

Effect of Seeding Rate, Seed Treatment, and Planting Date on Soybean Performance

by Jim Trybom, Agronomy Research Scientist

Introduction

Recent soybean yield records have re-focused growers' attention on increasing yields on their farms. This may require taking another look at basic agronomic practices that influence yield, including planting date and seeding rate. In addition, growers should consider whether certain crop inputs have potential for increasing yields. Seed treatments are one such input that may increase yields by improving stand establishment and plant health. Pioneer researchers have evaluated both cultural practices and seed treatments for many years to determine their effect on yield and profitability in soybean production systems.

The objectives of this study were to:

- 1) Determine the optimum seeding rates for maximizing profitability in soybeans at two planting dates, early and normal.
- 2) Evaluate the benefit of using seed treatments in soybean production.

Study Description

This field study was planted at 7 locations in 2006, 8 locations in 2007, and 9 locations in 2008. There were two targeted planting dates, early and normal (Table 1).

Table 1. Locations and planting dates, 2006-2008.

Location	2006		2007		2008	
	Early	Normal	Early	Normal	Early	Normal
York, NE	4-11	5-9	5-3	5-18	5-1	5-16
Johnston, IA	4-24	5-17	5-2	5-18	5-7	5-22
Princeton, IL	4-20	5-26	4-23	5-17	4-24	5-22
Champaign, IL	4-24	5-24	4-21	5-14	4-24	5-21
Windfall, IN	4-28	5-30	5-7	5-18	5-5	5-25
Tipton, IN					5-28	6-20
Mankato, MN	5-4	5-9	4-21	5-12	4-30	5-15
Westbrook, MN	5-19	5-22	4-21	5-15	5-14	5-28
Dysart, IA			5-3	5-17	5-15	6-18



Field studies were conducted at several locations from 2006 to 2008 to determine optimum soybean seeding rates for yield and profitability, and the benefits of using seed treatments.

Plots were planted in 30" rows in a split-split plot design (variety as main plot, seed treatment as split-plot, and seeding rate as split-split plot). Four adapted varieties were included in the study each year. Three seed treatments were included, CruiserMaxx[®], ApronMaxx[®], and an untreated check (Table 2).

Table 2. Seed treatments and product rates evaluated.

Treatment Name	Product Rate
CruiserMaxx	ApronMaxx RFC @ 1.5 oz/cwt + Cruiser 5FS @ 1.28 oz/cwt + polymer
ApronMaxx	ApronMaxx RFC @ 1.5 oz/cwt
Check	Untreated

Seeding rates were 55,000, 110,000, 165,000, and 220,000 seeds/acre with targeted viable seeds of 50,000, 100,000, 150,000, and 200,000 plants/acre, respectively. All plot locations were conventional-tilled and in a corn-soybean rotation. The York location was the only irrigated site. Plant stand, lodging severity, and plant height traits were collected.

Plots were harvested for grain yield. Data were analyzed by planting date at each location using an ANOVA for a split-split plot design.

Applied Questions

Was there a yield advantage to planting early?

Yes. As Figure 1 indicates, yields were generally higher with late-April and early May plantings in this study. Other research studies have shown this same trend. Yield increases are often attributed to the concurrence of longer days with critical soybean development stages when soybeans are planted early. This and other planting date studies have shown that Pioneer® brand Y-series and M-series soybean varieties respond well to early planting.

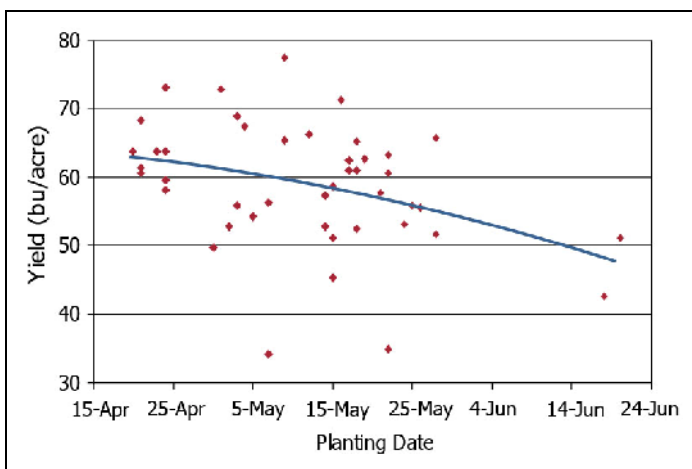


Figure 1. Soybean yield response to planting date (from 23 site-years) in 2006-08. Pioneer Agronomy Sciences.



Use of a fungicide and insecticide seed treatment increased soybean yield and profitability in Pioneer research studies.

Did the use of a seed treatment increase yield?

When averaged across 23 site-years from 2006 to 2008, CruiserMaxx® increased yield over the untreated check by 2.6 bu/acre in the early planting date and 1.6 bu/acre in the normal planting date (Figure 2).

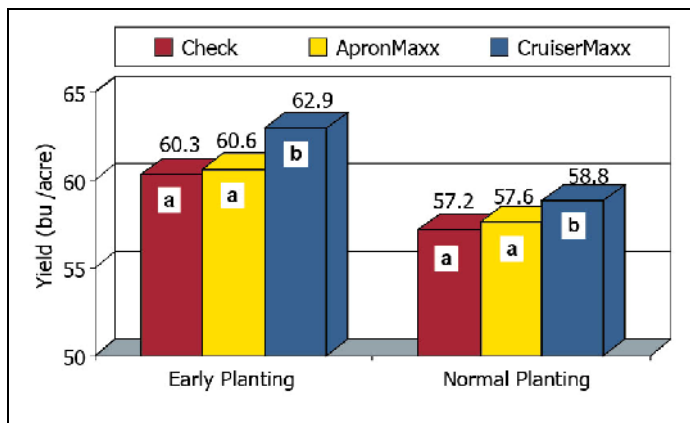


Figure 2. Effect of seed treatments and planting date on soybean yield in 2006-2008. Pioneer Agronomy Sciences.

This is consistent with the yield response observed in other Pioneer Agronomy Sciences seed treatment studies. Use of a fungicide seed treatment alone (ApronMaxx®) did not increase yield significantly above the untreated check in either planting date.

Did the use of CruiserMaxx increase income/acre?

Yes. Using a soybean market price of \$8/bu, the CruiserMaxx seed treatment significantly improved income/acre by \$8 and \$2 for the early and normal planting dates, respectively (Figure 3). At a soybean market price of \$10/bu, income/acre was improved by \$14 and \$4, respectively, for the early and normal planting dates.

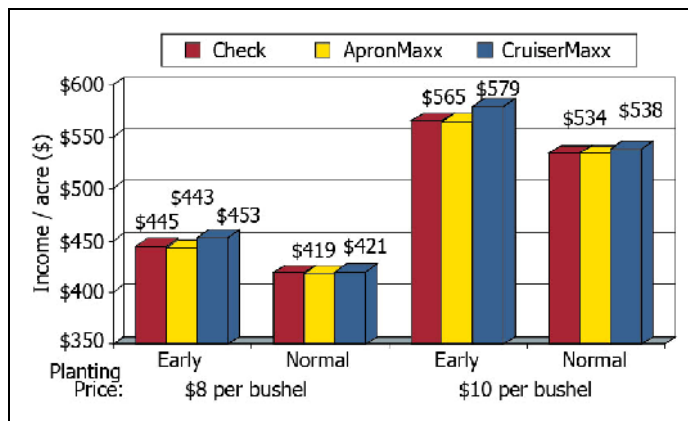


Figure 3. Income/acre for seed treatments by planting date and market price of soybeans. Pioneer Agronomy Sciences.

At what seeding rate was income/acre optimized for early and normal plantings?

Optimum economic seeding rates varied by planting date and seed treatment (Figure 4).

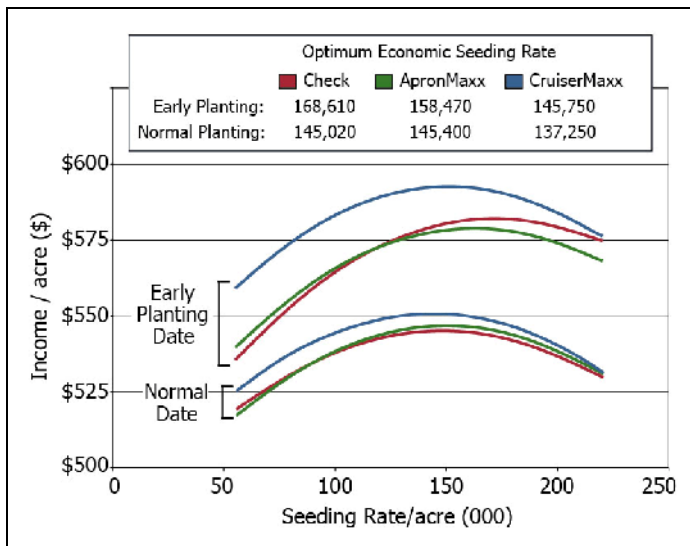


Figure 4. Optimum economic soybean seeding rate* for early and normal planting dates, 2006-2008. Market price of soybeans = \$10 per bushel. Pioneer Agronomy Sciences.

*The optimum economic seeding rate will vary depending on the commodity price of soybeans and seed price. In this case, income per acre was calculated as soybean yield (bu/acre) minus seed cost and was based on the following assumptions: Soybean price = \$10.00/bushel. Untreated seed costs = \$40.00/unit (assuming 2900 seeds/pound), or \$0.276/1000 seeds. ApronMaxx® treatment was an additional \$4.50/unit (\$0.307/1000 seeds) and CruiserMaxx® was an additional \$13.00/unit (\$0.365/1000 seeds).

For the untreated check, the optimum varied from 168,210 for the early plantings to 145,020 for the normal plantings. The fungicide only treatment differed from the check only in the early plantings, where 10,000 fewer seeds were needed to maximize income. The CruiserMaxx treatment was most profitable at 145,750 seeds/acre in the early planting, and 137,250 seeds/acre in the late planting. Income/acre was higher for all seeding rates for the CruiserMaxx treatment in both planting dates. The average yield level in these trials was approximately 60 bu/acre.

Based on this study, what seeding rates are recommended?

Environmental conditions vary by year and from field to field making it difficult to give a standard recommended seeding rate for all situations. Recommendations should be made based on soybean seed cost, market price and individual field conditions. Table 3 gives a starting point for seeding rate decisions. Please note that the optimum seeding rates shown are based on soybeans grown in 30-inch rows.

Table 3. Approximate economic optimum seeding rates/acre for various seed costs and market prices*.

Treatment	Seed Cost/Unit	Optimum Seeding Rate/Acre (000)	
		\$8/bu	\$10/bu
Untreated Check	\$35	156.5	168.0
	\$40	155.6	167.3
	\$45	154.8	166.7
	\$50	153.9	166.0
Fungicide Seed Treatment (ApronMax)	\$40	144.8	158.8
	\$45	144.0	158.3
	\$50	143.0	157.7
	\$55	142.2	157.1
Fungicide / Insecticide (CruiserMaxx)	\$45	130.3	146.5
	\$50	129.4	145.9
	\$55	128.6	145.3
	\$60	127.7	144.8

*Based on this 2006-2008 study averaged across planting dates, 2800 seeds/lb, and seed treatment costs shown at top of column.

It is commonly understood that soybeans have a greater ability than corn to compensate for reduced stands. However, too much reliance on this ability can lead to poor stands and the need to replant in some situations. Higher seeding rates may need to be maintained to help prevent potential yield reductions or replanting when seedbed conditions, weather or pests are likely to reduce soybean stands.

® ApronMaxx and CruiserMaxx are registered trademarks of a Syngenta Group Company