

Do soybeans respond to starter fertilizer and seed inoculum?

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New York farmers typically plant soybeans following corn into fields that test medium-high to high in P. For soils testing medium to high in phosphorus, Cornell University recommends the addition of not more than 15 to 25 lbs of P₂O₅ and a similar amount of N. Soybeans, however, are usually planted in late May or early June when average soil temperatures exceed 60°F and soil organic matter mineralization takes place. This raises the question whether a small amount of N and P starter fertilizer is really needed and how seed inoculation affects the fertilizer recommendations, especially the N recommendation.

We initiated the 3-year study in 1999 to examine the response of soybeans to starter fertilizer application (15 lbs N and 55 lbs of P₂O₅, applied as 14 gallons/acre of 10-34-0) with or without the addition of Cell-Tech and Hi-Stick seed inoculum on fields testing high in soil test P (Morgan extractable P of 9 to 39 lbs P/acre). Responses were tested in fields that had never been planted to soybeans or had been planted 4 to 5 times to soybeans in the 1990s. We tested in fields with or without a soybean history because seed inoculum is recommended in fields without a soybean history but not in fields with a soybean history. The 1999 growing season was extremely dry, 2000 was very wet, and 2001 was moderately dry.

When averaged across the 3 years, the use of Cell-Tech inoculum increased soybean yields when compared with the check (no starter fertilizer or inoculum) in fields with a soybean history (Table 1). Likewise, the use of Hi-Stick inoculum plus starter fertilizer increased soybean yields when compared with the starter fertilizer treatment. Apparently, soybeans can respond to the use of seed inoculum in fields with a soybean history under New York growing conditions. The use of starter fertilizer, however, did not increase soybean yields in the presence or absence of inoculum in fields with a soybean history. Apparently, soybeans do not require starter P fertilizer in fields that test high in P.

When averaged across the 3 years, the use of Cell-Tech and Hi-Stick seed inoculum increased soybean yields in the presence or absence of starter fertilizer in fields without soybean history (Table 2). Averaged across the 3 years, no differences in yield increase were observed between Cell-Tech and Hi-Stick inoculums. Also, the use of starter fertilizer did not increase soybean yields in the presence or absence of inoculum. Apparently, soybeans do not respond to starter fertilizer N and P under New York growing conditions even in fields with no soybean history.

We recommend the use of inoculum for all soybean plantings, even in fields with a soybean history. Also, we do not recommend any starter fertilizer P for soybeans in fields that test high or very high in P (≥ 9 lbs P/acre Morgan extraction). Finally, we do not recommend the use of starter N fertilizer for soybeans, even on fields with no soybean history.

Table 1. Soybean yields under different inoculum and starter fertilizer combinations in fields <i>with soybean history</i> in 1999, 2000, and 2001 at the Aurora Research Farm.				
Treatments	1999	2000	2001	Mean
	-----bu/acre-----			
Cell-Tech	30	46	45	40
Hi-Stick + Starter [†]	32	45	42	40
Cell-Tech+Starter	30	46	42	39
Hi-Stick	31	44	42	39
Starter	31	43	40	38
Check	32	42	39	38
LSD 0.05	NS	2	3	2
[†] Starter fertilizer was applied at a rate of 15 lbs N and 55 lbs P ₂ O ₅ /acre. Soils tested high for phosphorus availability.				

Table 2. Soybean yields under different inoculum and starter fertilizer combinations in fields <i>without soybean history</i> in 1999, 2000, and 2001 at the Aurora Research Farm.				
Treatments	1999	2000	2001	Mean
	-----bu/acre-----			
Cell-Tech+Starter [†]	25	52	35	37
Cell-Tech	25	49	35	36
Hi-Stick + Starter	23	50	35	36
Hi-Stick	22	51	32	35
Starter	24	45	32	34
Check	21	47	32	33
LSD 0.05	NS	7	3	2
[†] Starter fertilizer was applied at a rate of 15 lbs N and 55 lbs P ₂ O ₅ /acre. Soils tested high for phosphorus availability.				