

Corn Response to Sulfur Fertilization when Grown on Irrigated Sandy Soil

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Introduction

The objective of this trial was to investigate how field corn responds to sulfur fertilization when grown on irrigated coarse sandy soil with low organic matter.

Materials and Methods

Soil type was a Fruitfield coarse sand soil with approximately 1.5 percent organic matter and soil pH of 6.0 (buffer pH of 7.0). A spring soil test reported 134 ppm P (very high), 98 ppm K (low), and 11 ppm S (low/medium) in the topsoil. Spring tillage included chisel plowing and disking. Pioneer P1324 hybrid corn seed was planted on May 7. Plant emergence was uniform and final stand counts averaged 31,000 plants/acre. Weed control was achieved by applying s-metolachlor + atrazine + mesotrione herbicide crop pre-emergence on May 13 and a post emergence application of glufosinate + atrazine on June 11. Potash (0-0-60) fertilizer was broadcast at a rate of 200 lb/acre on April 4. Total N (nitrogen) application for the season was 200 lb/acre and applied in split applications as dry urea broadcast on May 24 and liquid UAN through irrigation on July 2 and July 20. Plots were arranged in a randomized complete block design with four replications. A treatment plot consisted of six rows 50 ft long. Calcium sulfate (21% Ca, 17% S) was used as the sulfur source and banded between plot rows at rates equal to 10, 20, and 40 lb/acre sulfur on May 29. An irrigation water sample was collected in July for quality analysis by Texas A&M Water Testing Laboratory, College Station, Texas. Plant tissue sampling occurred on July 19

when corn was at the R1 growth stage by collecting leaves that were opposite and below the primary ear. Plant samples were sent to A&L Analytical Laboratories, Memphis, Tennessee, for nutrient concentration analysis. Yield determinations were made on October 16 by harvesting the center two rows of each plot.

Results and Discussion

This study was conducted on a coarse sandy soil that received 16 in. of rainfall during April and May, creating conditions that probably leached nutrients below the crop root zone. This was evidenced by young corn plants exhibiting slow growth and pale green foliage with yellow parallel striping. Sulfur (calcium sulfate) treatments were applied on May 29 and within a week the treated plots developed darker green foliage, indicating a sulfur deficiency may have existed. However, by July 1 plots were indistinguishable—all were growing vigorously and had developed dark green foliage. Leaf sampling on July 19 revealed all treatments had sulfur concentrations of 0.20 percent or greater, within the A&L Labs reported sulfur sufficiency range of 0.15 – 0.59 percent. Application of sulfur fertilizer increased leaf sulfur concentration by 0.05 percentage units (Table 1). At harvest, plot grain yields were uniformly high and no treatment differences were found.

So how do we explain plant symptoms of sulfur deficiency early in the season but no yield response to sulfur fertilization? An answer might be found in the irrigation water. Analysis by Texas A&M Water Lab found a sulfate (SO_4^-) content of 24 ppm, which would calculate to 1.7 lb of sulfur in every acre-inch of water. Due to infrequent rainfall during

June, July, and August, we applied 16-acre in. of irrigation water to the corn crop. Although this amount of irrigation was necessary to relieve the drought stress, it also was contributing 27 lb of sulfur. Therefore, it is likely applying supplemental sulfur

fertilizer did not increase grain yield this year because the corn plants were receiving adequate sulfur from the irrigation water and other environmental sources during the growing season to support high yield.

Table 1. Sulfur fertilizer treatments, sulfur concentration in plant tissue, and treatment yields.

Treatment	Description	Plant tissue % sulfur^a	Yield bushels/acre^b
Control	No sulfur fertilizer	0.20	258.6
Sulfur 10 lb/acre	59 lb/acre CaSO ₄ applied May 29	0.25	257.9
Sulfur 20 lb/acre	118 lb/acre CaSO ₄ applied May 29	0.23	254.4
Sulfur 40 lb/acre	236 lb/acre CaSO ₄ applied May 29	0.25	261.8

^aLeaf samples collected on July 19.

^bPlot harvest October 16, grain moisture 17%, treatment yields weren't significantly different at the 5% level.