Modern Soybeans Require More S and N

Purposeful nutrition management and timely planting can pay off in yield.

Increasingly, soybeans are becoming more than just something to rotate with corn. Savvy growers are learning that high-yielding soybean varieties, if managed intentionally, will pay off the extra effort in yield. In a recent webinar, "High-Yielding Soybeans: More Sulfur (and Nitrogen) Acquired or Required?" Dr. Shaun Casteel, Extension Soybean Specialist at Purdue University, highlighted key management practices to help growers optimize their soybean yields. He stressed that timely planting and the appropriate nutrition applied at the right growth phase make a significant difference in the modern high-yield varieties.

"Growers are starting to be more intentional with their decisions in regard to soybeans," Casteel says. "It no longer should be a crop you just plant and hope for the best. We have good data that shows earlier planting of soybeans is a crucial part of yield management. And the newer varieties are taking up and using more nitrogen (N) and sulfur (S) than the older varieties, which means we have to be more purposeful about nutrient management."

The pattern of uptake of S has changed significantly over the years in modern soybean varieties (see chart below). More sulfur is now removed at harvest. "You have the combination of varieties that need more S at the same time there is less of it available in the soil," Casteel says. "In 2001 we had more than 18 pounds of S per acre coming from the atmosphere in the Midwest and upper Midwest. The Clean Air Act in 1990 reduced sulfur emissions and acid rain. By 2015, only to 3 to 5 lb/acre of S were from the atmosphere."

In addition, the newer high-yielding corn varieties are using and removing more S and N during the season and at harvest.

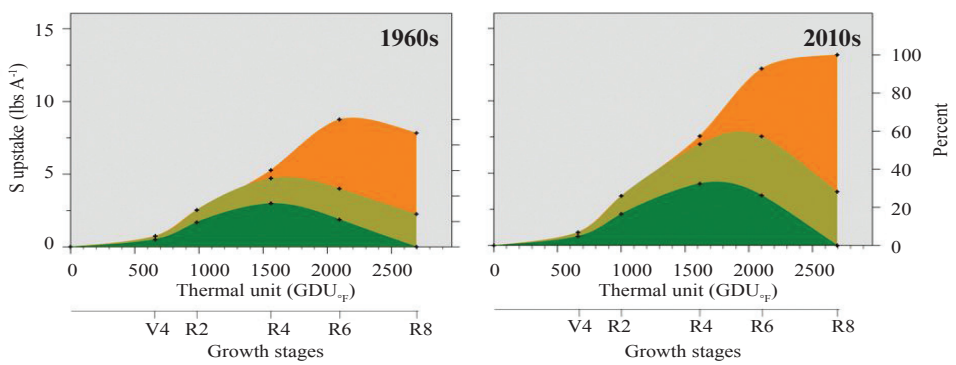
How much S to apply in a particular field is a function of many variables, including soil type and organic matter content. "There is no reliable soil test for S because it is mobile in the soil," Casteel says. "And tissue samples are just a snapshot, so take two or three during the early and midpoint of the season. Optimum leaf concentrations of S should be between 0.25% to 0.60% for bloom to early pod set."

Planting During the 'Sweet Spot'

The time of planting can make a big difference, too, Casteel says. "In the Midwest, late April to early May is the sweet spot," he says. "You want to use the best combination of heat accumulation and light interception to maximize nodal development, reproductive branches and canopy closure. Ideally, the canopy should close before reproduction starts, around July 4. Our research shows that for every day after mid-May or even early May sometimes, there is a loss of yield potential of at least 0.3 to 0.4 bu/acre per day."

Casteel and his team tested a number of S fertilizer products applied at various S rates at planting. The S sources included Sulf-N® ammonium sulfate, MicroEssentials® MES-10, and a Tiger 90CR® blend, with both of the latter sources containing half the total S as ammonium sulfate and half as elemental S. While all three sources yielded similarly at rates of 20 and 30 lb S/acre, the two elemental S-containing sources were less effective than ammonium sulfate at rates of 5 and 10 lb S/acre. In fact, the grain yield with ammonium sulfate at 10 lb S/acre already attained the maximum grain yield, and there was no significant oxidation of the elemental sulfur in the other two sources to add available S during seasonal soybean growth. In other words, S from ammonium sulfate was twice as efficient in achieving maximum grain yield than S from the elemental S-containing products. Thus, that is the reason why 20 lb S/acre were required to achieve maximum grain yield with MES-10S and with the Tiger 90CR blend, while 10 lb S/acre were enough when Sulf-N was used.

The optimal rate of S is based on the source and timing (e.g., growing conditions) for soybean. If sulfur applications are within a few weeks of planting (before or after), 10 to 20 lb S/acre will be more than enough if S is needed. The lower rates would be more associated to soluble S sources (i.e., sulfate form) and late spring/early summer; whereas, the higher rates would be needed for those that are less soluble and/or earlier in the spring.



The pattern of uptake of sulfur (S) has changed significantly in modern soybean varieties. Research shows that varieties developed in the 2010s (right) continue to absorb and use S between R6 and R8 (during seed and pod development), while older varieties decrease their use after R6.