by Jim Gerwing, Dr. Ron Gelderman and Anthony Bly

Effects Of Seed-placed P Studied

South Dakota researchers find a number of variables determine tolerance of corn to P placed close to the sed.

Summary: *Stand reduction of corn ranged as high as 41 to 66 percent, depending on location and materials used, where phosphorus was placed close to corn seeds. The safest liquid material was 10-34-0, followed by 7-21-7, and 9-18-9. Injury caused by the 9-18-9, which reduced stands significantly was attributed to a larger quantity of N + K_20 supplied by this material. In addition to stand reduction, P placed close to the seed also slowed crop emergence.*

Many farmers in South Dakota plant corn in no-till or very limited tillage situations, thus restricting the application opportunities of a non-mobile nutrient such as phosphorus. Broadcast applications of P have shown reduced effectiveness, especially in drier regions. Subsurface band applications can work but require separate equipment and trips across the field and can cause considerable soil disturbance. Banding phosphorus with the planter, however, has saved time and application costs while placing P below the soil sur-face near plant roots for efficient uptake.

While P banded two inches beside and two inches below the seed at planting has been shown to be an effective placement for corn, disadvantages of such placement include: 1) cost of openers, 2) weight, 3) trash clearance, 4) soil disturbance, and 5) possible seed placement difficulties. Because of these problems, many growers in this region are considering placement of phosphorus directly with the seed at planting. Placing P with the seed, however, creates potential for seed injury and reduced stands.

One of the objectives of our three-year study (1992-94) was to evaluate the effect of common liquid phosphorus materials on plant emergence when placed directly with corn seeds.

Stands reduced

As shown in Figure 1, 10-34-0 and 7-21-7 placed in the furrow with corn seed did not reduce emergence below 93 percent, even at the P_20_5 rate of 50 lbs/A. However, in 1994 stands were reduced 41 and 66 percent at Highmore and Beresford, respectively, when the same rate of phosphorus was applied as 9-18-9.

The injury caused by 9-18-9 could be attributed to the larger quantity of N + K_20 supplied by this material (Table 1). In addition, the N form supplied with the 9-18-9 used here was urea rather than ammonium N supplied by the other two materials. Some ammonia may have been released from the urea N. increasing seed injury.

Methodology

Sites for this study were located on or near experiment stations at Beresford and Highmore in the southeast and cen-tral parts of South Dakota, respectively.

Table 1. Type of fertilizer and rate of nitrogen and potassium applied with phosphorus, Gerwng, et al., South Dakota State University, 1994.

P_2O_5 rate	`10-34-0	7-21-7	9-18-9
lbs/A	..... lbs/A N + K_2O		
0	0	0	0
12.5	4	8	12
25.0	7	17	25
50.0	15	33	50

Table 2. Fertilizer and rate used in liquid seed studies, Gerwng, et al., South Dakota State University, 1994.

P_2O_5 rate	`10-34-0	7-21-7	9-18-9
..... lbs/A.....			
0	0	0	0
12.5	37	60	69
25.0	73	119	139
50.0	147	238	278

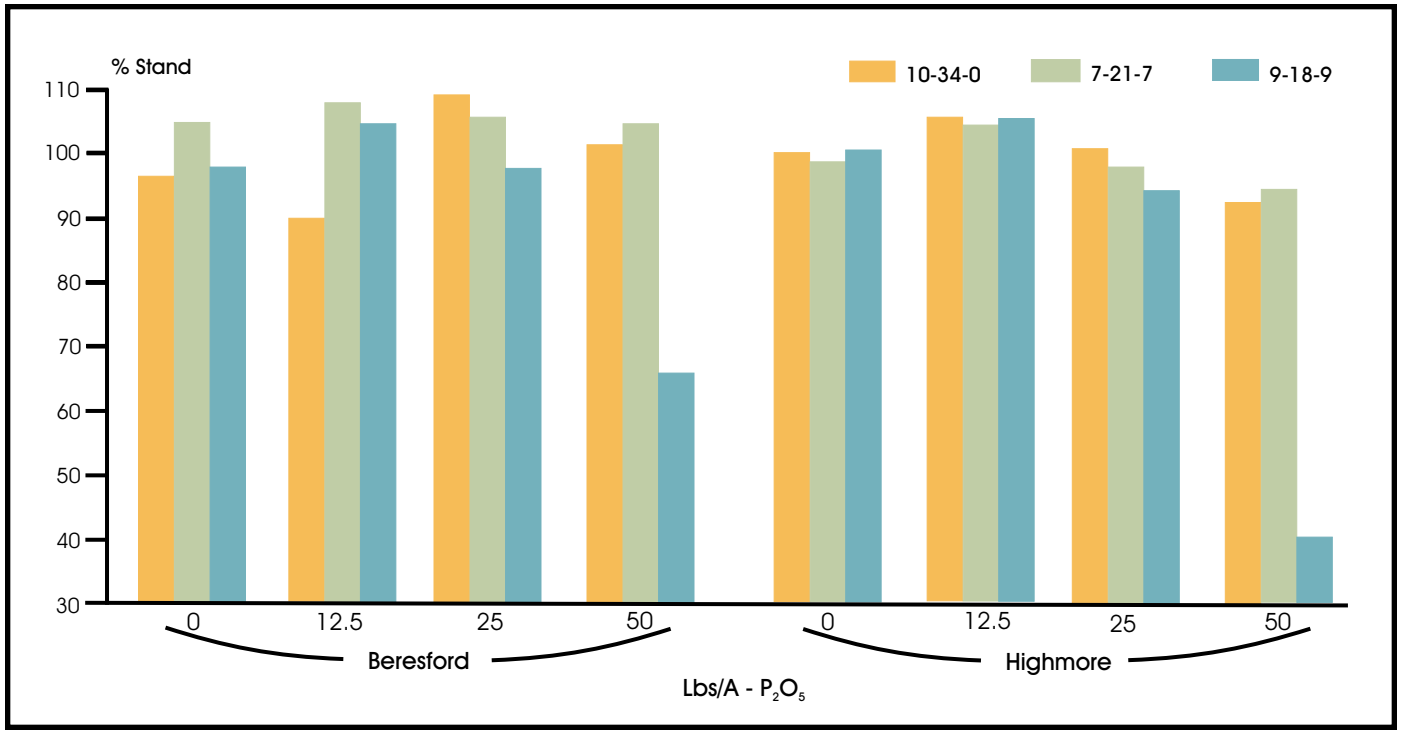

Figure 1. Influence of seed-placed liquid fertilizer on corn stand, Gerwing, et al., South Dakota State University, 1994.

Readings at the no-till Beresford site in 1994 were: soil moisture 25.9 percent, organic matter 3.2 percent, and pH 5.9. Soil is silt loam.

Soil moisture reading on the clay loam soil at the Highmore site in 1994 was 8.6 percent at seeding depth at planting. Organic matter was 3.2 per-cent and soil pH was 6.5.

Planting. Both sites were planted in 30-inch rows with normal planting units using double disk openers. Liquid fer-tilizer was metered with electric pumps and dropped immediately behind the seed tube opening between the double disk openers.

Plots. The experimental design for all sites consisted of randomized split plots. All plots were replicated four times.

Fertilizer. Type of fertilizer used, rate of P_20_5 per acre, and the rate of total material used are listed in Table 2. Rates used at both locations were 0, 12.5, 25, and 50 lbs/A of P_2O_5. Because the materials had different grades, the rate per acre of total material used for each phosphorus rate was different (Table 2). Rates of material ranged from 37 lbs/A for 10-34-0 to a high of 278 lbs/A for 9-18-9. Composition of the 9-18-9 was orthophosphoric acid and potassium hydroxide. Nitrogen and potassium rates also varied with materi-al at any given phosphorus rate (Table 1). The $N + K_2O$ rates ranged from 4 lbs/A for 10-34-0 to 50 lbs/A for 9-18-9.

Use caution

From our observations of seed-placed phosphorus on corn, the safest liquid material was 10-34-0, followed by 7-21-7 and 9-18-9. Liquid 10-34-0 had the least effect on corn stand. In addition to stand reduction, seed-placed fluids also slowed crop emergence.

From these studies we make the fol-lowing precautions to minimize risk of stand reductions when placing fertilizer with corn seed in 30-inch rows:

1. Do not use UAN or urea
2. Do not apply more than 10 lbs/A of $N + K_2O$
3. Do not apply more than 100 lbs/A of 10-34-0 or 70 lbs/A of 7-21-7
4. Reduce rates 50 percent for dry or sandy soils.

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