

Starter Fertilizer for No-Till Corn and Sorghum Production

By Charles S. Wortmann

Starter fertilizer increased both irrigated and dryland corn yields. Yield increases were greater in irrigated than in dryland production. Results from sorghum trials did not support the use of starter at normal planting dates, but response may be greater for early planting dates when soils are cooler.

Starter and pop-up fertilizers are usually applied in addition to other required nutrients to achieve optimal crop growth and performance. Placing a concentrated band of fertilizer near or with the seed often promotes rapid and uniform growth, especially when the soil is cool and wet.

Although the terms are sometimes used loosely, “starter” usually refers to fertilizer applied (at planting) below and to the side of the seed, while “pop-up” or “in-furrow” refers to fertilizer applied with the seed, and “dribble” refers to that applied in a concentrated band on the soil surface. These are all forms of “banding” fertilizer. **However, the term “starter” is sometimes used in reference to all three methods.**

Past research in Nebraska on medium and fine-textured soils under conventional tillage did not find the use of starter fertilizer to be economical. Results of some studies in other states have shown a higher probability of corn and sorghum response to nitrogen (N), phosphorus (P), and sulfur (S) in starter fertilizer under no-till compared to tilled conditions. Furthermore, some studies have found method of placement of starter fertilizer to be

important. Also, soil type and topographic position may be important factors determining response.

Fourteen corn trials were conducted in eastern Nebraska in 2002 and 2003 to determine corn response to starter, pop-up, and dribble-applied fertilizer under no-till conditions. Of the fourteen corn trials, eight were located on farmer fields, three at Haskell Lab, and three at the University of Nebraska Lincoln Agricultural Research and Demonstration Center (UNL ARDC). Sites were selected to represent diverse soils and topographic positions.

Twelve sorghum trials were conducted in eastern Nebraska over the same period (2002 and 2003 seasons) to determine sorghum response to starter, pop-up, and dribble-applied fertilizers under no-till conditions. All trial sites were on farmer fields,

and were selected to represent diverse soils and topographic positions. Sites were planted at the same time farmers planted, usually in late May.

Eight starter fertilizer treatments for both corn and sorghum were compared. Nitrogen and P starter treatments were compared to a no starter control, and included three methods of application

Table 1. Starter treatments.

lb/A			Starter placement
N	P ₂ O ₅	S	
0	0	0	Control
20	20	0	2 x 2 ¹
20	20	0	Over the row
10	10	0	In-furrow
20	20	10	2 x 2
20	20	10	Over the row
10	10	5	In-furrow
10	10	5	In-furrow with ATS ²

¹2x2 = 2 in. to side of row and 2 in. deep.
²ATS = ammonium thiosulfate.
 Ammonium sulfate (AS) is S source in other treatments.

and S rate and source variables. **Table 1** lists treatment details.

Results

Corn. Soil pH in the corn sites ranged from 5.4 to 6.8 (**Table 2**). Soil organic matter (SOM) ranged from 1.9 to 3.3%. Bray-1 P ranged from low to very high, with the median level over three times higher in the 0 to 2 in. depth than in the 2 to 8 in. depth. The potassium (K) level was high or very high at all sites.

On average, corn yield increased 7.5 bu/A with starter fertilizer, with a slightly greater increase with in-furrow placement of N+P as compared to other starter application treatments (**Figure 1**). Response was greater under irrigated conditions (**Figure 2**) than under dryland conditions, although several of the dryland trials experienced severe water deficits. Most of the response occurred at sites where soil Bray-1 P was <15 parts per million (ppm)...**Figure 3. This suggests that P in the starter fertilizer is more important than N.**

Over all trials, there was no benefit to including S in the starter fertilizer (**Figure 1**), but there was a small advantage to including S for dryland sites (**Figure 2**). There was no difference between ATS and ammonium sulfate effect on corn yield.

Sorghum. Sorghum grain yield was increased with starter fertilizer in only one of the 12 trials. The average yield without starter fertilizer was 91 bu/A and the average yield with the most effective starter fertilizer treatment (10 lb N + 10 lb P₂O applied in-furrow) was 93 bu/A. Including S in the starter did not result in increased sorghum yield.

	pH	SOM, %	K, ppm	P, Bray-1, ppm	
				0 to 2 in.	2 to 8 in.
Minimum	5.4	1.9	194	4.5	3.1
Maximum	6.8	3.3	621	78.5	33.6
Median	6.0	2.5	312	35.0	9.6

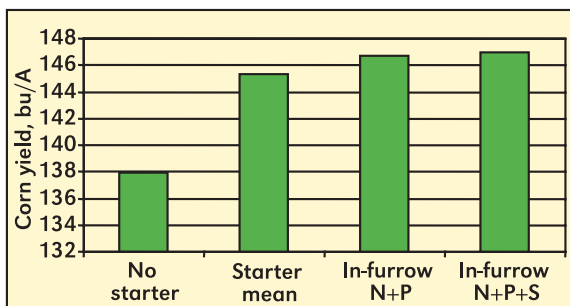


Figure 1. Average corn response to starter fertilizer (irrigated and dryland).

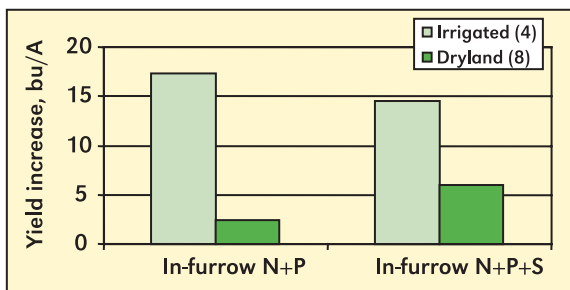


Figure 2. Average corn response to in-furrow fertilizer in irrigated and dryland conditions.

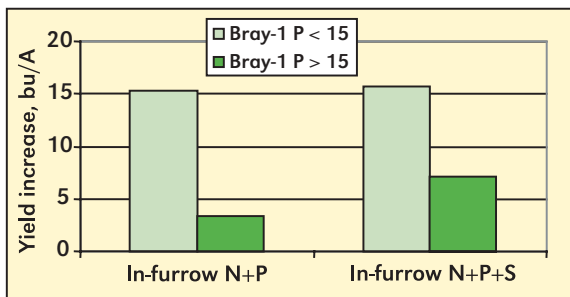


Figure 3. Average corn yield response to in-furrow fertilizer at different soil P levels (bu/A).



Phosphorus was the most important nutrient in starter fertilizer for corn in a Nebraska no-till study.

Conclusion

Corn yield increase under irrigated conditions in Nebraska, especially if soil P is less than 15 ppm, is sufficient to justify application of P and maybe some N in starter fertilizer (e.g., 10-34-0 or 11-52-0) at about 10 lb P₂O₅/A. Yield increases with starter

fertilizer under dryland conditions were smaller and less frequent, but starter fertilizer use may be profitable in adequate rainfall years. In-furrow placement was more effective than over-the-row or 2x2 placement.

Based on the results of the 12 sorghum trials, we cannot recommend starter fertilizer for no-till milo (grain sorghum) at the typical planting dates used in Nebraska. Response to starter fertilizer may be greater with earlier planting dates when the soil is cooler. Three trials are continuing in 2004 with an early May planting date at adequate P sites to test the effect of in-furrow application of 10-34-0 as well as the effects of row-cleaning. [BC](#)

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