A lysimeter study of sulfur fertilization of an annual-range soil

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A lysimeter study, to determine the rate and frequency of sulfur fertilization and the source of sulfur for maximum returns, was initiated with the annual legume, rose clover, on Vista sandy loam. Such factors as the availability of sulfur in the soil, sulfur supplied by precipitation and air contact, leaching losses, and the uptake of sulfur by clover plants were considered in the study.

Each lysimeter consisted of a cylindrical tank 74” in diameter and 25.5” deep filled with a reconstituted sandy loam profile. The bottom contained a drain so that the percolate could be collected for analysis.

Gypsum containing tracer amounts of radioactive sulfur was applied at rates of 100 and 300 pounds per acre to two lysimeters each. Two lysimeters were treated with a 200 pound per acre rate of non-labeled gypsum and three lysimeters were not treated and served as checks. Use of the tracer material permitted identification of fertilizer sulfur in the percolate and the plants.

Sulfur in gypsum is very susceptible to percolation loss when applied to a coarse-textured soil such as Vista sandy loam. In this experiment sulfur—sulfate sulfur—was lost from the treated tanks at a rapid rate in the initial percolate from early winter rains. The magnitude of the loss was proportional to the amount of gypsum applied. As the rainy season progressed the amount of sulfur loss per unit of percolate gradually declined, as less and less gypsum remained to be leached.

Each treatment, including the check, lost essentially the same percentage of the total leached sulfur with each increment of percolate. The amount of water passing through the soil was sufficient, evidently, to maintain maximum solubility. The first 50% of the percolate carried down an average of 89% of the total leachable sulfur for all treatments. During the year of the experiment rainfall was abundant—31.8”—and the first 50% of the percolate resulted from an amount of precipitation almost equal to the annual mean rainfall of 19.4”.

There was considerable variation in the concentration of sulfur in rainwater, ranging from a low of 0.5 ppm—parts per million—to a high of 4.7 ppm, but the concentration was as high in the last storms of the season as it was in the first storms, and no particular trend was evident. The amount of sulfur absorbed from the atmosphere by the soil surface was negligible, 0.1 pound per acre.

Growth of clover planted on the lysimeters was stimulated by the gypsum applications and yields were significantly increased.

Left: Cumulative amount of sulfur leached as a function of the amount of percolate from lysimeters receiving several rates of gypsum. Right: Relative rate of loss of sulfur by leaching as influenced by the rate of gypsum application.
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