Forms of Sulfur: Sulfate vs. Elemental

Sulfur fertilizer sources are gaining attention as the amount of sulfur available from the environment decreases and nutrient removal and uptake rates are showing the need for additional nutrients. There are many fertilizer options on the market today, but the majority fall into one of two categories: **sulfate**, which is mobile in the soil, or **elemental sulfur**, which is immobile until it is oxidized. Ultimately, the source of sulfur you choose to apply varies depending on time of year, precipitation pattern, and soil type. Learn more about the different forms of sulfur to make the best fertilizer decision for your crops.

Sulfate Sulfur:

Sulfate sulfur is the only form of sulfur that plants can utilize, but because it is immediately available to plants, it is also prone to loss through leaching. The most common sulfate fertilizer source is ammonium sulfate (AMS). AMS may not be the best choice when AMS granules are not similar in size and weight to other nutrients in a blend (causing segregation). Sulfate-sulfur fertilizers are more suited for pre-plant and in-season applications since the form is readily plant available.

Elemental Sulfur:

Elemental sulfur sources are the most concentrated sulfur carrier but must be oxidized to sulfate (SO_4^{2-}) before the plant can utilize it. Traditional elemental sulfur granules can take months, or even years, to oxidize completely. Since the elemental sulfur form needs to be oxidized to become plant available, fall applications are an option. Oxidation rates are dependent on the following factors:

Environmental and Soil Factors

- Microbial presence
- Soil temperature, moisture, aeration and soil pH

Fertilizer Factors

- Sulfur particle size
- Sulfur particle distribution

Micronized Sulfur Technology (MST):

A newer option on the market, Micronized Sulfur Technology (MST), is a patented technology where the elemental sulfur source has been micronized, resulting in an average particle size of 15 micron. The smaller particle size allows for quicker elemental sulfur oxidation and earlier availability to crops, and as particle size decreases, surface area multiplies.

Smart Nutrition™ MAP+MST®:

Smart Nutrition MAP+MST integrates the micronized elemental sulfur directly in the manufacturing of Mono-Ammonium Phosphate (MAP) granules and has a guaranteed analysis of 15 percent elemental sulfur as MST. Benefits include:

- Uniform distribution of MST in each granule allows for maximum soil to fertilizer contact
- Increased surface area, increased oxidation rate

- Minimized risk of sulfate leaching in high loss environments
- High phosphorus and sulfur nutrient density means overall lower fertilizer volumes needed to meet nutrient recommendations

Learn how Smart Nutrition works and how to apply it to ensure your crops have access to the sulfur they need throughout the growing season.