DIFFERENTIAL SOYBEAN VARIETAL RESPONSE TO NO-TILL PLANTING IN WHEAT STRAW

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INTRODUCTION

Double-cropping soybeans and winter wheat grown for grain is a predominate cultural system in the Midsouth. In the last few years, equipment has become available to plant into the wheat stubble and obtain a stand consistently. The conservation compliance requirements of the farm bill has spurred many growers into adapting no-till planting practices for soybeans planted after wheat. Conservation compliance coupled with the recent increase in recommended varieties from about 30 (mostly public) to over 100 (mostly private) has resulted in much greater genetic diversity in commercial varieties. The "niche" to which varieties are best adapted has become smaller.

Genetic diversity among varieties to phytotoxic substances in wheat straw was demonstrated by Herrin et al. (1986). However, their field study was not related to their greenhouse derived indexes (Caviness and Collins, 1985). Boerma (1978) has developed cultivars specifically adapted for double cropping. However, no documented grain yield reduction in the field from varieties planted in wheat straw has been reported. The objective of the study reported herein was to evaluate yield response of soybean varieties planted in standing wheat straw and to determine if their relative rank is the same as in a monocropping system.

MATERIALS AND METHODS

Experiments were initiated in 1992 in Mississippi and in 1993 in Arkansas. Specific cultural practices are given in Table 1. Fertilizer, preplant burndown and weed control followed recommended practices for each location and was tailored to the weed species and cultural practices. Weed control was maintained at a very high level.

Soybean varieties planted at Verona, MS were those entered in the conventional monocrop (MC) soybean variety trial. In Mississippi the MC conventional variety trial and the no-till double-cropped (DC) trial were adjacent to each other and on the same soil type. Trials were planted at the normal planting time and is listed in Table 1. The MC study was planted in a prepared seedbed and DC soybeans were planted no-till into wheat stubble after wheat harvest.

In Arkansas, varieties selected were those whose 3-year means were not measurably different in MC variety trials (ie. recommended varieties, Anon., 1993).

Each Maturity Group (MG) was analyzed separately at each location using analysis of variance procedure. Means were separated by least significant difference (LSD).

RESULTS AND DISCUSSION

In 1992 and 1993, the Mississippi yield range differences between varieties was about 20 bu/acre from low to high in MG V and VI in both years (Tables 2 and 3). In Mississippi, varieties responded differently planted in wheat stubble than planted in a monocrop system in both years. Overall means indicated that yields in double-cropped beans were about 25% or more less than monocrop beans. In addition, varieties which had the highest yield in monocrop were not the highest yield in double-cropped system. These data suggest that soybean varieties should be evaluated in both monocrop and double-cropped systems as one study to more fully evaluate as to whether varieties under both systems have the same yield potential.

In Arkansas, the yield differences ranged about 15 bu/acre and showed a difference in MG's (Table 4 and 5). MG VII was lower than MG's IV, V and VI. The data here are for varieties (excluding MG IV) that would normally be recommended as being equivalent for the location based on conventional variety trials. However, these data suggest that in the recommended varieties for MG V and VI, approximately ***50%*** are superior for

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planting no-till in wheat stubble. These studies should lead to a revision of our recommendations by eliminating those entries that do not maintain yield when no-tilled in wheat straw.

Table 1. Specific cultural practices and site characteristics of double-cropped soybean variety evaluation.

Location	Mississippi	Arkansas
Experimental Design	RCB with 4 reps	RCB with 2 reps
Plot Size	10 ft x 20 ft	7.9 ft x 25 ft
Soil Type	Leeper Silty Clay	Calloway Silt Loam
Wheat		
Land Prep. Wheat	Chisel, Disk, Do-all	Disk, Disk, Do-all
Variety	Coker 9835	Cardinal
Seeding Rate, Method (lb/acre)	80, Drilled	90, Drilled
Harvest Dates	6-21-92 6-10-93	6-31-93
Stubble Height (in.)	12	8
Soybean		
Planting Date		
Double-Crop (DC)	6-23-92 6-16-93	7-9-93
Monocrop (MC)	5-1-92 6-16-93	
Seeding Rate (seed/row-ft)	9	3 to 5
Row Spacing (in.)	30	19
Harvest Date		
Double-crop	10-26-92 11-8-93	11-8-93
Monocrop	10-4-92 10-21-93	

Table 2. Yield characteristics for 1992 for the Mississippi location. Maturity Group V and VI soybean variety yield response planted no-till in wheat stubble, Verona, MS.

Group V			Group VI		
Variety	D.C.	M.C.	Variety	D.C.	M.C.
	Bu/acre			Bu/acre	
Holliday	43.4	51.0	Deltapine DPX 3682	39.3	45.4
Capehart Stone	41.1	51.6	Pioneer 9641	37.8	43.8
Deltapine 415	39.8	52.4	North King S62-66	36.6	55.1
Hartz H5088	39.7	51.5	Young	35.8	48.0
Pioneer 9593	39.2	54.9	Sharkey	34.9	55.6
Agra Tech AT 575	38.6	48.9	Davis	34.6	43.9
Northrup King C485	38.4	54.8	Buckshot Bu 62	34.6	52.8
Asgrow A5885	37.9	52.3	Riverside Cajun	33.9	57.8
Riverside RVSL 9094	36.9	52.4	Hartz 6200	33.9	50.3
Forrest	36.8	39.8	Buckshot Bu 62	33.0	52.8
Hutcheson	36.0	57.2	Deltapine 3627	32.5	45.5
Rhodes	35.6	53.9	Hartz 6686	32.3	52.0
Asgrow ACT 9204	34.6	46.6	Hartz H6500	31.7	52.0
Hartz H5566	34.5	50.1	Leflore	31.4	47.0
Terra-Vig 515	34.2	43.7	TN6-90	29.5	47.7
Hartz H5810	34.1	42.9	D87-5870	29.1	55.1
Northrup King C6955	33.8	43.4	Northrup King S6423	29.1	42.0
Pioneer 9592	33.7	49.9	Riverside RVSL9185	28.9	27.0
Deltapine 105	33.5	46.0	Riverside RVSL9142	28.4	46.3
Agra Tech AT 2665	32.9	52.6	Tracy-M	28.1	51.0
Northrup King S5960	32.0	35.0	Bryan 66	28.0	44.0
Asgrow A5403	31.9	50.0	Buckshot *66*	27.7	54.1
Terra-Vig 5452	31.8	48.6	Terra-Vig 6653	27.2	46.8
Riverside 577	31.5	46.8	Northrup King x9169	26.9	46.4
Hartz H5070	31.2	48.1	Riverside 699	25.8	52.4
Agra Tech AT 2555	30.7	41.1	Lamar	25.8	54.0
Terra-Vig 5693	30.3	39.0	Hornbeck HEK 65	25.1	45.2
Walters	29.8	37.3	Northrup King x9267	23.6	47.7
Asgrow A5560	29.4	51.3	Buckshot BU 68	22.5	53.5
Hartwig	29.4	33.0	Stoneville FFR 646	21.9	44.5
Asgrow ACT 9219	29.0	56.4	Terra-Vig x6670	18.7	42.9
Riverside AVSL 77	28.6	58.3			
Stoneville FFR38108	27.6	43.9	LSD_{10}	6.3	6.5
Epps	27.0	45.0			
Terra-Vig x6897	27.0	40.7			
North King x9256	27.0	47.0			
Underwood 509A	26.7	40.9			
Stoneville FFR 595	25.6	43.4			
Terra-Vig x5653	24.7	50.4			
Buckshot 55	24.6	54.0			
Pioneer 9551	24.5	43.3			
Buckshot 507	23.5	46.0			
LSD_{10}	7.3	7.3			

Table 3. Yield characteristics for 1993 for the Mississippi location. Maturity Group V and VI soybean variety yield response planted no-till in wheat stubble, Verona, MS.

Group V			Group VI		
Variety	D.C.	M.C.	Variety	D.C.	M.C.
	Bu/acre			Bu/acre	
Northrup King S5960	39.7	50.6	Sharkey	42.3	41.1
Delta King DK 5850	37.7	49.8	Davis	41.3	39.3
Pioneer 9584	36.9	43.9	Pioneer 9692	40.7	48.9
Asgrow ACT 14	36.6	47.6	Agra Tech ATX 2665	39.6	40.8
Buckshot 55	36.6	53.9	Asgrow XP 6711	38.8	50.0
Rhodes	36.1	47.3	Riverside 678	37.0	38.0
Deltapine 415	35.4	45.8	Young	36.6	37.2
Deltapine DP 3589	35.4	61.2	Lamar	36.4	42.7
Buckshot EK 58	33.7	43.5	Deltapine DP 3606	34.4	47.4
Northrup King C485	33.5	49.7	Hartz 6200	34.1	39.9
Pioneer 9592	33.5	50.8	Hartz H6500	34.0	40.7
Deltapine DPX 3553	33.1	47.2	Hartz 6686	33.7	38.9
Delta King DK 551	32.6	46.4	Lyon	32.9	39.5
Northrup King x9357	32.6	42.3	SC84-931	32.7	52.9
Northrup King C6955	32.1	37.8	Northrup King x9365	32.4	42.5
Terra-Vig 5555	31.8	45.6	Riverside Cajun	32.4	38.5
Buckshot 507	30.9	40.4	Northrup King S6266	31.1	45.1
N87-325	30.5	43.2	Northrup King x9366	30.4	42.5
Terra-Vig 5452	30.3	48.7	TN6-90	29.8	41.3
Asgrow XP 5843	30.1	50.7	Bogart Carl	29.1	32.2
Asgrow A5885	29.5	48.6	Pioneer 9641	28.9	39.6
Capehart Stone	29.4	43.3	Buckshot 66	28.6	41.1
Riverside RSVL 9094	28.2	47.9	Terra-Vig TVX 6565	28.1	40.6
Pioneer 9551	27.3	36.1	Vernal	27.6	36.6
Riverside RVSL 77	27.3	49.5	Terra-Vig 6792	25.6	38.0
Agra Tech AT 575	26.6	48.8	Riverside 699	24.1	42.2
Hutcheson	26.4	43.5	Terra-Vig 6253	21.4	46.1
Holliday	26.1	47.2	V86-815	18.0	34.2
Asgrow A 5560	26.0	47.3	Mean	32.4	41.0
Agra Tech AT 555	25.1	41.6			
Asgrow A5979	25.0	46.9	LSD_{10}	5.1	6.5
Agra Tech AT 520	24.7	42.9			
Forrest	24.3	30.9			
Pioneer 9593	22.4	44.9			
Riverside 577	20.9	40.3			
Hartwig	19.6	35.6			
KS 5292	17.1	36.8			
Mean	29.1	44.6			
LSD_{10}	5.8	6.3			

Table 4. Yield characteristics for 1993 for the Arkansas location using Maturity Group IV and V.

Group IV		Group V	
Variety	Yield	Variety	Yield
	Bu/acre		Bu/acre
Manokin	22.0	Hartz H 5350	24.8
Pioneer 9442	19.9	Hartz H 5088	24.8
Crawford	19.6	Riverside 577	22.1
Northrup King S4884	18.3	A 5560	22.1
Hartz H 4464	14.9	Hartz 5164	21.7
Northrup King RA452	13.7	Hutcheson	21.7
RSV 499	13.7	A 5403	20.2
Williams 82	9.9	Deltapine 415	20.2
TN 4-86	9.3	Hartz H 5810	20.2
A 4715	8.0	Northrup King C485	19.6
		Terra-Vig 5555	18.9
LSD_{06}	9.4	Crowley	18.6
		Deltapine 105	18.6
		AT 555	18.6
		AT 5885	18.0
		Walters	17.7
		Pioneer 9584	17.4
		Northrup King C6955	16.4
		Buckshot 55	16.4
		Rhodes	15.2
		Northrup King S5960	14.3
		Hartz H 5566	12.7
		Narow M	10.8
		Terra-Vig 5452	9.6
		LSD_{05}	9.7

Table 5. Yield characteristics for 1993 for the Arkansas location using Maturity Group VI and VII.

Group VI		Group VII	
Variety	Yield	Variety	Yield
	Bu/acre		Bu/acre
Pioneer 9641	25.9	Hartz H 7190	17.0
A 6961	23.9	Pioneer 9711	11.2
Brim	23.3	Stonewall	7.5
Young	23.0	Riverside 757	4.7
A 6785	22.4	LSD_{05}	10.3
Hartz 6200	21.7		
Riverside Cajun	19.9		
Sharkey	18.6		
Hartz 6686	18.3		
Terra-Vig 6253	17.4		
LLoyd	14.9		
Buckshot 66	14.0		
A 6297	13.7		
Davis	9.6		
LSD_{05}	12.5		

LITERATURE CITED

Anonymous, 1993. Soybean update. Coop. Ext. Ser., Univ. of Arkansas.

Boerrna, H.R. 1978. Breeding soybeans for double-cropping. p. 57-62. In Proc. Eighth Soybean Res. Conf. Arner. Seed Trade Assoc., Washington, D.C.

Caviness, C.E. and F.C. Collins. 1985. Double cropping. In Richard Shibles (ed.) World Soybean Research Conference 111: Proceedings. Westview Press, Inc., London.

Herrin. L.L.. F.C. Collins. and C.E. Caviness. 1986. Techniques for identifying tolerance of soybean to phytotoxic substances in wheat straw.