Waypoint ANALYTICAL

# Sulfur & Boron Testing in Soybeans

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*Crop Notes*

Soil testing is a proven tool for evaluating nutrient availability. In Illinois, the established trend for many is to test every four years, focusing on pH, phosphorus, and potassium. But plant growth also requires an adequate supply of several other nutrients. Some assume that Illinois soils do not require micronutrient testing or that testing for them is expensive. Both of these assumptions may have been true in the past, but neither is true today. The increasing use of the Mehlich III (M3) extraction now allows for accurate and cheaper testing of all essential nutrients. However, sulfur (S) and boron (B) are commonly believed to be inaccurately represented. While the test for extracted S and B is accurate, there are characteristics of each that can make them difficult to extract.

Sulfur acts much like nitrogen (N) in soil. It's largely found in organic matter, and must be converted into sulfate ($SO_4^{2-}$) by microbes to be taken up. This sulfur OM fraction is not easily extracted, and the negatively charged sulfate is prone to leaching. M3 soil test levels of 20-40 ppm sulfur are generally adequate, but this doesn't account for potential additions from OM or losses by leaching.

For boron, typically only a small fraction in soil is available to plants. If available B is low, it is difficult to detect because of the tiny quantities extracted. Soils with higher B are more accurately tested, including soils with potentially toxic levels. M3 soil test levels of 0.5-1.5 ppm are considered optimum.

Plant tissue testing is another tool gaining popularity in Illinois. It allows us to determine proper nutrient levels within the plant. Tissue tests accurately measure all essential nutrients in the tissue, including sulfur and boron. Inadequate nutrition can be caused by low soil availability, compaction, excess/inadequate moisture, diseases, nematodes, and more.

Optimum tissue test levels for each nutrient can vary based on growth stage because nutrient demand fluctuates. Including the growth stage with your samples allows the lab to provide proper result interpretations. Nutrients found in larger quantities are usually expressed as percent (%), while nutrients in smaller quantities are expressed in parts per million (ppm). Optimum sulfur concentrations in soybean range from 0.3-0.8% through V6, drop to 0.25-0.6% at R1, and drop further to 0.2-0.5% at R2+. Boron remains constant at an optimum range of 20-60 ppm throughout all soybean growth stages.

Nutrients such as N, P, K, and S are required in large amounts and therefore difficult to correct in-season. Foliar applications of micronutrients like B are possible to reduce yield loss in-season, but the best long-term solution is to correct issues in the soil. Because of the reduction in acid rain, our soils no longer receive "free" sulfur from the atmosphere. Adding sulfur annually at a rate of 20-30 lbs per acre works well where sulfur deficiencies exist, preferably in a readily available $SO_4^{2-}$ form. Boron can also be applied to the soil, but with care to not over-apply and cause phytotoxicity. Typically, 1-2 lbs per acre is an adequate rate in boron-deficient soils.

Soil and tissue tests are important tools for growers to properly assess nutrient availability and supply. Each test has their own benefits and limitations, but when used together a grower can gain a better overall picture of their agronomic practices. Some nutrients like sulfur and boron require both tools to generate adequate data for optimal management. Proper nutrition keeps soybeans healthy by allowing them to better resist yield loss from diseases, insects, nematodes, and drought. Ultimately, increased yields should result. Speak with an agronomist at a testing lab to learn more about how to fit these tools into your system.