Dr. John G. Clapp

One Good Way To Add Punch To Starters: Include Sulfur

Industry agronomist says potential yield increases from adding sulfur to starters should be even more positive in the future due to a decline in atmospheric sulfur.

Summary: Following passage of the Clean Air Act of 1990 the need for sulfur (S) in starters has become ever more evident because of the significant drop in sulfate (SO_4) precipitated from the atmosphere. The decrease in atmospheric sulfate deposited since the Act's passage has been as high as 75 percent in some areas. Even though responses to S in starters were apparent before passage of the Clean Air Act, responses since its passage are significantly greater, pointing even more to the increased importance of using S in starters.

Crop yield response to sulfur in starter fertilizers has increased because of 1) increased use of more concentrated phosphate fertilizers, 2) reduced atmos-pheric sulfur levels precipitated due to the Clean Air Act, and 3) reduced use of sulfur-containing crop protection chemicals in crops where fungicides and insecticides are needed.

Phosphorus is a main component of starter fertilizers. Current high-analysis phosphate fertilizers used, such as APP, MAP, DAP, and TSP, contain very little or no sulfur as compared to SSP. Prior to the development of concentrated phosphate fertilizers, single superphosphate was used extensively as a source of phosphorus. This material also supplied a significant amount of sulfur, which was in the range of 60 to 70 percent of that of P_2O_5.

Starter grades high in phosphate are generally recommended in order to stimulate early root development. Liquid starter grades have become popular in many commercial operations

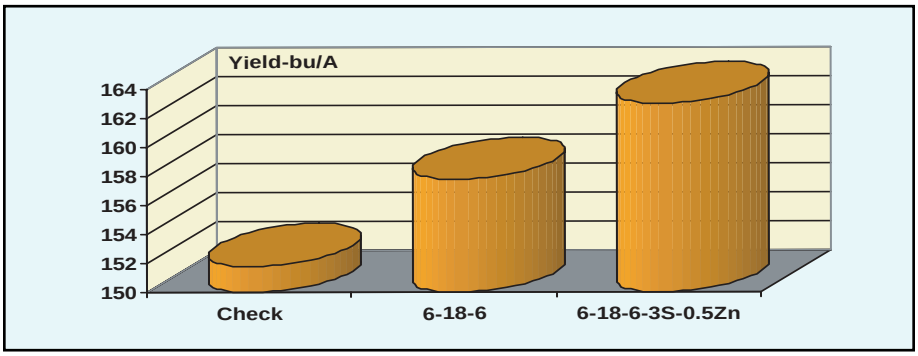

Figure 1. Influence of S and Zn on NPK starter fertilizers applied at 7 gal/A, Eastern Iowa, Paul, avg. 1983-1986.

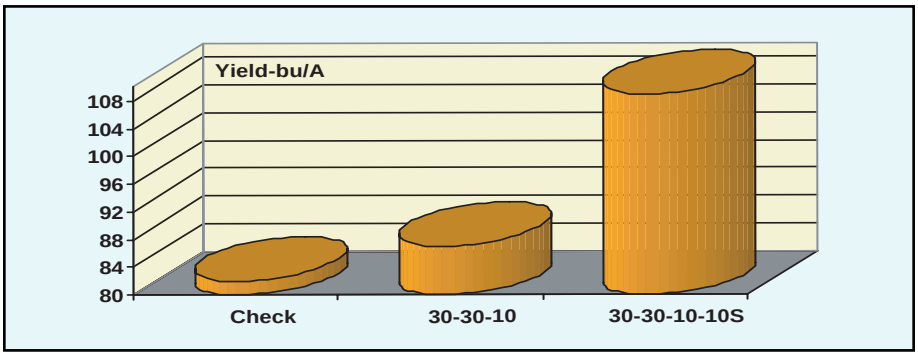

Figure 2. Influence of S on NPK starter fertilizers on dryland corn, N balanced at 150 lbs/A, 2 x 2 placement, Lamond, et al., 1999.

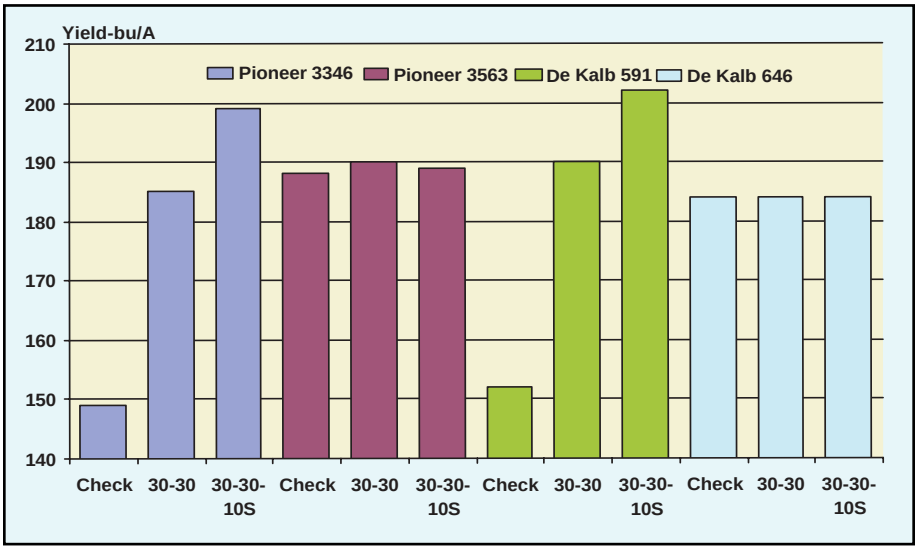

Figure 3. Influence of NP starter fertilizer and NP +S starter on hybrids, Lamond and Gordon, avg. 1996-1998.

because of their uniformity, especially when micronutrients are included. In liquid systems, ammonium polyphosphate (APP) has been the basis for many starter grades, since this product has a high-level phosphate. If additional nitrogen is needed, UAN solution is usually added. To create combinations of N, P, and S, ammonium thiosulfate is added to APP to boost S levels in the mix. The addition of potassium and sulfur can be accomplished by using potassium thiosulfate.

Pre-legislation

Prior to the Clean Air Act of 1990 many areas of the Eastern U.S. received 9 lbs/A of S from the atmosphere. This level has been significantly reduced at many locations. Many of the collection sites are located near urban areas where the atmospheric sulfur level may be greater than in rural areas.

Even before the Clean Air Act, a good response to the addition of sulfur (also zinc) in an NPK corn starter fertilizer was noted in a four-year study. These results, as illustrated in Figure 1, showed a 5.2 bu/A yield response for the addition of sulfur and zinc to an NPK starter fertilizer and a 11.2 bu/A yield response when compared to a no-starter check.

Post-legislation

More recent evaluations of sulfur in starters, since the passage of the Clean Air Act, show an even greater response when this nutrient is added to a starter. Kansas State University researchers, for example, report yield increases of 22 bu/A after adding 10 lbs/A of S to an NPK starter on no-till dryland corn (Figure 2).

This study was continued a second year (2000) with a yield response of 13 bu/A after the addition of sulfur in an NPK starter.

Kansas researchers also report different responses among corn varieties to starter fertilizers with or without sulfur (Figure 3). In this three-year study, the corn varieties Pioneer 3346 and DeKalb 591 responded significantly to NP starter fertilizers, with an additional significant response to sulfur. The responses to sulfur for this three-year period were increases of 14 and 12 bu/A for the varieties, respectively. Pioneer brand 3563 and DeKalb variety 646 did not respond to starters.

Such results offer proof of the benefits of adding sulfur to a starter fertilizer program. Potential yield increase due to adding sulfur in the starter material should be even more positive in the future, since the decline in atmospheric sulfur precipitated is expected to continue.

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