



Weed Removal Timings in No-Till, Double-Crop, Glyphosate-Resistant Soybean Grown on Claypan Soils

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INTRODUCTION

- Typical production practices for double-crop soybean involve no-till planting after winter wheat harvest, and managing weeds with postemergence herbicides.
- The combination of reduced tillage and recent estimates that over 80% of soybean acres include glyphosate-resistant varieties, indicate a need for research addressing the appropriate use of glyphosate in no-till, double-crop soybean production systems.
- Effective herbicide programs, combined with competitive canopy closure and limited crop response, are needed to provide the necessary weed-free interval to achieve full yield potential, especially if herbicides without residual soil activity are used in no-till, double-crop systems.

OBJECTIVE

- Our objective was to evaluate the influence of glyphosate application timing on weed control, weed biomass production, and soybean grain yield in no-till, glyphosate-resistant soybean planted after winter wheat harvest.



MATERIALS AND METHODS

- Field experiments were conducted in 2000, 2001, and 2002 at the University of Missouri Bradford Research and Extension Center near Columbia (central Missouri) and the Greenley Research Center near Novelty (northeast Missouri).
- Soil at Columbia was a Mexico silt loam with 7% sand, 73% silt, and 19% clay.
- Soil at Novelty was a Kilwinning silt loam with 32% sand, 36% silt, and 32% clay.
- Treatments consisted of weed-free and untreated checks; glyphosate (0.75 lb ae/acre) applied before planting, and when weeds were 4-, 8-, or 12-inches tall; and glyphosate at 1.5 lb ae/acre applied to 24-inch tall weeds.
- Each site was a randomized complete block with four replications. Plot size was 10 ft by 35 ft at Columbia and 10 ft by 40 ft at Novelty.
- Weed biomass from a 10.8-ft² area in each plot were collected 3 to 7 weeks before soybean harvest, and dried at approximately 104° F for 3 days (Tables 2 & 3).
- Soybean yields were adjusted to 13% moisture before analysis (Table 4).
- Data were subjected to ANOVA and means were separated using Fisher's Protected LSD (P=0.05).

Table 1. Dates of various field operations at Columbia and Novelty, MO in 2000, 2001, and 2002.

Operation	Columbia			Novelty		
	2000	2001	2002	2000	2001	2002
Wheat planting (prior fall)	7 Oct.	16 Nov.	3 Oct.	20 Oct.	10 Oct.	29 Oct.
Wheat harvest	29 June	20 June	18 June	30 June	3 July	5 July
Soybean planting ¹	7 July	25 June	25 June	2 July	3 July	5 July
Glyphosate - burndown	7 July	25 June	25 June	2 July	2 July	5 July
Glyphosate - 4-in weeds	13 July	28 June	28 June	18 July	20 July	24 July
Glyphosate - 8-in weeds	17 July	30 June	26 July	21 July	29 July	5 Aug.
Glyphosate - 12-in weeds	19 July	NA ²	NA ²	24 July	9 Aug.	15 Aug.
Glyphosate - 24-in weeds	27 July	24 July	1 Aug.	4 Aug.	20 Aug.	30 Aug.
Weed biomass harvest	13 Sep.	4 Oct.	16 Sep.	1 Sep.	7 Sep.	10 Sep.
Soybean harvest	21 Oct.	29 Oct.	17 Oct.	11 Nov.	26 Oct.	21 Oct.

¹ Soybean varieties: Pioneer 94B01 (Columbia - 2000), Morsoy 3660N RT (Columbia - 2001 & 2002), and Asgrow 3701 (Novelty - all three years).
² Glyphosate applications to 12-in tall weeds were not made at Columbia in 2001 and 2002.

RESULTS AND DISCUSSION

Table 2. Grass weed biomass (dry weight), three to seven weeks prior to harvest at Columbia and Novelty, MO in 2000, 2001, and 2002.

Treatment	Rate (lb ae/acre)	Columbia			Novelty		
		2000	2001	2002	2000	2001	2002
Glyphosate - burndown	0.75	0.19	0.09	0.41	0.56	0.25	0.13
Glyphosate - 4-in weeds	0.75	0.15	0.09	0.52	0.01	0	0.0007
Glyphosate - 8-in weeds	0.75	0.15	0.02	0.02	0.02	0	0.0003
Glyphosate - 12-in weeds	0.75	0.25	NA ¹	NA ¹	0	0.16	0
Glyphosate - 24-in weeds	1.5	0.04	0.0007	0.03	0.04	0.03	0.002
Untreated		0.22	0.01	0.21	1.14	1.96	0.12
LSD (0.05)		0.18	0.06	0.31	0.65	1.39	0.09

¹ Glyphosate applications to 12-in tall weeds were not made at Columbia in 2001 and 2002.

- Grass weed pressure was highly variable (especially at Columbia), with giant foxtail being the most common species across all site-years.
- At Columbia in 2002, grass biomass was greatest with the burndown and 4-inch weed treatments, indicating new weed flushes following application. This biomass also correlated with reduced yields at this location.

Table 3. Broadleaf weed biomass (dry weight), three to seven weeks prior to harvest at Columbia and Novelty, MO in 2000, 2001, and 2002.

Treatment	Rate (lb ae/acre)	Columbia			Novelty		
		2000	2001	2002	2000	2001	2002 ¹
Glyphosate - burndown	0.75	0.39	0.53	0.24	1.43	0.01	0
Glyphosate - 4-in weeds	0.75	0.08	0.28	0.44	0.05	0.010	0
Glyphosate - 8-in weeds	0.75	0.01	0.44	0.04	0	0.0003	0
Glyphosate - 12-in weeds	0.75	0.01	NA ²	NA ²	0.002	0.002	0
Glyphosate - 24-in weeds	1.5	0.01	0	0.05	0.002	0	0
Untreated		0.84	0.83	1.02	2.15	0.04	0
LSD (0.05)		0.12	0.33	0.65	0.93	0.02	0

¹ Broadleaf weeds were not present at Novelty in 2002.

² Glyphosate applications to 12-in tall weeds were not made at Columbia in 2001 and 2002.

- Broadleaf weed biomass values in all treatments were less than untreated checks in all but three situations: burndown treatments at Columbia-2001 and Novelty-2000, and 4-inch weed timing at Columbia-2002.
- These situations corresponded to reduced soybean yields. However, the reduction following the burndown treatment at Columbia-2001 was not statistically significant.

Table 4. Soybean yield (bu/acre) at Columbia and Novelty, MO in 2000, 2001, and 2002.

Treatment	Rate (lb ae/acre)	Columbia			Novelty		
		2000	2001	2002	2000	2001	2002
Glyphosate - burndown	0.75	12.6	23.8	6.6	22.2	42.9	14.6
Glyphosate - 4-in weeds	0.75	12.6	30.3	6.4	26.9	43.9	20.9
Glyphosate - 8-in weeds	0.75	10.2	27.5	15.6	27.8	45.5	19.3
Glyphosate - 12-in weeds	0.75	11.5	NA ¹	NA ¹	26.0	44.2	16.8
Glyphosate - 24-in weeds	1.5	12.2	27.3	17.0	20.2	45.0	14.4
Weed Free		12.0	28.7	19.1	27.9	43.6	21.5
Untreated		5.5	10.8	3.1	15.5	33.4	13.8
LSD (0.05)		3.4	8.9	10.4	2.0	6.7	5.3

¹ Glyphosate applications to 12-in tall weeds were not made at Columbia in 2001 and 2002.

- Soybean grain yields for the untreated checks were lower than weed-free checks at all site-years, indicating that weed pressure was high enough to cause yield reductions.
- Soybean yields were similar to the weed free checks in 3 of 6, 4 of 6, 6 of 6, 4 of 4, and 4 of 6 site-years for the burndown, 4-, 8-, 12-, and 24-inch timings, respectively.
- Although weed biomass was effectively reduced with the 24-inch timing, inconsistent yields indicate that weeds should be removed before reaching 24 inches.

CONCLUSIONS

- This research indicates that glyphosate applications when weeds were 8- or 12-inches tall were the most consistent for reducing weed biomass and maintaining soybean grain yield potential.

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