SULFUR NUTRITION ON GOLF COURSES

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Plants absorb sulfur as the sulfate ion. If applied as elemental sulfur it must first be oxidized by solid organisms into the sulfate form before being utilized by plants. Elemental sulfur is also beneficial as an amendment but we will leave that for further discussion. For now just consider sulfur from the nutritional standpoint.

Sulfur deficiency is often mistaken for nitrogen deficiency in areas where it occurs. Plants become uniformly chlorotic, stunted, and spindly. However, since sulfur does not easily translocate, the symptoms are first noticed in the young leaves versus the older leaves for nitrogen deficiency.

Sulfur deficiencies are rare in Arizona since the irrigation water often contains sufficient sulfate ion to supply the plant needs. There are selected areas of Arizona where little or no sulfate is found in the water and response to sulfur has been found.

Since sulfur is a constituent of three essential amino acids — cystine, cysteine, and methonine — and it is necessary for protein synthesis, it is no wonder that a deficiency exhibits the above symptoms. In plant analysis, a ratio of 10:1 for total N to total S is generally considered adequate for best growth.

Sandy soils, low in organic matter are most likely to show sulfur deficiency. Environmental factors can increase or decrease the likelihood of sulfur deficiency depending on circumstances. For example, elemental sulfur will not oxidize properly under saturated (waterlogged) conditions. Instead, hydrogen sulfide (rotten egg smell) may be produced. Temperature, pH, soil organisms, and fineness of the particles or elemental sulfur also influence the ratio of oxidation.

THIOBACILLUS organisms are generally the main genus of organisms responsible for sulfur oxidation. Oxygen is an absolute necessity for these organisms in order to change elemental sulfur to sulfate. Even then, the rate of oxidation can vary from 4 to 12 weeks or longer depending on the species present. In other words, all soils do not show different rates of oxidation.

Maximum oxidation of sulfur to sulfate occurs at field capacity mositure. Above or below this level the oxidation of sulfur is impeded. Obviously surface application of elemental sulfur is seriously slowed in its oxidation rate.

Most of the sulfur oxidizing organisms are more active in acid soils than in alkaline soils. Since most of our soils are alkaline, the rate of oxidation will be slower than expected, especially if applied during the cooler part of the year. Optimum temperature for oxidation is between 27° and 35°C.

One of the most important factors affecting the sulfur oxidation is the size of the elemental sulfur particles applied. Large particles of sulfur (5-10 mesh) oxidize very slowly and less than 3% was oxidized after 1 month. Compare this to a nearly 82% oxidation rate for particle size 120-170 mesh.

As a rule of thumb, use sulfur that passes a 16 mesh screen 100%, and 50% should also pass a 100 mesh screen.

There are other products and fertilizers containing sulfur that can be used in place of elemental sulfur. Generally, these products are higher in price but sometimes easier and more convenient to apply. Fertilizers containing sulfate will not affect the pH of the soil like elemental sulfur or the poly sulfides with the exception of ammonium, aluminum, and iron sulfates. Remember, it is during the oxidation process that the pH is lowered. If oxidation does not occur, the pH will not be lowered.

Since grasses can more easily extract sulfate ion than broad leaf plants, sulfur deficiencies will be rare in turf. However, when present, they can be difficult to diagnose visually, since they are not expected. An inexpensive analysis on soil or water can remove this from the unknown list of nutrients that can affect the quality of a course. ■