

# Influence of Starter Fertilizer on Soybean Performance

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General guidelines suggest only limited (<5 lbs. fertilizer salts) or no fertilizer should be placed in contact with soybean seed. However, some farmers continue to inquire about the practice of placing starter fertilizer with the seed due to various limitations. The objective of this trial was to re-examine the influence of varied rates of starter fertilizer when placed in the seed furrow on stand establishment. A secondary objective was to assess the impact of seed size on potential injury due to fertilizer salts.

## Materials and Methods

- Kruger K-033RR (2350 seeds/lb.), Kruger K-009+RR (3321 seeds/lb.), and Northstar Genetics NS0099RR (4283 seeds/lb.) soybean varieties were selected based on available seed supply and contrast of seed size.
- The plant establishment data was determined by actual plant stand counts from within a 19.2 square foot area of each plot.
- The row spacing within the trial was 7 inches; trial was planted on May 25; and soil moisture conditions after planting were good.

General comments related to seed-placed fertilizer salts:

- The rate per acre of starter fertilizer (~ salts) should be decreased as row spacing increases.
- As row spacing increases (widens) a given rate of fertilizer becomes more concentrated and in direct contact with the seed.
- Coarse textured soils (low water retention and lower CEC) have greater potential for fertilizer salt damage to seeds than do fine textured soils.
- Finer textures soils have higher CEC capacity and hence greater ability to adsorb the damaging NH<sub>3</sub> ions from fertilizers.
- More water in the soil is good in that the free ammonia NH<sub>3</sub> has a high affinity for water, thus reducing damaging effects on seed.

**Table 1. Soybean performance as influenced by starter fertilizer.**

Starter Fertilizer Salts	Equivalent 11-52-0	Yield	Test Weight	Seed Protein	Seed Oil	Seeds / Pound	Days to PM	Plant HT	Pod Ht	--- Plant Establishment ---			Stand % of Check
										Initial	Interim	Final	
lb/acre	lb/acre	bu/ac	lb/bu	%	%			inch	cm	plants ft <sup>2</sup>			
0	0	39.2	56.0	36.7	18.8	3331	103.4	26.6	4.2	2.9	3.4	3.3	100
5	45	40.5	56.1	36.8	18.8	3292	103.8	26.4	3.0	2.5	2.5	2.5	76
10	91	36.7	56.3	36.7	18.8	3219	104.5	26.7	3.3	2.2	2.3	2.2	67
15	136	34.5	56.2	36.9	18.8	3267	105.3	26.3	3.1	1.6	1.8	1.9	58
LSD.05		4.0	NS	NS	NS	NS	0.8	NS	NS	0.42	0.37	0.41	
LSD.01		NS	NS	NS	NS	NS	1.1	NS	NS	0.56	0.51	0.56	

**Table 2. Soybean performance as influenced by variety and starter fertilizer.**

Variety	Starter Salts lb/acre	Yield bu/ac	Test Weight lb/bu	Seed Protein %	Seed Oil %	Seeds / Pound	Days to PM	Plant HT inch	Pod Ht cm	--- Plant Establishment ---			Stand % of Check
										Initial	Interim	Final	
										--- plants ft <sup>2</sup> ---			
Kruger K-033RR <i>2350 seeds/lb</i>	0	35.6	54.9	36.5	18.9	2659	106.0	24.9	4.7	2.8	3.3	3.4	100
	5	38.5	55.0	36.7	18.9	2501	106.3	23.6	3.3	2.6	2.5	2.5	74
	10	35.4	55.2	35.9	19.0	2479	106.7	25.5	4.0	2.6	2.5	2.4	71
	15	34.4	54.3	36.2	19.1	2440	107.7	24.7	2.7	1.6	1.6	1.8	53
Kruger K-009+RR <i>3321 seeds/lb</i>	0	44.9	56.3	37.0	19.0	3308	103.0	27.6	4.0	3.6	3.8	3.7	100
	5	39.7	56.5	37.0	18.8	3242	103.5	25.7	3.3	2.8	2.8	2.7	73
	10	39.8	56.7	37.1	18.8	3181	104.3	27.2	2.5	2.2	2.2	2.1	57
	15	41.1	56.6	37.3	18.8	3238	105.5	27.8	4.0	1.7	2.1	2.1	57
Northstar Gen.NS0099RR <i>4283 seeds/lb</i>	0	36.3	56.4	36.7	18.7	3857	101.8	26.8	4.0	2.4	2.9	2.9	100
	5	42.7	56.6	36.6	18.7	3935	102.3	29.1	2.5	2.1	2.2	2.4	83
	10	34.6	56.8	37.1	18.6	3812	103.3	27.2	3.5	1.8	2.3	2.2	76
	15	27.9	57.1	37.0	18.5	3916	103.3	26.0	2.8	1.6	1.8	1.8	62
LSD.05		6.6	0.5	NS	NS	NS	NS	NS	NS	NS	NS	NS	

**Table 3. Soybean performance as influenced by variety.**

Variety	Seed Size	Yield bu/ac	Test Weight lb/bu	Seed Protein %	Seed Oil %	Seeds / Pound	Days to PM	Plant HT inch	Pod Ht cm	--- Plant Establishment ---		
										Initial	Interim	Final
										--- plants ft <sup>2</sup> ---		
Kruger K-033RR	Large	36.0	54.8	36.3	19.0	2520	106.7	24.7	3.7	2.4	2.5	2.5
Kruger K-009+RR	Medium	41.4	56.5	37.1	18.8	3242	104.1	27.0	3.4	2.6	2.7	2.6
Northstar Gen.NS0099RR	Small	35.4	56.7	36.8	18.6	3880	102.6	27.3	3.2	2.0	2.3	2.3
LSD.05		3.3	0.2	0.3	0.15	89	0.7	NS	NS	0.35	0.31	NS
LSD.01		4.5	0.3	0.4	0.2	120	0.9	NS	NS	0.47	NS	NS

**Table 4. Analysis of variance for sources of variation and traits reported.**

Source of Variation	Yield	Test Weight	Seed Protein	Seed Oil	Seeds / Pound	Days to PM	Plant HT	Pod Ht	--- Plant Establishment ---		
									Initial	Interim	Final
Variety	**	**	**	**	**	**	NS	NS	**	*	NS
Starter Fertilizer	*	NS	NS	NS	NS	**	NS	NS	**	**	**
Variety * Starter Fertilizer	*	*	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mean	37.7	56.2	36.8	18.8	3277	104.3	26.5	3.4	2.3	2.5	2.5
C.V. %	12.1	0.6	1.2	1.1	3.8	0.9	12	41.3	21.1	17.3	19.1

## Discussion

- Any amount of starter fertilizer placed with the seed resulted in significant reductions in stand establishment.
- Stand reduction increased as starter fertilizer rates increased.
- Stand reduction due to fertilizer salts was similar among soybean varieties of different seed sizes.
- This trial will be conducted again by the CREC during the 2006 season.