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Impact of Planting Date and Seed Treatment on Soybean Yield

John Lundvall
Iowa State University

Keith Whigham
soy@iastate.edu

Mark E. Westgate
Iowa State University, westgate@iastate.edu

Dale E. Farnham
Iowa State University

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Abstract
Today's high-yielding soybean varieties respond favorably to early planting. Multi-year results from statewide university research farms suggest that mid-April to early May planting dates produce top yields in most comparisons. Research farm and on-farm strip trials also suggest that elite varieties yield similarly over a wide range of seeding rates and resulting harvest populations. Based on these results, producers are advised to plant soybeans as soon as spring field conditions allow, with a seeding rate of 150,000 to 175,000 seeds per acre. The yield response of modern varieties to early planting raises questions about expanding the soybean planting season (very early planting of some soybean acres in late March or early April) when weather conditions allow. In 2000 a soybean "planting date x seed treatment" study was initiated to evaluate yield response of two adapted, high-yield varieties to very early planting. Research objectives are to determine whether planting soybeans earlier than corn could be a viable management option for Iowa producers, and if fungicide seed treatments are needed to make this practice profitable. 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 Armstrong Research Farm are typical of the Marshall-Exira soil association.

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John Lundvall, ag specialist, agronomy
Keith Whigham, professor and extension agronomist
Mark Westgate, associate professor, agronomy
Dale Farnham, assistant professor and extension agronomist

Introduction

Today's high-yielding soybean varieties respond favorably to early planting. Multi-year results from statewide university research farms suggest that mid-April to early May planting dates produce top yields in most comparisons. Research farm and on-farm strip trials also suggest that elite varieties yield similarly over a wide range of seeding rates and resulting harvest populations. Based on these results, producers are advised to plant soybeans as soon as spring field conditions allow, with a seeding rate of 150,000 to 175,000 seeds per acre. The yield response of modern varieties to early planting raises questions about expanding the soybean planting season (very early planting of some soybean acres in late March or early April) when weather conditions allow. In 2000 a soybean "planting date x seed treatment" study was initiated to evaluate yield response of two adapted, high-yield varieties to very early planting. Research objectives are to determine whether planting soybeans earlier than corn could be a viable management option for Iowa producers, and if fungicide seed treatments are needed to make this practice profitable. 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 Armstrong Research Farm are typical of the Marshall-Exira soil association.

Materials and Methods

Adapted, high yield conventional varieties from LG/Callahan (9288 variety, relative maturity 2.8) and Merschman ("Mohave V" variety, relative maturity 2.8) seed companies were tested in 2000. LG/Callahan and Merschman offer fungicide-treated soybean seed. Fungicide seed treatments fight soybean seedling diseases that can weaken or kill early-planted soybeans, causing profit-robbing stand reductions. Each company was asked to furnish their varieties with and without their respective fungicide treatments; therefore, a total of four treatments were compared on each of four planting dates. Experimental plots were planted directly into standing corn stalks using a John Deere 7000 planter with 30-inch row spacing. All plots were planted at a rate of 175,000 seeds per acre. Planting dates included March 30, April 14, May 10, and May 30. Planting dates and treatments were included in a split-plot design with four replications. Main plot treatments were planting dates, and subplot treatments were variety/seed treatment combinations. Hail damage on July 25 reduced yield potential of all plots. Plots were machine harvested on September 29. Grain yields (adjusted to 13% moisture) and established plant population estimates are summarized in Tables 1-3.

Results and Discussion

Averaged across varieties, fungicide-treated and untreated soybean yields were statistically similar ($P>0.05$) (Table 1). The lack of yield response to seed treatment was consistent regardless of planting date. Averaged across treatments, soybean yield performance was statistically similar ($P>0.05$) on planting dates from March 30 to May 10 (Table 2). Yield of two individual treatments was statistically similar ($P>0.05$) on all planting dates; yield of LG/Callahan treated and Merschman untreated plots dropped significantly ($P<0.05$) as planting was delayed to May 30 (Table 2). Two treatments yielded best when planted on May 10. Producers considering very early soybean planting recognize the risk of stand losses

caused by seedling diseases in cooler soils. Poor germination was another factor causing poor stands in LG/Callahan untreated plots planted March 30 (Table 3). Dry weather limited development of some soybean seedling diseases in 2000. Regardless of planting date, fungicide seed treatment did not consistently improve soybean yield performance at the Armstrong Research Farm; however, producers are advised to base management decisions on multiple-year data. This study will be continued at the Armstrong Research Farm in 2001.

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Table 1. Effect of planting date and seed treatment on soybean yield in 2000 at Lewis, IA.

	Yield performance by planting date				
Experimental treatment	March 30	April 14	May 10	May 30	All planting dates
	----------(Bushels/acre)----------				
Untreated seed (control)	36.6 a[1]	35.1 a	37.8 a	32.3 a	35.5 a
Fungicide-treated seed	37.3 a	35.9 a	36.4 a	32.1 a	35.4 a
Mean	37.0	35.5	37.1	32.2	35.4
L.S.D. (P=0.05)	NS[2]	NS	NS	NS	NS

[1] Within columns, experimental treatment mean yields followed by different letters are statistically different (P<0.05).
[2] "NS" indicates no statistically significant (P=0.05) seed treatment effect on soybean yield.

Table 2. Effect of planting date, variety, and seed treatment on soybean yield in 2000 at Lewis, IA.

	Yield performance by planting date				Planting date
Experimental treatment (trt.)	March 30	April 14	May 10	May 30	yield effect?
	----------(Bushels/acre)----------				(P=0.05)
LG/Callahan with no seed trt. (control)	36.9 a[1]	36.5 a	38.8 a	34.4 a	NS[2]
LG/C with fungicide seed trt.	38.2 a	36.5 a	36.7 a	30.7 a	D1,2,3 > D4
Merschman with no seed trt. (control)	36.3 a	33.8 a	36.9 a	30.1 a	D1,2,3 > D4
Merschman with fungicide seed trt.	36.5 a	35.3 a	36.1 a	33.4 a	NS
Mean	37.0	35.5	37.1	32.2	D1,2,3 > D4
L.S.D. (P=0.05)	NS[2]	NS	NS	NS	

[1] Within columns, experimental treatment mean yields followed by different letters are statistically different (P<0.05).
[2] "NS" indicates no statistically significant (P=0.05) planting date or experimental trt. effect on soybean yield.

Table 3. Estimated established plant stand levels in 2000 at Lewis, IA.

Experimental treatment (trt.)	March 30	April 14	May 10	May 30
	----------(Plants/acre)----------			
LG/Callahan with no seed trt. (control)	114,000	139,000	142,000	143,000
LG/C with fungicide seed trt.	142,000	141,000	146,000	143,000
Merschman with no seed trt. (control)	144,000	138,000	144,000	143,000
Merschman with fungicide seed trt.	145,000	141,000	148,000	142,000