by Bill Mahanna and Ev Thomas

Sulfur — thinking beyond alfalfa

PRODUCERS are keenly aware of the need for sulfur in alfalfa as an 8-ton annual alfalfa yield will remove 43 pounds of sulfur per acre. What may be less appreciated is the potential response corn has to sulfur fertilization. Rainfall once provided sufficient amounts of sulfur for crop growth. However, as the federal government tightened sulfur emission standards, less sulfur can be found in the atmosphere . . . hence our need to apply the vital element to farm fields.

In addition to reduced atmospheric levels, there is also less sulfur in high-analysis fertilizers exemplified by superphosphate (0-20-0) containing 11 to 12 percent sulfur, while triple superphosphate (0-46-0) contains only 3 percent sulfur. Combine this with reduced manure application (typically 0.25 to 0.30 percent sulfur) on many cornfields and sulfur deficiency symptoms can occur, especially in high-yielding years.

Behind the big three

Sulfur is one of 16 elements essential to crop production, ranking just behind nitrogen, phosphorus and potassium. It is necessary for plant protein synthesis, and production of sulfur compounds is important in protecting the plant against stress and pests.

Plants require inorganic sulfate, which is mineralized from organic matter. High organic matter soils provide more sulfate than sandy soils. Mineralization of organic sulfur is a microbial process that occurs faster in warm, moist soils compared to cold, saturated soils.

Corn planted into cold soils may show deficiency symptoms that often disappear when soils warm up and microbial activity is increased. Similar to nitrate, sulfate is mobile in the soil and can be lost due to leaching, making it unavailable to young plants with shallow root systems. In heavily saturated soils, sulfate can be reduced to hydrogen sulfide and volatilized into the atmosphere.

Sulfur deficiency in alfalfa appears as lighter colored (pale) plants in areas of the field not prone to low pH or poor drainage. In the corn depicted in the photo, sulfur deficiency is characterized by yellowing between the leaf veins similar to nitrogen deficiency. Sulfur is not easily translocated in plants, so symptoms typically appear in younger, upper leaves. Meanwhile, deficiencies of mobile nutrients, like nitrogen, show up first in lower leaves. It is best to tissue test plants so as not to confuse sulfur deficiencies with other deficiencies displaying similar symptoms.

Application rates

The sulfur requirement of 200 bushels per acre of corn is 16 pounds per acre for the grain and 14 pounds per acre for the stover. Older research does not show any advantage to sulfur fertilization of corn.

However, research since 2007 at both Iowa State University and the University of Illinois has shown significant yield gains (15 to 28 bushels per acre), suggesting corn growers begin to look at sulfur as part of their fertility plan. This is particularly true for silage corn that does not receive sulfur from manure application.

Sulfate-containing fertilizers provide sulfur in a readily available form, while elemental sulfur sources must be oxidized before being utilized by the plant. Many growers are finding success with the application of synthetic gypsum (flue gas desulfurization or FDG) obtained from a process that removes sulfur dioxide from coal-powered power plants.

In a recent dairy producer meeting in northeast Iowa, alfalfa growers said they were applying as much as 1 ton of gypsum on heavier clay ground. While there are various claims as to the value of gypsum to reduce compaction, improve soil structure and water infiltration in nonsodic soils, there is no disputing the value of 13 to 16 percent sulfate sulfur found in gypsum.

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courtesy of DuPont Pioneer

YELLOWING BETWEEN LEAF VEINS is a symptom of sulfur deficiency in corn.