KANSAS SOYBEAN COMMISSION-4th QUARTERLY PROGRESS REPORT

Title: Best Management Practices in Soybeans for Managing Herbicide-Resistant Weeds in Western Kansas.

Principal Investigators:

1. Andrew N. Tucker, Assistant Professor of Agronomy, Department of Agriculture, Fort Hays State University, Hays, KS; Email: antucker@fhsu.edu; Ph: (785) 628-4010

2. Vipan Kumar, Assistant Professor of Weed Science, Agricultural Research Center, Kansas State University, Hays, KS 67601; E-mail: vkumar@ksu.edu; Ph: (785)-625-3425 ext. 214

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Project Timeline: March 1, 2019 through February 28, 2020

Progress Report: April 15, 2020

Objectives:

1. Quantify the impact of row-spacing, time of planting, and seeding rates on glyphosate-resistant kochia and Palmer amaranth interference in soybean.

2. Determine the ultimate impact of those agronomic practices on soybean grain yields and quality in western Kansas.

Materials and Methods: A field experiment was established at Kansas State University Agricultural Research Center (KSU-ARC) near Hays, KS. Soybean plots were established under no-till wheat stubbles. Experiment was setup in split-split plot design with 4 replications with following factors: **Whole plot:** a) Standard herbicide program; b) No herbicide; **Split plot:** a) 100,000 seeds/ac; b) 150,000 seeds/ac; c) 200,000 seeds/ac; **Split-split plot:** a) 30-inch row spacing; b) 15-inch row spacing. Study site had natural infestation of Palmer amaranth, kochia, tumble pigweed, and puncture vine. A Roundup Ready 2 Xtend soybeans Asgrow "AG39X7" was planted on June 6, 2019. A standard PRE herbicide treatment of Authority MTZ @10 oz/a was applied to selected plots on June 6 followed by a POST treatment of Xtendimax @ 22 fl oz/a plus Roundup PowerMax @ 32 fl oz/a was applied on July 10, 2019. Data collection on soybean performance, weed density, NDVI, and percent weed control have been collected.

Results and Discussion: Averaged across all seeding rates and row spacing combination, herbicide program consisting PRE application of Authority MTZ @ 10 oz/A followed by POST application of Xtendimax @ 22 fl oz/A plus Roundup PowerMax @ 32 fl oz/A provided effective control (90 to 100%) of kochia, Palmer amaranth, prostrate pigweed and puncture vine compared to nontreated plots at 8 weeks after planting (WAP) of Roundup Ready 2 Xtend soybeans **(Figure 1).** The data on percent visual control was consistent with total weed density observed. All treated plots had significantly lesser number of total weed seedlings at 8 WAP compared to non-treated plots **(Table 1)**. Preliminary results on normalized difference vegetation index (NDVI) showed a significantly higher values in plots with 15-inch rows compared to 30-inch rows **(Table 1 and Figure 3)**; further indicating the high ground cover in narrow rows which will indirectly be capturing more sunlight and preventing the late season weed emergence. Total weed density throughout the growing season shows the effect of post emerge herbicide treatment affecting overall weed density, however, row

spacing nor seeding rate seemed to effect overall weed density **(Figure 2)**. Row spacing and plant population effects on grain yield were variable, (**Table 2, Figure 4, and Figure 5)**. This research has been presented at the following meetings to date: the 74th annual meeting of the North Central Weed Science Society from December 10-13, 2019 in Columbus, OH and the 2020 annual meeting of the Weed Science Society of America from March 2-5, 2020 in Maui, HI. The study will be repeated in the upcoming growing season.

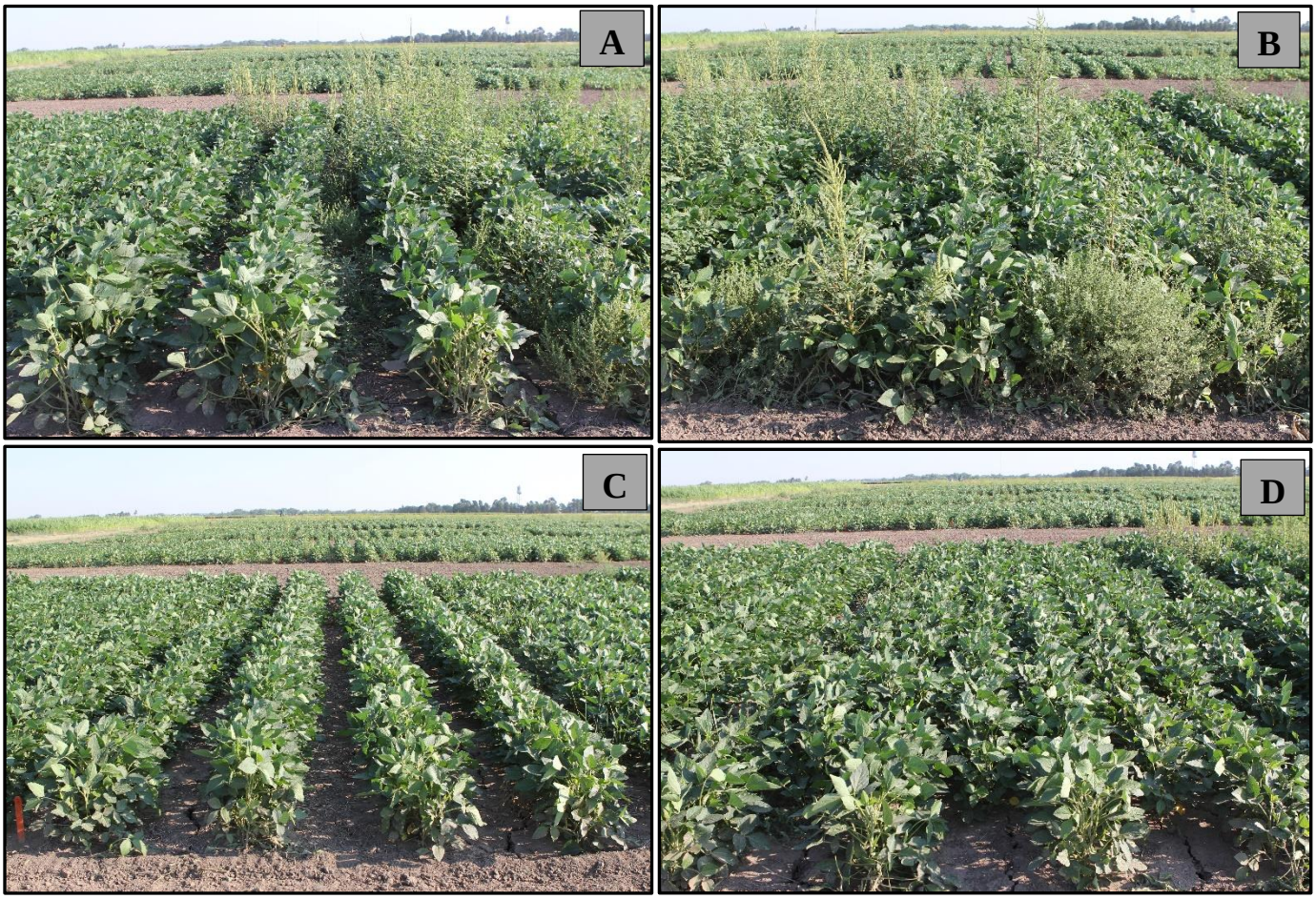

Figure 1. Weed control in soybeans planted at 100,000 seeds/ac in two row spacing: 30-inch (A & C) and 15-inch (B & D). Plots A & B were not treated with any herbicide; whereas, plots C & D were treated with Authority MTZ followed by Xtendimax plus Roundup PowerMax. Pictures were taken on August 2 (about 8 weeks after planting).

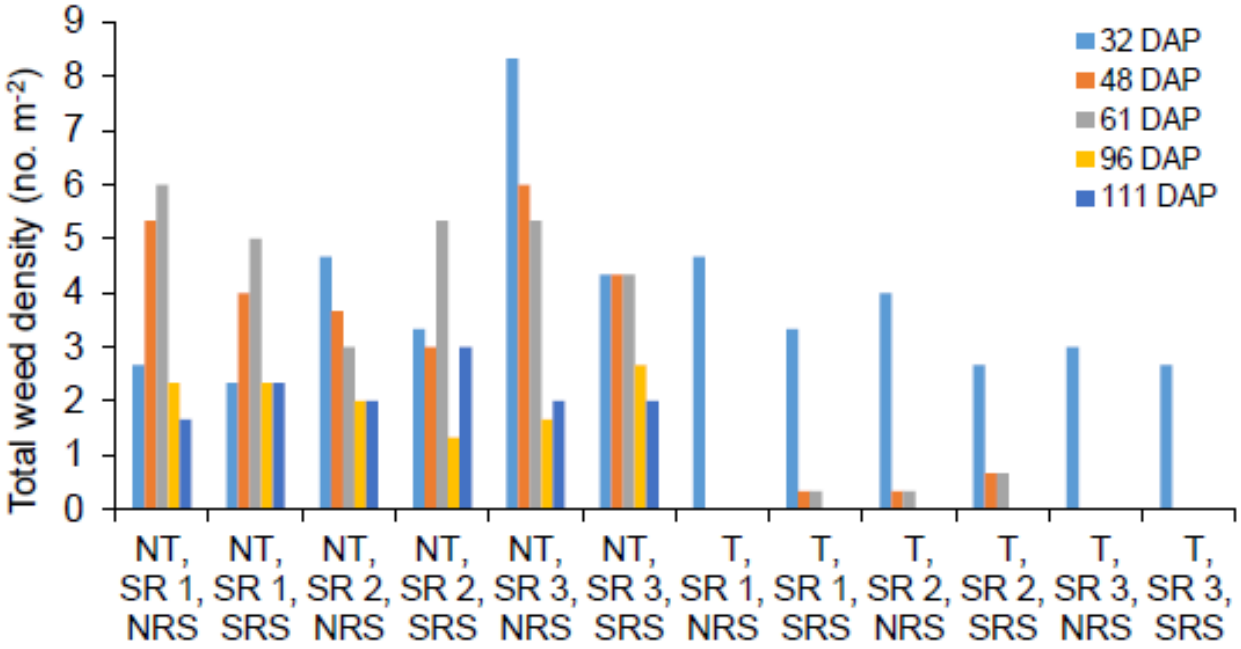

Fig. 2. Total weed density in different treatments throughout the season.

Table 1. Influence of standard herbicide, seeding rate, and row spacing on total weed density at 8 weeks after planting in Roundup Ready 2 Xtend soybeans at Kansas State University Agricultural Research Center near Hays, KS.

Herbicide(s) [a]	Seeding rates (seeds ac^{-1})	row spacing (in.)	Weed density at 8 WAP ($g\ m^{-2}$) [b]	NDVI [c]
Authority MTZ *fb* Xtendimax + Roundup PowerMax	100,000	15	0.11 c	0.72 ab
	100,000	30	0.33 c	0.54 de
	150,000	15	0.33 c	0.73 ab
	150,000	30	0.33 c	0.41 f
	200,000	15	0 c	0.79 a
	200,000	30	0 c	0.49 ef
Nontreated	100,000	15	6.1 a	0.70 ab
	100,000	30	5 a	0.59 cd
	150,000	15	3 b	0.78 a
	150,000	30	5.3 ab	0.60 cd
	200,000	15	5.3 a	0.77 a
	200,000	30	4.3 ab	0.65 bc

[a] Authority MTZ at 10 oz/a was applied immediately after soybean planting; whereas, a tank mixture of Xtendimax at 22 fl oz/a and Roundup PowerMax at 32 fl oz/a was applied at 5 weeks after soybeans planting (at V4 to V5 stage).

[b] Means followed by the same alphabet letters within a column are not statistically different according to Fischer Protected LSD ($\alpha = 0.05$).

[c] Normalized difference vegetation index (NDVI) was measured on August 2, 2019.

Table 2. Influence of standard herbicide, seeding rate, and row spacing on final grain yield and 1,000 seed weight on Roundup Ready 2 Xtend soybeans at Kansas State University Agricultural Research Center near Hays, KS.

Herbicide(s) [a]	Seeding rates (seeds ac^{-1})	row spacing (in.)	Grain Yield (bu/ac)	1000 seed wt (g)
Authority MTZ *fb* Xtendimax + Roundup PowerMax	100,000	15	39.31	44.64
	100,000	30	38.95	48.72
	150,000	15	35.71	46.49
	150,000	30	32.86	45.19
	200,000	15	42.11	44.24
	200,000	30	37.29	47.94
Nontreated	100,000	15	25.04	41.48
	100,000	30	25.53	45.86
	150,000	15	40.65	45.94
	150,000	30	34.47	49.62
	200,000	15	32.41	45.97
	200,000	30	34.63	47.03

[a] Authority MTZ at 10 oz/a was applied immediately after soybean planting; whereas, a tank mixture of Xtendimax at 22 fl oz/a and Roundup PowerMax at 32 fl oz/a was applied at 5 weeks after soybeans planting (at V4 to V5 stage).

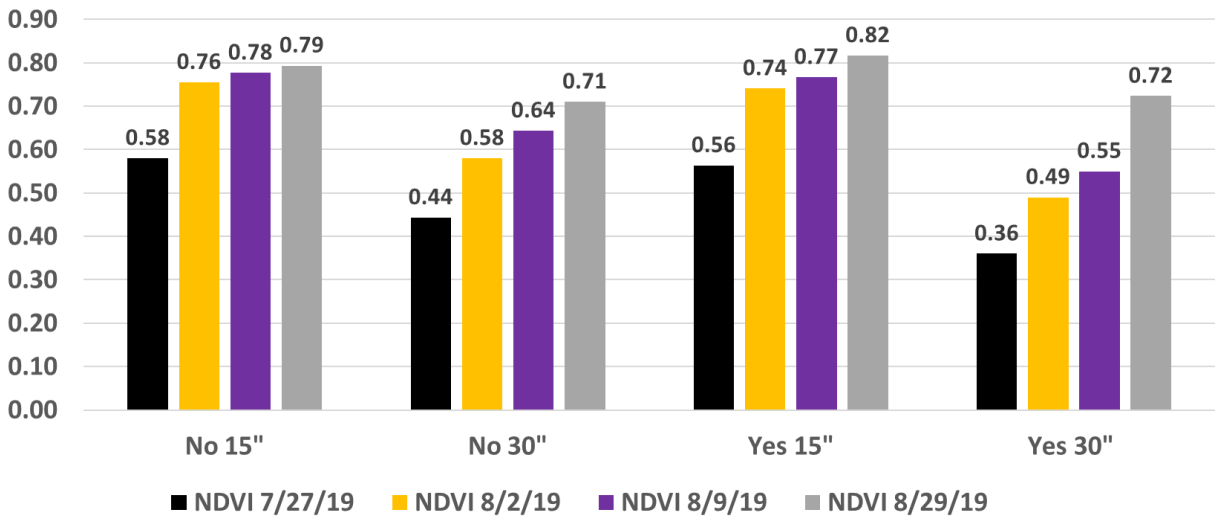

Figure 3. Row Spacing Effects on NDVI throughout the growing season

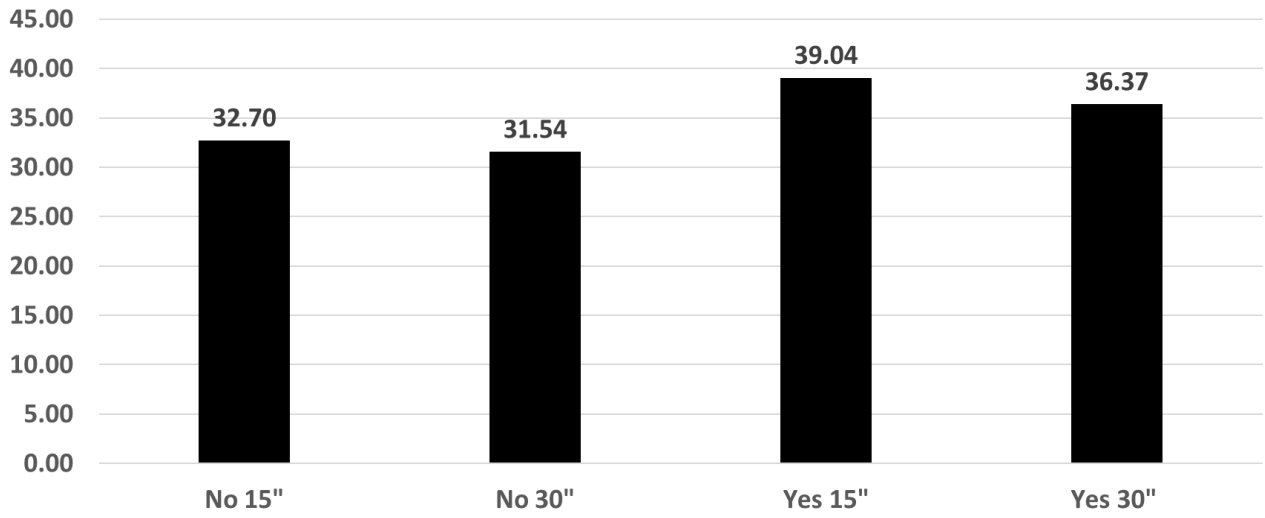

Figure 4. Row Spacing Effects on Grain Yield

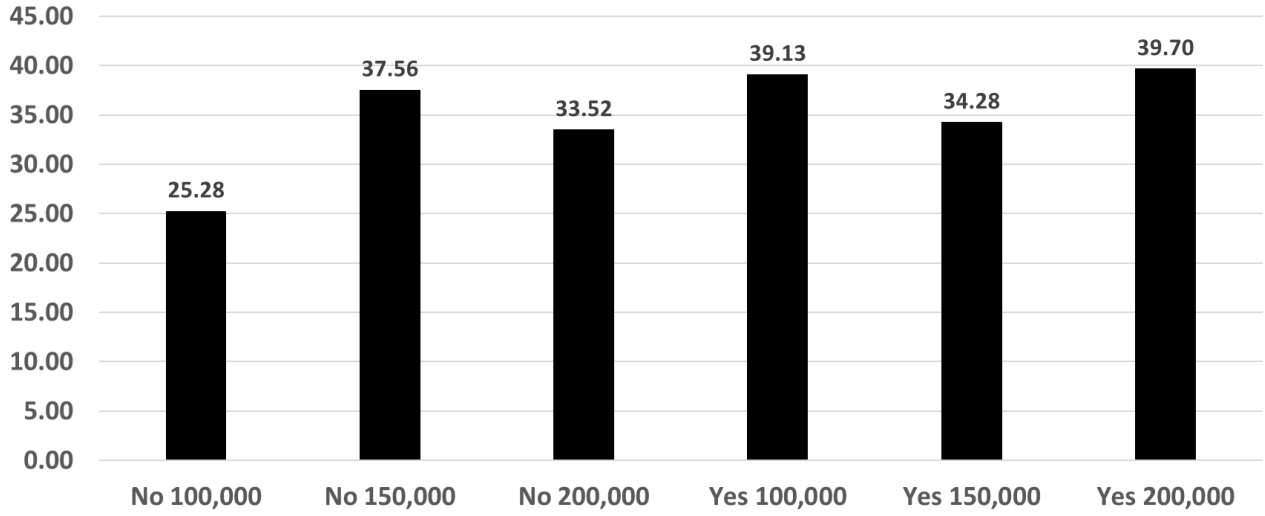

Figure 5. Seeding Rate Effects on Grain Yield