

Surface Banding Effective for Corn Starter

Mounting evidence shows surface dribbling starter plus N and P closer to plantroots than broadcasting.

Surface banding of nitrogen (N) or NPKs mixes has been recognized as being more effective than broadcasting solids or the same fluid materials, especially in high residue crops such as grass, wheat, corn, and sorghum. Such improved performance means greater penetration of surface residues, lower N loss by ammonia volatilization, less foliar burn, and diminished P fixation.

Over the past few years, a greater appreciation of the effectiveness of surface banding starters on row crops in reduced-till has led to a reexamination of the factors involved in surface banding.

Because starter placement beside and below the seed requires an opener, and as planting equipment has increased in size, growers frequently opt not to hang more steel on already heavy equipment. Thus, a disinclination by growers to use starters. However, more recent research has shown that the substantial advantages of using starters in reduced-till do not need to be lost because of a lack of openers. Certainly, low salt index starters in direct seed contact are effective and do not require openers. But research also shows that surface banding fluid NPKS starters to the side of the row also can be very effective.

High N

High N formulations have been shown to have a key role in starter responses in high residue systems. Recent

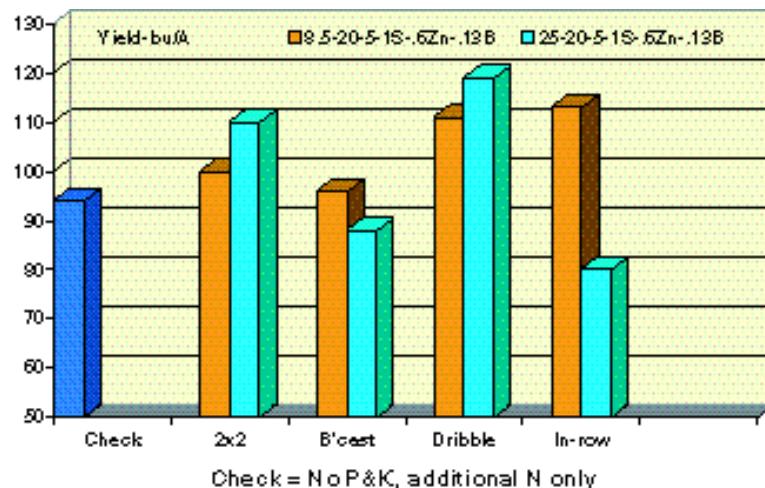


Figure 1. Effect of varying starter N rates and placement methods on corn yields, Mulford University of Maryland.

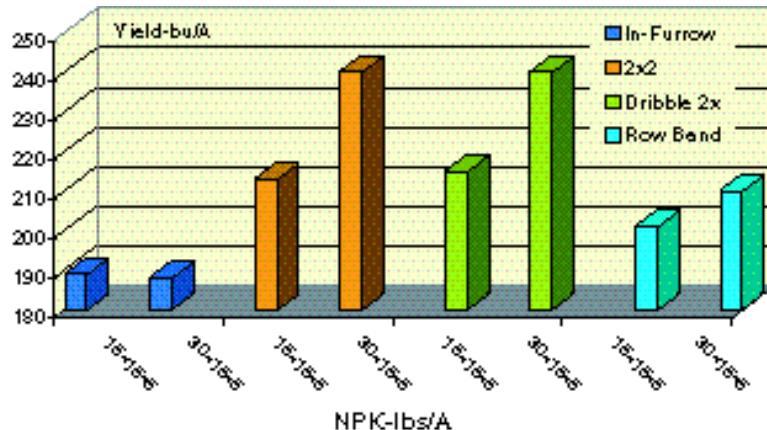


Figure 2. Surface banding (dribble 2 x 0) of high N starter has been very effective for reduced-till corn; banding over row has been less effective, Cordon, Kansas State University.

research in Kansas and Iowa (Tables 1 and 2) has confirmed that such high N to P2O5 ratios (1:1 or greater) have much to do with plant uptake of phosphorus (P). Higher plant P concentrations and higher uptake at the V-6 stage were confirmed, even with high P-testing soils.

High concentrations of ammonium-N in the starter band have two likely

effects on P availability and uptake: diminished P fixation and enhanced physiological uptake of P. However, a word of caution. High N starters produced from blending UAN or urea with other solutions cannot be placed in direct seed contact because of the potential for germination damage from urea hydrolysis. Urea inhibitors such as Agrotain could be added to the

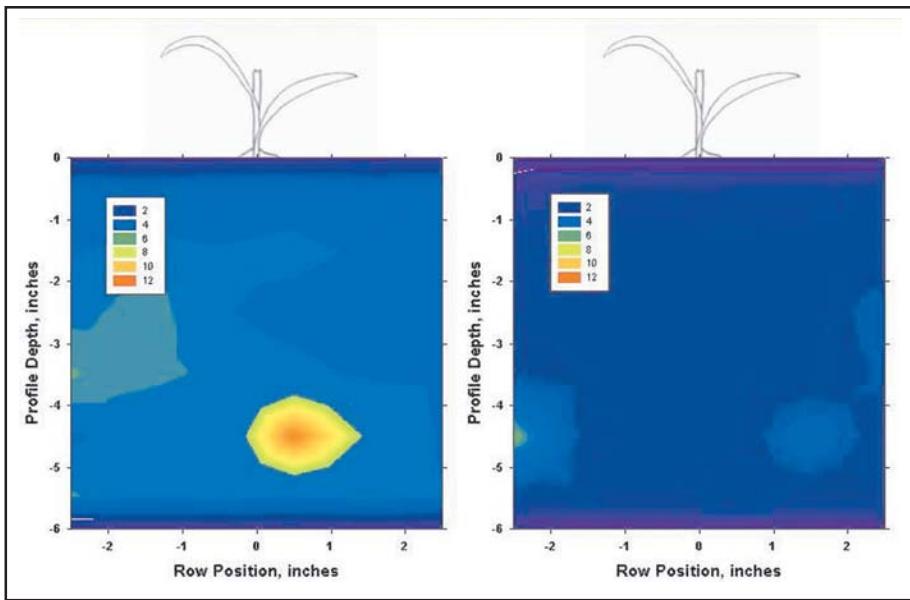


Figure 3. Soil distribution of bio-available P after dribble applications of fluid starter 2 inches side of seed row, Kovar, National Soils Tilth Laboratory.

starter to reduce possible ammonium toxicity that might damage germinating seeds in young plant roots. Such inhibitors could also reduce nitrogen losses by slowing urea hydrolysis.

K Starter

Recently, the incidence of early-season K deficiencies in corn under reduced-till has become more and more common in many states, even when soil test K levels are considered to be adequate. Research in Iowa by Dr. Antonio Mallarino and Kansas by Dr. Barney Gordon has confirmed the need of K in starter to offset the effects of early-season stress. Amounts of K needed may not be large but have significant effects on yields, even when soil tests are very high.

Starter Placement

Research supported by the Fluid Fertilizer Foundation (FFF) has shown that high N starters can be effective in placement configurations other than the conventional 2 x 2 placement. Studies in both Maryland and Kansas on high P-testing soils (Figures 1 and 2) have demonstrated that dribble placement of

starter on the soil surface 1 to 2 inches to the side of the row can produce yields essentially equal to 2 x 2 placement. However, surface banding directly over the row was substantially less effective, possibly due to migration of urea into the soil surrounding the germinating seed.

Surface-applied P

The fact that surface starter placement is effective as measured by P uptake and yield implies that surface applications of P are not as immobile as long assumed, but rather that some degree of P mobility must exist.

Evidence of such mobility has been provided in recent FFF-supported research by Dr. John Kovar of the National Soil Tilth Laboratory in Ames, Iowa (Figure 3). A significant amount of P mobility was detected beneath surface dribble bands of starter 43 days after application on a silt loam soil. Substantial P downward movement was detected with both 15-30-10 and 60-30-10 starter rates.

With the evidence of P mobility from Kovar's research and the excellent responses to surface dribble starter in Gordon's, Mulford's, and Kovar's field studies, there is no question that the N and P are getting to the plant roots. Sulfur would likely show similar mobility. However, the mobility of K and Zn in these high ammonium bands has not been determined. One has to wonder if the concentrations of ammonium might also affect the ability of these nutrients to move in the soil because of saturation of the soil's exchange sites with ammonium ions beneath the surface bands.

Continuing Work

Research on the efficacy of fall-applied surface bands and surface starter bands for wheat is under way at locations in the U.S. and Canada with support from the FFF. Fall application

Table 1. Effects of N concentration on starter response in irrigated corn

Lb/A N-P ₂ O ₅ -K ₂ O	2-year Avg. bu/A
Control, no starter	159
5-15-5	187
15-15-5	192
30-15-5	210
45-15-5	210
60-15-5	209

Gordon, Kansas State U.

Table 2. Effect of starter composition and placement on corn yield and grain moisture at harvest.

Treatment	Yield bu/A	Grain moisture %	P removal lbs P ₂ O ₅ /A
Check	180	16.4	63
15-30-10 dribbled over row	181	16.4	63
30-30-10 dribbled over row	177	16.3	62
45-30-10 dribbled over row	181	16.8	63
60-30-10 dribbled over row	191	16.4	67

Yields adjusted to 15.5% moisture. Kovar, National Soils Tilth Lab.

of P and K suspensions raises the question of how much soil penetration of P (and K) may occur without tillage incorporation. It is interesting to speculate if high concentrations of K could affect P fixation and increase P vertical mobility. For wheat, the possibility of surface banded starter being effective could mean less disturbance of the seed bed particularly if separate fertilizer openers are being used.

Surface bands of nutrients, particularly N, have been proven effective for a number of crops for many years. More recently, the excellent performance of surface banded starters for row crops means that growers with large equipment in reduced-till systems can still reap the benefit of starters without the necessity of separate openers for subsurface 2 x 2 placement. Logistics of handling starters at planting remains a consideration, but for the recorded yield benefits of starters, it is a huge factor to ignore when profits are the ultimate concern.