A COMPARISON OF SOYBEAN SEED COAT TECHNOLOGY IN RELAY-INTERCROP AND DOUBLE-CROP PRODUCTION SYSTEMS.

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Farmers are continually trying to increase grain yields and reduce production costs to increase farm profitability. Cropping systems in Northern Missouri shifted from including wheat in the rotation to primarily corn-soybean rotation due to a relatively strong corn and soybean prices. However, wheat is an important crop for soil conservation and building organic matter on highly erodible soils.

Double-crop soybean production is risky for farmers in Northern Missouri due to dry summers and risk of an early frost. Double-crop, no-till soybeans are often planted into dry soil in early July. These conditions commonly result in poor soybean growth and reduced stands. Timely summer rains are essential for high yielding double-crop soybean.

Relay-intercropped soybeans are planted into standing wheat. The growing season of the two crops overlaps in this production system. Previous research evaluated relay-intercropped soybean planted in the southern United States (Porter and Khalilian 1995), Kansas (Duncan et al. 1990), and Nebraska (Moomaw and Powell 1990). Planting timing and mechanical injury to wheat reduced grain yields. Other research evaluated travel lanes in wheat; however, specialized field equipment and layout was required. However, none of this research included soybean seed coat technology planted into 15 in. wheat. Current soybean seed coat technology has included IntelliCoat^{TM} and SuperKote^{TM} sources. These technologies may delay germination until conditions are suitable rapid soybean growth. Delayed germination would allow a farmer to plant earlier into standing wheat and reduce mechanical injury to the wheat. Seed coat technology could reduce risk associated with double-crop soybean and help farmers avoid a production disaster due to poor germination in dry soils or the risk of an early frost. Coated soybean seed may be provided at no additional cost to an additional $10/acre depending on the seed source. However, no independent evaluations have evaluated the performance and cost-effectiveness of different seed coat technologies in Missouri.

The use of seed coat technology is a production decision. Farmers can make simple modifications to equipment already owned to make relay-intercropping work; however, the cost-effectiveness and performance of the seed coat technology source in Missouri was unknown. Seed coat technology for soybean is a new concept and a comparison between technology sources was needed. The utilization of split-row (15 in.) planters for planting wheat and soybean in a relay-intercropping system may provide a cost-effective double-crop alternative and reduce risk associated with double-crop soybean in Northern

Missouri. Therefore, the objective of this research was to evaluate soybean grain yield and the cost-effectiveness of seed coat technology used in a relay-intercropped production system compared with full-season and double-crop soybean.

This study was arranged as a split-plot design with four replications at the Greenley Research Center in 2003, 2004, and 2005. The main plot was cropping system (15 in. wheat followed by double-crop soybean, 7.5 in. wheat followed by double-crop soybean, 15 in. wheat with relay-intercropped soybean, and full-season soybean) and the sub-plots were soybean seed coat technology sources (Tables 1-3). Plot size was 10 by 40 ft. with four replications. 'Pioneer 25R37' were planted in 15 and 7.5 in. rows on 12 October 2002, 17 October 2003, and 8 November, 2004. Relay-intercrop and full-season soybean were planted on 23 April 2003, 28 April 2004, and 25 April 2005 at 200,000 seeds/acre. Plots were harvested with a small plot combine and moisture adjusted to 13% prior to analysis. All data were subjected to ANOVA and means separated using Fisher's Protected LSD (p=0.05).

SuperKote soybean emergence was similar to non-coated soybean; however, germination was delayed 7 to 14 days with the Intellicoat seed coat technology (personal observation). This resulted in shorter soybeans that and approximately one vegetative stage behind non-coated soybean (data not presented). Wheat planted in 7.5 in. narrow rows had grain yields similar and up to 28 bu/acre greater than 15 in. wide-row wheat in 2003, 2004, and 2005 (Tables 1-3). Average wheat grain yield from 2003 to 2005 was 65 and 56 bu/acre in 7.5 and 15 in. rows, respectively.

Excessive early soybean growth may reduce wheat yields in a relay-intercrop production system. C4350 SuperKote in 2003 (Table 1) and all cultivars in 2004 reduced wheat grain yields except 5143 NRR Intellicoat soybean (Table 2) when compared to 15 in. wheat. However, no soybean cultivars reduced wheat grain yields in 2005 (Table 3). In general, relay-intercrop soybean grain yield was similar to double-crop yields in 2003. Relay-intercropped soybean grain yield was 19 to 58 bu/acre greater than double-crop soybeans in 2004 with coated soybean yields similar to non-coated soybean while wheat grain yields were greater with coated soybean compared to non-coated soybean. Soybean grain yields in 2005 will be determined.

Table 1. Wheat and soybean grain yield as affected by wheat row spacing, cropping system, and seed coat technology in 2003.

	Wheat yield			Soybean yield			
	Wheat row spacing		Relay-intercrop system[a]	Double-crop soybean following		Relay-intercrop system	Full-season soybean
Soybean variety	7.5 in.	15 in.		7.5 in. wheat	15 in. wheat		
	bu/acre						
5143 NRR Intellicoat	78	50	56	9	—[b]	12	28
5143 NRR Fungicide only[c]	—	49	35	—	7	15	27
5143 NRR Non-coated	61	56	43	10	8	8	29
C4350 NRR SuperKote	70	65	33	8	7	7	29
C4350 NRR Non-Coated	73	63	40	3	9	9	19
LSD (p=0.05)	21			5			

[a]15 in. wheat with 15 in. soybean planted April 23, 2003.
[b]Treatment was not included.
[c]Captan, PCNB, Thiabendazole, and Metalaxyl.

Table 2. Wheat and soybean grain yield as affected by wheat row spacing, cropping system, and seed coat technology in 2004.

	Wheat yield			Soybean yield			
	Wheat row spacing		Relay-intercrop system[a]	Double-crop soybean following		Relay-intercrop system	Full-season soybean
Soybean variety	7.5 in.	15 in.		7.5 in. wheat	15 in. wheat		
	bu/acre						
5143 NRR Intellicoat	63	49	42	4	5	63	71
DK 38-52	60	50	28	31	31	50	74
5143 NRR Non-coated	65	57	29	30	29	62	77
C4444 NRR SuperKote	64	55	38	30	31	61	76
C4444 NRR Non-Coated	61	52	24	30	30	65	76
LSD (p=0.05)	9			6			

[a]15 in. wheat with 15 in. soybean planted 28 April 2004.

Table 3. Wheat grain yield as affected by wheat row spacing, relay-intercrop system, and seed coat technology in 2005.

Soybean variety	Wheat row spacing		Relay-intercrop system[a]
	7.5 in.	15 in.	
	bu/acre		
5143 NRR Intellicoat	72	58	59
DK 38-52	70	60	60
5143 NRR Non-coated	65	58	60
C4444NRR SuperKote	72	61	57
C4444NRR Non-coated	71	62	62
LSD (p=0.05)	6		

[a]15 in. wheat with 15 in. soybean planted 25 April 2005.

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