Post Rock Extension District Column

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By Sandra L. Wick
K-State Research and Extension-Post Rock District
Crop Production Agent

Could sulfur deficiency be a problem in your already drought-stressed wheat?

Well, winter has certainly not brought the much-needed moisture yet so far, but we certainly are hoping for some to occur in the next couple of months. The 2023 wheat crop is certainly struggling at this time mostly from limited moisture and growth development, however, in recent years, sulfur (S) deficiency in wheat has become more common in many areas of Kansas, particularly in no-till wheat.

During the current season, the wheat crop has likely taken up a very limited amount of S due to two main reasons. First, the majority of the S needs by the crop will occur after spring green up, when the crop goes through stem elongation. Thus, fall S needs by winter wheat are very small, which was exacerbated this year by small crop growth due to droughty conditions that limited crop emergence and tillering across most of the state. Second, the dry conditions also likely limited S movement into the root zone.
Historically, S deficiency was most common on high-yielding crops grown on irrigated, sandy soils that are low in organic matter and subject to leaching. However, due to reasons discussed above, an increasing number of finer-textured soils have shown S deficiency in recent years.

Generally, S-deficient wheat is yellow and stunted and is observed in patches in the field, especially in areas where there has been previous soil erosion or soil movement. The patchy S-deficient areas of the field are often found on hilltops or side slopes where erosion has occurred and soil organic matter is reduced, or where leaching is more pronounced.

Sulfur deficiency in growing crops is often mistaken for nitrogen (N) deficiency. However, unlike **N deficiency where older leaves** show firing and yellowing, with **S deficiency, the pale-yellow symptoms often appear first on the younger or uppermost leaves**. Wheat plants with S deficiency eventually become uniformly chlorotic.

Sulfur deficiencies in wheat have been showing up early in the spring, shortly after green-up, before organic S is mineralized from soil organic matter, and before wheat roots can grow into the subsoil to utilize any available S (sulfate) accumulations. Deficiencies of S are often difficult to identify because the chlorosis is not always obvious. Crops lacking S also may be stunted, thin-stemmed, and spindly. In the case of winter wheat, S deficiency delays stem elongation and early-spring maturity; however, it can hasten late-spring maturity and shorten the grain-filling period.. Winter annual weed competition is also enhanced due to the slower growth and lack of good tillering.

At present, many fields in north central and northeast Kansas have an established history of S deficiency for wheat. In this situation, rather than waiting for symptoms to appear in the spring, farmers may want to consider a winter topdress application of S as a preventive measure.

So what are the different forms of sulfur in the soil? The majority of S in soils is present in organic forms in surface soils and as sulfate (SO_4^{2-}), an inorganic form. Sulfate is relatively soluble or mobile, so it tends to leach down into the subsoil. In many of our Kansas soils, it will accumulate in the B horizon (subsoil) in two forms. Clay surfaces and coatings will retain some sulfate, and sulfate will also be present in the subsoil of many Kansas soils as gypsum (calcium sulfate).

So is there a soil test for sulfur and when is the best time to collect a sample? There is a soil test for available sulfate-S in the soil profile. For proper interpretation of this test, soil texture, soil organic matter, the crop to be grown, and the expected yield level all need to be considered. Accurate estimates of S needs cannot be made from a surface sample alone. Since sulfate is mobile, sampling to a **24-inch depth** is important. However, due to the relatively high demand for S during the rapid vegetative growth phase of wheat, and relatively shallow rooting by the wheat crop at this time, the S measured in the deeper, subsoil levels by the test may not be available to wheat in the early spring, especially where soils are cold. Now is a good time to collect soil samples and assess S levels as we plan for topdressing.

What are the different kinds of S fertilizer? There are many S-containing fertilizer materials. Several dry materials are available that can be blended with dry phosphorus or nitrogen fertilizers for winter/spring topdressing. However, some of these products are best used in pre-plant applications.
Dry fertilizers include Elemental S, Ammonium sulfate, AMS, Gypsum (analysis varies) and New N-P-S products such as micro-essentials, 40-rock, MAP+MST, and others that are typically ammonium phosphate materials formulated with S, and in some cases micronutrients such as zinc. **Liquid fertilizers** include Ammonium thiosulfate, ATS (12-0-0-26S) and Potassium thiosulfate, KTS (0-0-25-17S).
Topdressing with thiosulfate and UAN can be done early, before Feekes 5 growth stage (green up), and at temperatures below 70 degrees F. Be aware that some leaf burn may be expected with some of these liquid fertilizers. These products would be good sources for pre-plant application as well, although pre-plant applications would be more prone to leaching during the fall and winter when crop uptake is limited – especially in sandier soils where S deficiency symptoms are more common.

For more information on "wheat fertilization", stop by or call me at any office of the Post Rock Extension District in Beloit, Lincoln, Mankato, Osborne or Smith Center.

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*Post Rock Extension District of K-State Research and Extension serves Jewell, Lincoln, Mitchell, Osborne, and Smith counties. Sandra may be contacted at swick@ksu.edu or by calling Smith Center, 282-6823, Beloit 738-3597, Lincoln 524-4432, Mankato, 378-3174, or Osborne 346-2521. Join us on Facebook at "Post Rock Extension" along with our Ag News Roundup on Fridays.. Also remember our website is **www.postrock.ksu.edu** and my twitter account is @PRDcrops.*