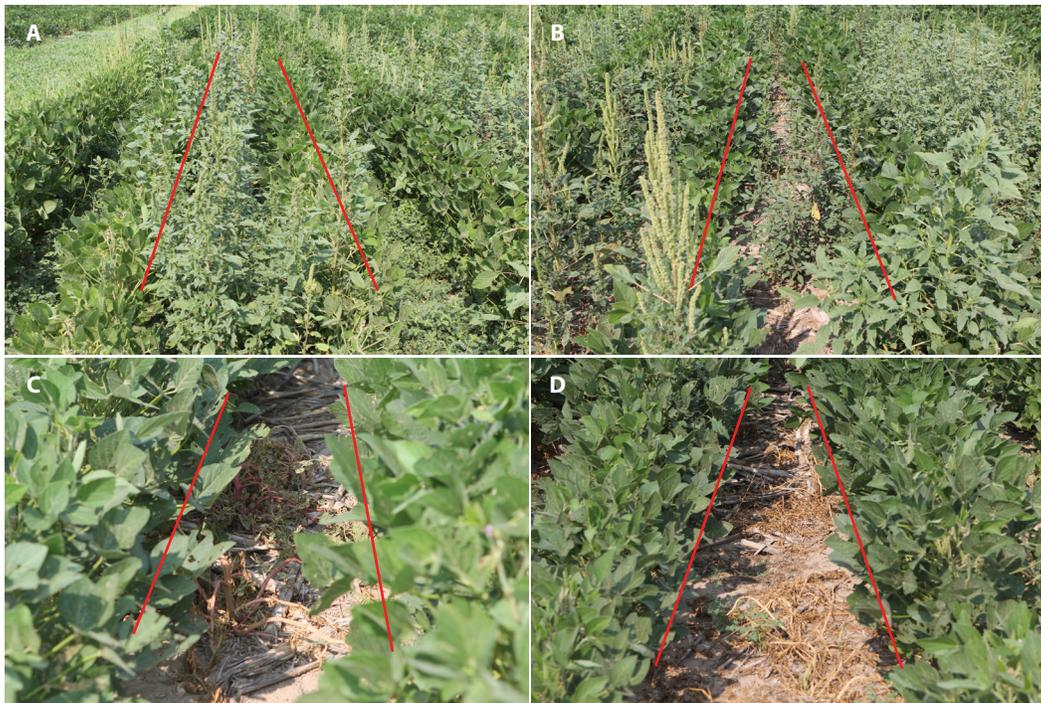


Figure 3. Photos of each plot taken at 30 days after treatment: non-treated check (A); Roundup PowerMax EPOST at 32 fl oz/a (B); XtendiMax EPOST at 22 fl oz/a (C); and XtendiMax EPOST at 22 fl oz/a *fb* Liberty LPOST at 32 fl oz/a (D). EPOST = early postemergence. LPOST = late postemergence. *fb* = followed by.