Starter Fertilizers Containing Potassium for Ridge-till Corn and Soybean Production

By W.B. Gordon

Use of conservation tillage, including ridge-tillage, has increased greatly in recent years because of its effectiveness in conserving soil and water. In the ridge system, tillage at planting time is confined to a narrow strip on top of the ridge. The large amount of residue left on the soil surface can interfere with nutrient availability and crop uptake.

This research showed that starter fertilizer can increase corn and soybean yields, even when soil test phosphorus (P) and potassium (K) levels are high or very high. However, placement and K source determined the overall effects of starter fertilizer.

Starter fertilizer applications have been effective in enhancing nutrient uptake even on soils high in available nutrients. Many producers favor in-furrow applications of starter fertilizer due to low initial cost of planter-mounted application equipment and problems associated with knife applications in high residue situations.

Field experiments were conducted at the North Central Kansas Experiment Field near Scandia, on a Crete silt loam soil (fine, montmorillonitic, mesic Panchic Arguistoll) from the spring of 1997 to the fall of 1998. Soil tests in the corn experimental area showed that initial soil pH was 6.4; organic matter was 2.4 percent; Bray 1 P and exchangeable K in the top 6 inches of soil were 43 parts per million (ppm; high) and 380 ppm (very high), respectively. In the soybean area, soil pH was 6.5; organic matter content was 2.2 percent; Bray 1 P was 45 ppm (high), and exchangeable K was 350 (very high). The experimental design was a randomized complete block with three factors.

Both the corn and soybean tests included liquid starter fertilizer (7-21-7) made with two K sources applied either in furrow or 2 inches to the side and 2 inches below the seed (2x2) at planting. The two sources of K were sulfate of potash (SOP) and muriate of potash (MOP). Liquid 7-21-7 fertilizer was made using ammonium

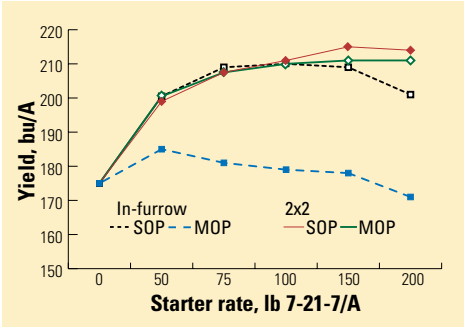

Figure 1. Effect of starter (7-21-7) placement, rate, and potassium source on corn yield.

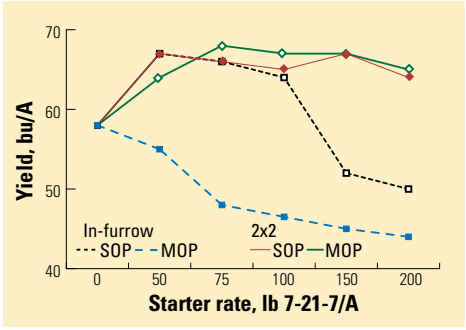

Figure 2. Effect of starter (7-21-7) placement, rate, and potassium source on soybean yield.

polyphosphate (10-34-0) and either SOP or MOP and was applied at 50, 75, 100, 150, and 200 lb/A.

A no starter check was also included. Sulfur (S) was balanced so that all plots received the same amount. Nitrogen (N) as 28 percent urea ammonium nitrate (UAN) was balanced on all corn plots to give a total of 200 lb/A. The soybean experiment received no additional N. Corn was planted in late April both years, at 32,000 seed/A. Soybeans were planted in mid-May at the rate of 200,000 seed/A. Stand counts were taken 2 weeks after emergence.

Results

Starter fertilizer increased yields of corn and soybeans despite high levels of soil P and K, except where excessive rates were applied in-furrow. Data illustrating the influence of starter rate, placement, and K source on corn and soybean yield and plant population are shown in **Figures 1** and **2** and **Table 1**.

In the corn experiment, starter fertilizer containing MOP applied in-furrow at the 50 lb/A rate reduced plant population by 4,493 plants/A and grain yields by 16 bu/A compared to the same rate applied in-furrow as SOP. Corn yield was reduced 31 bu/A when starter fertilizer containing MOP was applied in-furrow at 200 lb/A as compared to the same rate of SOP. When fertilizer containing SOP was placed in-furrow with corn seed, no population or yield reduction was seen except at the 200 lb/A rate where there was a 2,432 plant/A stand loss and a 12 bu/A yield reduction compared to the 2x2 placement. Although application of starter fertilizer at the 50 lb/A rate containing MOP increased yields over the no starter check, yields were still 16 bu/A lower than those when the same rate of MOP was applied 2x2.

The overall effect of rate, placement, and K source on corn yield is shown in **Figure 1**.

When starter fertilizer containing MOP was placed in-furrow with soybean seed, yields and plant populations were reduced regardless of rate. Yields and populations of soybean declined when in-furrow rates of starter fertilizer containing SOP exceeded 100 lb/A. Placement of starter 2x2 had no adverse effect on soybean yield with either K source. **Figure 2** illustrates the effect of starter rate, placement, and K source on soybean yield.

Conclusions

Starter fertilizer increased corn and soybean yield even though levels of soil P and K were high and very high, respectively. Placing starter fertilizer away from seed in a 2x2 placement was safe at the highest rates of application, regardless of K source. However, there are hazards associated with in-furrow placement of starter fertilizer containing MOP and SOP at higher rates. In general, salt injury from SOP proved to be less than MOP when applied in-furrow. Understanding the potential for damage from fertilizer placed in contact with seed is critical in achieving the maximum benefits of starter fertilization. BC

Dr. Gordon is with Kansas State University.

TABLE 1. Effect of starter rate, placement, and potassium source on corn and soybean plant population 2 weeks after emergence.

		Placement			
		In-furrow		2 x 2	
	Rate	Potassium source			
Crop	7-21-7 lb/A	SOP	MOP	SOP	MOP
		plants/A, thousand			
Corn	0	31.3	31.3	31.3	31.3
	50	31.4	26.9	31.3	31.3
	75	31.3	25.1	31.4	31.3
	100	31.3	24.1	31.2	31.3
	150	31.0	24.6	31.2	31.2
	200	28.9	23.9	31.3	31.3
Soybeans	0	197	197	197	197
	50	196	160	198	198
	75	196	158	198	198
	100	192	152	198	198
	150	154	142	199	197
	200	152	139	198	197