

Yield Performance of Roundup Ready[®] versus Conventional Soybean Varieties

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Introduction

Many Iowa soybean producers have adopted Roundup Ready[®] (RR) technology on their farms in recent years. Reduced weed control costs, greater flexibility in herbicide application timing, and the potential for “cleaner” soybean fields are often cited as reasons for using RR technology; however, questions remain about potential profit-robbing yield reductions associated with RR varieties. A soybean yield performance comparison of adapted, elite RR varieties and elite conventional varieties was initiated in 1999. Our research objective was to compare the genetic yield potential of commercial varieties, not to analyze the economics of one soybean variety-herbicide program versus another. Establishment of similar studies at four other university research farms statewide afforded yield response comparisons of adapted varieties from five unique soil associations and environments. Soils at the Northwest Research and Demonstration Farm are typical of the Galva-Primghar soil association.

Materials and Methods

Four seed companies were contacted to recommend their best-yielding RR variety and best conventional, high-yield variety adapted for northwest Iowa. In no instance were varieties from a single company identified as “sister lines” (varieties with identical genetic makeup except for the herbicide-resistance gene). A total of 12 treatments were compared, with two RR variety “blocks” per

replication. One RR variety herbicide treatment block received a postemergence Roundup Ultra[™] herbicide application (RR+). The other RR variety block was treated with a postemergence selective herbicide application (RRS). A third block of four conventional varieties (CN) was treated with the same postemergence selective herbicides.

Experimental plots were planted at 178,000 seeds per acre on May 19 (1999) and May 15 (2000), using a John Deere 7000 planter with 30-inch row spacing. Herbicide treatments and varieties were included in a split-plot design with four replications. Main plot treatments were herbicide treatments, and subplot treatments were varieties. Herbicide treatments were applied approximately four weeks after soybean emergence.

Experimental plots in RR+ treatment blocks received a one-time application of Roundup Ultra[™] herbicide at a rate of 32 ounces per acre; the RRS and CN treatment blocks received one-time applications of Fusion[®] and Flexstar[®] at labeled rates. Plots were combine harvested on October 7 (1999) and October 11 (2000). Grain yields (adjusted to 13% moisture) are summarized in Tables 1-2.

Results and Discussion

Our results suggest that yield potential of elite RR varieties is competitive with that of elite conventional varieties. Averaged across varieties, yield of RR+ plots was statistically greater ($P < .05$) than that of CN plots in 1999; RR+ and CN treatments yielded similarly ($P > .05$) in 2000 and over the two years (Table 1).

Yield performance of individual RR varieties averaged 2.0 bushels/acre (bu/A) greater in RR+ treatment blocks than in RRS treatment blocks (Table 2); however, yield differences between RR+ and RRS treatments were statistically significant ($P < .05$) in only one of eight comparisons. Properly-timed herbicide

application minimized soybean “stunting” symptoms in both CN and RRS-treated plots; moreover, weed pressure was not a yield-determining factor, inasmuch as all experimental plots were maintained relatively weed-free. These results suggest that yield performance of elite RR soybean varieties may be equal to that of elite conventional varieties, although RR varieties differ in their genetic yield potential. Producers are advised to review unbiased, replicated yield comparisons from multiple environments when making RR or conventional soybean variety selections.

Acknowledgments

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No endorsement is intended of herbicides used in this study, nor is criticism implied of herbicides not used.

Table 1. Effect of herbicide treatment on soybean yield in 1999 and 2000 at Sutherland, IA.

Herbicide treatment	Mean yield performance		
	1999	2000	1999-2000
	------(bushels/acre)-----		
Four elite RR varieties with 32 oz./acre Roundup Ultra™ applied four weeks after emergence	49.2 a ¹	40.9 a	45.0 a
Four elite RR varieties with Fusion® and Flexstar® applied at labeled rates four weeks after emergence	47.0 b	39.0 b	43.0 b
Four elite conventional varieties with Fusion® and Flexstar® applied at labeled rates four weeks after emergence	47.0 b	42.3 a	44.7 a
L.S.D. (P=.05)	1.7	1.7	1.4

¹ Within columns, herbicide treatment mean yields followed by different letters are statistically different (P<.05).

Table 2. Soybean yield performance by company in 1999 and 2000 at Sutherland, IA.

Treatment	Company 1	Company 2	Company 3	Company 4	
		------(bushels/acre)-----			
1999	“RR+”	50.6 a ¹	49.0 a	47.5 a	49.6 a
	“RRS”	45.8 b	47.5 a	46.8 a	48.1 ab
	“CN”	45.9 b	47.4 a	48.5 a	46.4 b
	Mean	47.4	48.0	47.6	48.0
	L.S.D. (P=.05)	4.5	NS	NS	3.1
2000	“RR+”	40.6 a	41.6 ab	38.1 ab	43.2 a
	“RRS”	39.6 a	40.2 b	35.7 b	40.3 a
	“CN”	38.0 a	45.7 a	42.9 a	42.4 a
	Mean	39.4	42.5	38.9	42.0
	L.S.D. (P=.05)	NS	5.0	5.1	NS

¹ Within each company comparison, yields followed by the same letter are statistically similar (P>.05).