

Effect of Seeding Rate and Seed Treatment on Soybean Performance

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Introduction

Higher commodity prices for soybeans have changed the balance of the input cost / yield response equation. Even so, growers should be vigilant to optimize their return on all crop inputs, including their seed investment. For example, the best seeding rate is one that optimizes yield and minimizes seed costs, thereby maximizing profits. Seed treatments impact the seeding rate equation by increasing the percentage of seeds that ultimately contribute to the stand. Seed treatments may also increase yields through improved plant health.

The objectives of this study were:

- 1) To determine optimum soybean seeding rates for maximizing yield and profitability at early and normal planting dates, and
- 2) To evaluate the benefit of using seed treatments to increase yield and/or safely reduce seeding rates.

Study Description

This field study was planted at five Midwest locations in 2006 and 2007. There were two targeted planting dates; early and normal (Table 1).

Table 1. Locations and planting dates in 2006 and 2007.

Location	2006		2007	
	Early	Normal	Early	Normal
York, NE	April 11	May 9	May 3	May 18
Johnston, IA	April 24	May 17	May 2	May 18
Princeton, IL	April 20	May 26	April 23	May 17
Champaign, IL	April 24	May 24	April 21	May 14
Windfall, IN	April 28	May 30	May 7	May 18

Plots were planted in 30-inch rows in a split-split-plot design (variety as main plot, seed treatment as split-plot, and seeding rate as split-split-plot). Four Pioneer® brand varieties with the Roundup Ready® gene were included in the study (93M10, 93M11, 93M42, and 93M43). Three seed treatments were included, CruiserMaxx® Pak, which is an insecticide-fungicide combination, ApronMaxx® fungicide, and an untreated check (Table 2).



Field studies were conducted at five locations in 2006 and 2007 to determine optimum soybean seeding rates for yield and profitability, and the benefits of using seed treatments

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. Current soybean varieties respond well to early planting. Research has shown that late-April to early-May plantings produce higher yields because soybeans have more time to take advantage of the long days. The yield response in this study showed this same trend, late-April to early-May plantings produced the highest yields (Figure 1).

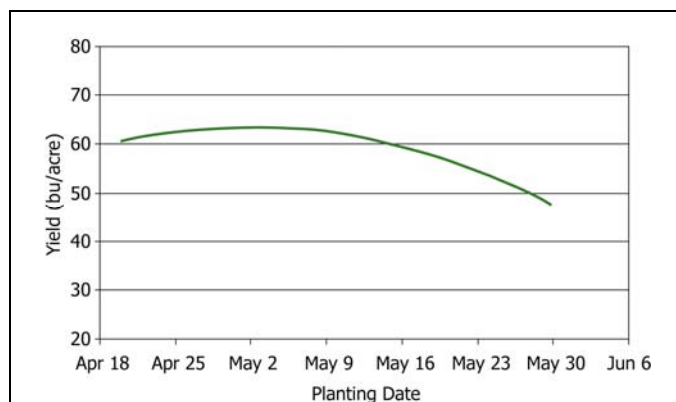


Figure 1. Soybean yield response to planting date (from ten site-years) in 2006-07.

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

Grain yields leveled off at seeding rates of 200,000 per acre with early planting and 175,000 at the normal planting date (data not shown). However, income per acre was optimized at approximate seeding rates of 181,000 and 158,000 seeds/acre for early and normal planting dates, respectively (Figure 2).

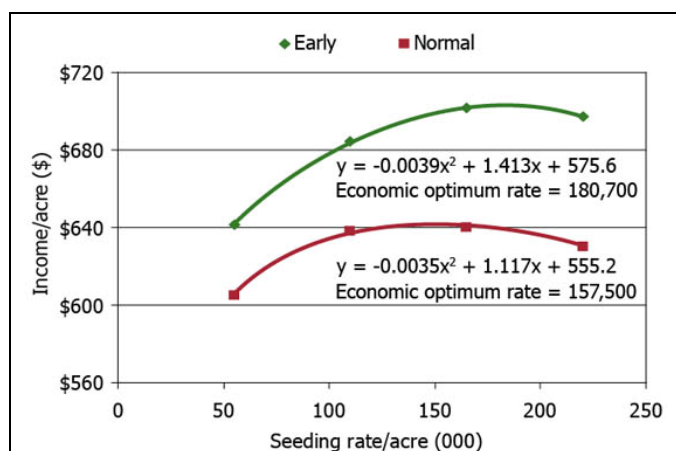


Figure 2. Optimum economic soybean planting rate for the early planting dates in 2006 and 2007.

Income per acre was calculated as soybean yield (bu/acre) minus seed cost and was based on the following assumptions: Soybean price = \$11/bushel and average seed cost = \$0.24/1000 seeds. Seed costs were calculated based on a price of \$30.45/unit assuming 2900 seeds/pound equaling a cost of \$0.21/1000 seeds for seed that was not treated. The cost of the ApronMaxx® treatment was an additional \$2.25/unit and CruiserMaxx® was \$9.75/unit.

The optimum economic seeding rate will vary depending on the commodity price of soybeans. Table 3 shows those seeding rates based on soybean market prices of \$8, \$10, \$12, and \$14/bushel.

Table 3. Optimum economic seeding rate for early and normal planting dates for several soybean prices.

Planting Date	Soybean Price	Seeding Rate/Acre
Early	\$8/bu	169,200
	\$10/bu	177,700
	\$12/bu	183,300
	\$14/bu	187,300
Normal	\$8/bu	144,800
	\$10/bu	154,100
	\$12/bu	160,300
	\$14/bu	164,800

Did the use of a seed treatment increase yield in either early or normal plantings?

Yes. The CruiserMaxx treatment increased yield 3.1 bu/acre at the early planting date and 1.4 bu/acre for normal planting compared to the untreated check (Figure 3). The CruiserMaxx treatment improved income \$25/acre in the early planting and \$16/acre when data were averaged over both dates.

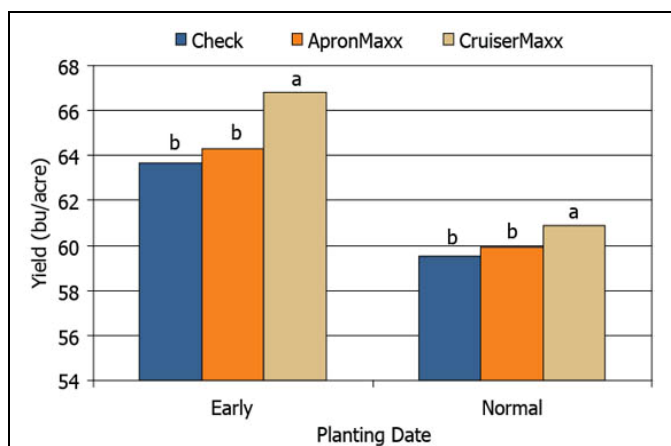


Figure 3. The effect of seed treatments and planting date on soybean yield in 2006 and 2007.

Does use of a seed treatment result in higher plant stands compared to using untreated seed?

Yes. According to this study, a seeding rate of 150,000 seeds/acre resulted in a final stand of 118,000, 114,000, and 110,000 for CruiserMaxx, ApronMaxx, and the untreated check, respectively. This means that it would require 161,000 untreated seeds per acre to achieve the same final stand as using 150,000 seeds/acre with CruiserMaxx (Figure 4). This 7% reduction in seeding rate would help offset a portion of the seed treatment cost.

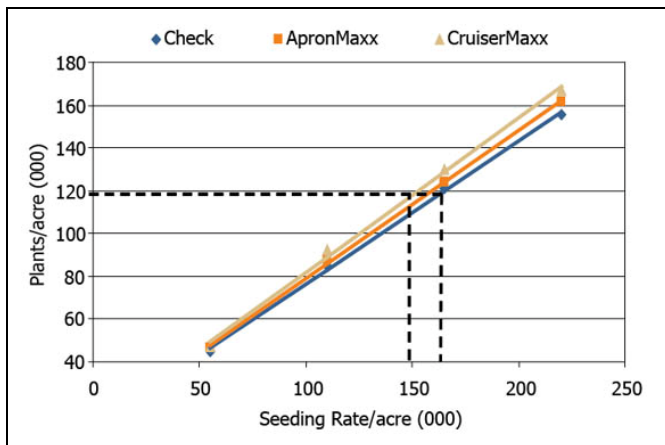


Figure 4. Final plant stand by seeding rate averaged over both planting dates in 2006 and 2007.

Also, the optimum economic seeding rate for the ApronMaxx and CruiserMaxx treatments were lower than the optimum economic seeding rate for the untreated check (Figure 5). Yields of both the seed treatments were greater than the untreated check at all seeding rates. Among seed treatments, the CruiserMaxx treatment outyielded the untreated check treatment at all seeding rates.

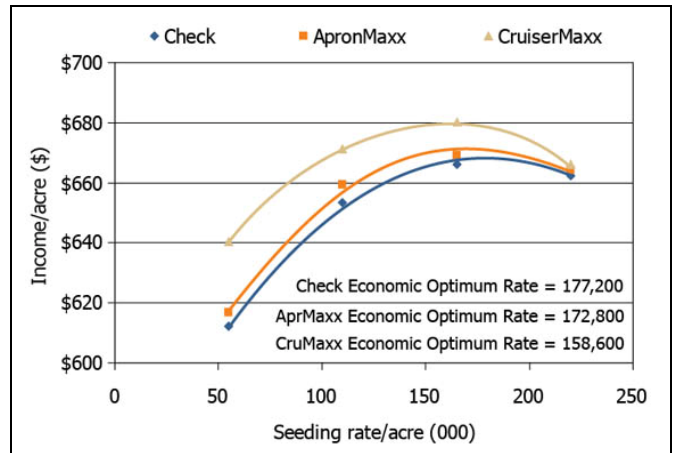


Figure 5. Optimum economic soybean planting rate for CruiserMaxx, ApronMaxx, and untreated check averaged over both planting dates in 2006 and 2007.