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Sulfur: Necessary for...Everything

Sulfur is a mysterious element. Sulfur compounds are the reason for the smell of rotten eggs and gun smoke, why cutting onions makes you cry, an important part of car batteries, and, unfortunately, that certain taste in Pittsburg's water. One other thing about sulfur...it's a key component in amino acids, proteins, and a necessary nutrient for every living organism. That is why sulfur is a common fertilizer in agricultural fields; however, it's also one that is hard to fully understand. In some ways, it acts like its mobile element sister, nitrogen, but in other ways, it is more immobile, like phosphorus or potassium.

Nearly 95% of the sulfur in soils is within organic matter (O.M.), and most sulfur comes from the decomposition of O.M. Every 1% O.M. in the soil releases 0.4 to 0.8 lbs of sulfur per year. This means that 2 to 4 lbs S per acre per year are released into the soil every year from O.M. in this area. Keep in mind, though, that this release of sulfur is not even throughout the year. Organic matter turnover varies widely with temperature, soil moisture, pH, texture, and tillage management. Rainfall also contains small amounts of sulfur, which amounts to about 1 lb S ac per year in recent years. The rainfall deposition of sulfur used to be much higher. In the 80s and 90s, between 7 to 20 lbs S per acre per year was added by rainfall, depending on the study and location. We cleaned up the sulfur coming from coal and refinery smoke stacks, and now very little comes from rainfall.

The small amount of sulfur coming from O.M. turnover and rainfall is plenty for the majority of our native range, yards, and trees, but might not be enough for the high production of crops and pastures. Common sulfur fertilizer rates for wheat, corn, and other 'grass' crops range from 10 to 15 lbs S per acre. Current research is showing that some fescue and brome pastures could use some sulfur application as well, and deficient fields can see a 500 to 800 lbs per acre increase through application. It would be logical to assume that hayed fields are more likely to see a response. It used to be thought that soybeans, while a huge sulfur user, are unlikely to show any sulfur application response. However, current research is showing that soybeans can respond to sulfur in specific situations. More research is needed to determine exactly what those situations might be.

Testing soil for sulfur is similar to testing for nitrogen and chloride. All of which really requires a profile test that is 18 to 24 inches deep to really understand what's there. This is something that all farmers need to take note of... sulfur on a 6-inch **soil sample is not all that useful**. The reason is that sulfur can collect in our clay subsoils. While nitrogen moves readily with water and can denitrify, sulfur has a tendency to leech and collect in subsoils where it will sorb onto clays. Quite often, the clayey 12" to 18" subsoil depth in our soils can have more sulfur than the

0” to 6” surface soil. Very young crops might not have the roots needed to reach this deeper sulfur, but it doesn’t take long until they can access this reserve. The lack of crop response to sulfur is often attributed to this subsoil sulfur collection. Sandy soils are going to have less sulfur holding ability and less natural sulfur from low O.M. soils.

Research has shown that crop response isn’t all that different based on fertilizer type, given similar application rates and losses. The exception is sulfur fertilizer. Ammonium sulfate (AMS) and ammonium thiosulfate are instantly available because they’re already in a plant-available form. Gypsum (calcium sulfate) needs a little time to dissolve, but it is also quickly available. So is the sulfur in “40 Rock”. However, element sulfur, a common, cheap fertilizer source, is not in a plant-available form. After application, converting element sulfur (S) to plant available sulfate (SO₄) is a multi-step microbial process that takes time. The conversion process takes months to a couple of years. Elemental sulfur is a cheap and recommended fertilizer source, but it requires proper planning. Fortunately, due to the slow breakdown and subsoil collection, a “sulfur bank” can be created and available to the crop when needed. Note that poultry litter also has sulfur, and likely plenty of it for the kind of yields we are expected to have around here. Still, litter is highly variable based on source, and sulfur content is one aspect of its use to look at.

Sulfur is a needed element for all living things, and nature has a way of providing sufficient amounts in rain and soil. However, as sulfur has been cleaned from our atmosphere and crop production has increased, sulfur deficiency is possible in our high-production crops. If you have any questions about soil fertility, please give me a call at the Wildcat Extension Girard office at 620-778-1037.

For more information or questions about preparing for or planting, please contact James Coover, Crop Production Agent, at jcoover@ksu.edu or (620) 724-8233.

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