Maintaining Nitrogen:
Sulfur Ratio Is Vital to High Cotton Yields

Pushing for top yields in cotton may require higher rates of sulfur fertilizer, says University of Georgia extension agronomist Dr. Glen Harris.

“Our recommendation for cotton is 10 pounds of sulfur per acre,” Harris notes. “I think it’s adequate for the average rates of nitrogen. But if you go with higher nitrogen rates for a high-yielding cotton crop, you might need 20 pounds of sulfur.”

The key, he says, is to keep sulfur (S) in step with nitrogen (N) in the plant. “You’ve got to maintain the proper nitrogen-to-sulfur (N:S) ratio in the tissue, maintaining a 12:1 to 15:1 ratio,” he explains. “Nitrogen and sulfur are both components of amino acids. If you don’t have enough sulfur and you have too much nitrogen, you can have a problem. You can have sulfur deficiency problems if you get above 18:1. If you get above 20:1, you’ve probably got a serious sulfur problem. That ratio holds pretty strong for all crop plants.”

Have It Available

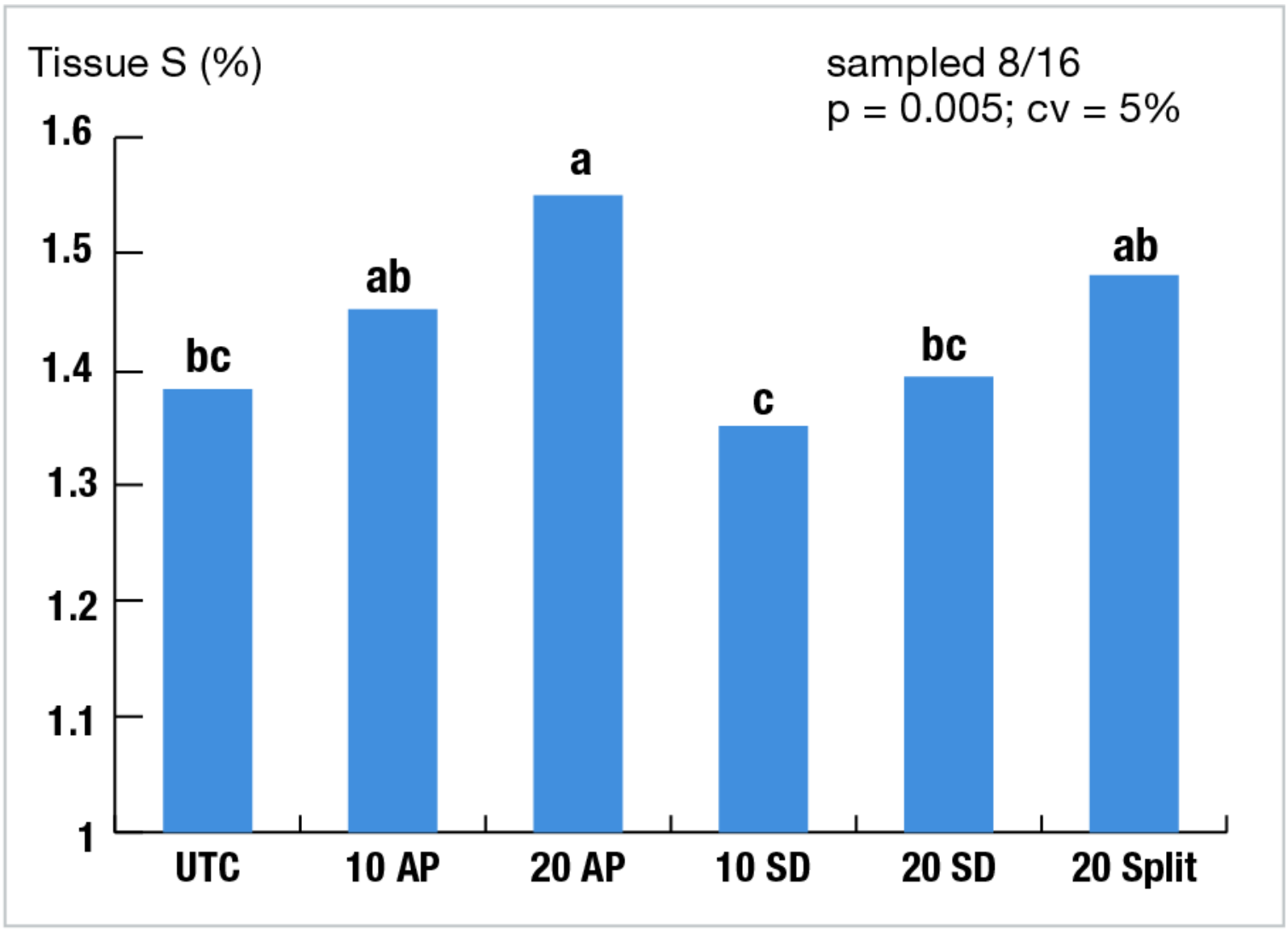
Harris is a believer in split applications of sulfur if possible, some at planting and some at sidedress. This is to help ensure that the nutrient is available throughout the crop’s period of greatest demand, which peaks in the fourth week of bloom.

If sidedressing is not economical, it’s worth applying the full rate of S at planting to avoid a shortage when the plant is producing foliage, setting squares or starting to fill bolls. In fact, a 2016 trial at the Sunbelt Expo grounds near Moultrie, Ga, logged the highest yields from at-plant applications of 20 pounds of sulfate-S per acre.

The accompanying figure shows sulfur concentration in cotton tissue at different rates and timings of S fertilization for that location.

“You want to have that sulfur there between first square and first bloom,” Harris notes.

Sulfur Concentration in Tissue
in Response to Different Rates and Timings of S Fertilization



Sunbelt Expo grounds, 2016. Sulfur rates are in lb/acre; UTC = untreated check; AP = after planting; SD = sidedressed a week prior to bloom; Split = ½ AP, ½ SD.

The sulfate-S form of sulfur is immediately available to crops, while elemental sulfur must be transformed by soil microbes into the sulfate form before it can be used by plants. Harris shies away from recommending foliar sulfur rescue treatments because of the risk of foliar burning, preferring to see sulfate applied to the soil to correct deficiencies.

Impacts on Yield

Harris recalls sidedress trials in 2014 near Camilla, Ga, in a crop suffering an acute shortage of sulfur.

“I wouldn’t have thought the sulfur-deficient cotton would have made a bale per acre,” he says. “It made two. But where the crop had enough sulfur, it made three bales.”

Harris is quick to note that most producers could have fixed the deficiency with a prompt sidedress application of ammonium sulfate or other immediately available nitrogen/sulfur fertilizer. The result would have likely been a yield between two and three bales per acre versus just two, he figures.

The impact of sulfur on yield can depend on the season, crop and soil type. Harris notes that the coarse soils of the Coastal Plain tend to be low in sulfur and have minimal ability to hold onto the mobile nutrient in a climate that receives more than 50 inches of rainfall per year.

"Last year, we didn't see a big impact on yield above 10 pounds per acre of sulfur," Harris points out. "But if you look at sulfur in cotton tissue tests, I definitely get a rate response." Cotton is a sulfur-intensive crop, removing as much as 12 pounds of sulfur per bale of lint.

Especially in light of the pursuit of high yields with today's genetics and inputs, Harris says he would like to see more work conducted on rates, sources and timing of sulfur. Meanwhile, he recommends producers set realistic yield goals and apply agronomic rates of sulfur to provide adequate levels and keep N:S ratios in balance. Paying attention to sulfur at planting can avert a scramble at bloom, he adds.

"I want you to do a good job with your soil-applied sulfur so you don't get into trouble later with your crop," Harris says.

Useful Resources

Sulf-N® ammonium sulfate is an excellent source of sulfate-S, which is immediately available to plants and ammonium-N. For more information on Sulf-N® and the benefits of ammonium sulfate in cotton, visit this page or contact Mercedes Gearhart, Senior Agronomist for AdvanSix.

Contact AdvanSix
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