

## WET SPRING COULD PUT SULFUR OUT OF COTTON'S REACH



In many light-textured Coastal soils, months of wet weather may have put sulfate-sulfur (S) — which is prone to leaching in wet weather — out of reach of cotton roots. Coupled with the region's naturally low-sulfur soils and a long-term decline in the deposition of airborne sulfur particles since the enactment of clean air laws, cotton growers in the Southeast should be on the lookout for sulfur deficiency.

Dr. Carl Crozier, extension soil fertility specialist at North Carolina State University's Vernon G. James Research and Extension Center in Plymouth, N.C., notes that each field has its own circumstances.

"This is highly variable across sites because of localized weather conditions and amounts, and intensities of rainfall as well as differences in soils, tillage, residue and cover crop practices," Crozier says. "But generally, more water moving through the profile leads to more likelihood of sulfate-S leaching downward in the profile."

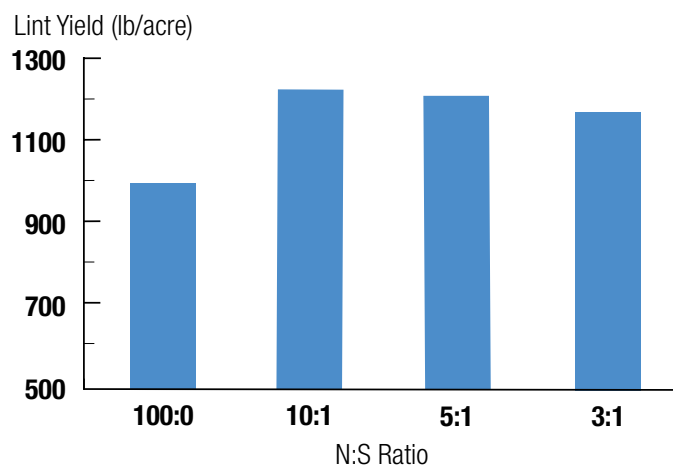
In the Fertilizer chapter of North Carolina State's *2018 Cotton Information*, Crozier and co-author Dr. David Hardy of the North Carolina State Department of Agriculture and Consumer Services explain that in low-organic-matter, sandy soils, sulfate-S travels with water into the soil profile until it encounters a layer of clay. If that clay layer is more than 18 inches below the surface, the S may be located in a place too deep for the crop to utilize.

### Managed Like Nitrogen

Sulfur deficiency can be a big hit to the pocketbook. Virginia Tech research typically reveals a 100- to-200-pound lint boost from applying S in deficient fields, notes Dr. Hunter Frame at Virginia Tech's Tidewater Research and Extension Center in Suffolk, Va. Because air pollution laws over the past few decades have dramatically reduced the amount of airborne S per acre deposited by acid rain, Virginia farms

do not get as much "free" S. According to Frame, they used to receive 15 to 40 pounds of S per acre, but now get only two to six pounds. Consequently, most cotton fields in the state are fertilized with blends containing S.

"We manage sulfur like nitrogen (N)," Frame says. "We have very low organic matter in southeastern Virginia, which makes sulfur and nitrogen highly leachable. In cotton right now, our recommendations are 20 pounds of



Lint yield for varying N:S ratios averaged over N rates of 60, 100, and 140 lb/acre at Suffolk, Va., in 2016.

Source: Dr. Hunter Frame. Adapted from *The Fluid Journal*, Winter 2018. Vol. 25, No. 4, Issue 99.

total sulfur per acre. Cotton following peanuts gets a 10-pound sulfur credit.

“Most of our sulfur in cotton goes out at sidedress, but we’re finding it may be beneficial to split that application between planting and sidedress,” Frame adds. “We’re starting to see a greater yield response putting some sulfur out at planting.”

Crozier and Hardy recommend three to five pounds of S per acre at planting — enough to get the crop started without leaving too much in the soil to leach in spring rains — followed by a sidedress application to achieve their 15- to-25-pound-per-acre recommended rate.

## In Balance

Frame points out that S is vital for creating chlorophyll and building many types of protein. Most ends up in cotton leaves. Frame tracked the fate of 25 pounds of applied S and found 17 pounds in the leaves, 1.5 pounds in the stem and five pounds in the bracts around the bolls.

He notes that an N:S ratio in leaf tissue of about 8:1 is typical in healthy cotton plants. In petiole tests, nitrate-N:S ratios of 30:1 or higher could predict yield loss due to a lack of balance between N and S in the crop. Frame cautions against N/S applications after mid-bloom, which may cause rank cotton and boll lock in a late-season growth spurt.



S-deficient cotton, Suffolk, Va., treated with 140 pounds of N and no S, 2016.

Source: Dr. Hunter Frame, *The Fluid Journal*, Winter 2018. Vol. 25, No. 4, Issue 99.

## Visual Symptoms of Deficiency

S deficiency presents similar visual symptoms as N deficiency in crops — yellowing leaves and reddish petioles.

However, the pattern of yellowing is the telltale sign. Because S is relatively immobile in the plant, Frame says, yellowing of S-deficient cotton appears in the new leaves of the upper canopy. N is readily moved through the plant’s conductive tissue, so yellowing occurs in older foliage as the crop relocates scarce supplies to nourish new vegetation.

Not all forms of S are readily crop-available. For example, elemental S must be converted by soil microbes into the sulfate form before plants can access the S. Sidedress applications of ammonium sulfate deliver sulfate-S,

which is immediately available to the crop. Ammonium sulfate also contains ammonium-N, which resists volatilization. Frame points out that surface applications of urea may lose 20 to 50 percent of their N to volatilization in the field, and laboratory testing demonstrates losses as high as 70 percent.

Though visual symptoms of S and N deficiency can be addressed through rescue applications, Frame says the best approach is a planned approach that keeps cotton supplied with S from the start.

“It’s extremely important (to keep cotton well nourished), and sulfur is one of the three nutrients we see the most deficiencies in cotton,” he notes.

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