

# THE GRAZIER



## Balancing Sulfur and Nitrogen Boosts Forage Yields

University researchers aiming to boost the yields and quality of forage and hay crops have found one way to do it economically — sulfur fertilizer.

Some soils, particularly those with low organic matter, are deficient in sulfur. By including ammonium sulfate in their fertility recommendations, researchers nationwide have improved the yields of forages like Coastal bermudagrass, bahiagrass, smooth brome grass and alfalfa. On some forages, adding sulfur has also improved their digestibility and protein.

### Coastal Bermudagrass in South

Mike Phillips, University of Arkansas, says the right balance of nitrogen and sulfur in Coastal bermudagrass results in about a 3 to 6 percent increase in crude protein and a production increase of up to 3,000 pounds of hay per acre.

Last year, Lafayette County Extension Agent Joe Vestal conducted a field trial comparing the performance of ammonium sulfate to ammonium nitrate on an established bermudagrass stand on a sandy loam soil.

"We worked with a pasture that had a thin stand to begin with," says Vestal. "The soil test indicated a sulfur deficiency — there was only 12 pounds of available sulfur per acre. But for top production, bermudagrass needs at least a 25 pound soil test level."

Side-by-side applications were made of ammonium sulfate and ammonium nitrate.

"We saw a definite sulfur response to ammonium sulfate," says Vestal. "The sulfur-treated plots really greened up, but the ammonium nitrate plot stayed a little yellow. We cut 1,200 more pounds of hay per acre on the sulfur-treated plot."

The increased forage productivity results from maintaining the optimum ratio of nitrogen to sulfur for protein formation. "The ideal N/S ratio in the plant is about 10:1 or 12:1," says Phillips. Approximately 100 pounds of ammonium sulfate (21-0-0-24 S) plus another 250 pounds of nitrogen per acre as ammonium nitrate during the first two spring applications is best. Another benefit of using ammonium sulfate over other nitrogen fertilizers is the improved plant recovery of nitrogen. When sulfur is deficient, bermudagrass only takes up about 55 percent of the nitrogen applied as ammonium nitrate. But

at moderate production levels, bermudagrass takes up about 80 percent when sulfur is available. The improved recovery means there is less potential for groundwater contamination.

Marcus Eichhorn of Louisiana State University has also measured an improved yield response from Coastal bermudagrass fertilized with ammonium sulfate.

"We've seen small but consistent increases in yields by using ammonium sulfate during the first fertilizer application in the spring," says Eichhorn. "We expect to see about an extra 500 pounds per acre for each cutting or one ton per year."

### Bahiagrass in Florida

According to Jack Rechcigl, of the University of Florida's research center in Ona, the quality of the forage crops in Florida has always been one of the factors limiting cattle performance and calf crop.

"The majority of Florida soils are sandy and have a very low nutrient holding capacity," says Rechcigl. "One nutrient that is deficient in many Florida soils is sulfur. Production went up as we increased nitrogen rates. But when we used ammonium sulfate instead of ammonium nitrate, our yields improved by as much as 25 percent."

The optimum yield response occurred when 77 pounds of sulfur per acre were used with 500 pounds of 0-10-20. Half of the fertilizer was applied in March, the balance in September.

In addition, the sulfur fertilization improved crude protein by 1.2 percent and digestibility by 3 to 4 percent 30 days after application.

### Alfalfa in Wisconsin

On the sandy soils common in northern and central Wisconsin, researchers have produced economically rewarding increases in alfalfa yields by applying nitrogen and sulfur at seeding.

Keith Kelling of the University of Wisconsin says a 20 to 40 pound nitrogen application at alfalfa seeding — plus sulfur as recommended by soil and tissue tests — can boost yields from the first year's production by almost one ton.

In experiments at the Spooner research station, an application of 200 pounds per acre of ammonium sulfate (42 pounds of nitrogen and 48 pounds of sul-

fur.) yielded 7.33 tons per acre over two years, an increase of 1,760 pounds per acre over the check.

"Alfalfa is a crop that removes a fair amount of sulfur from the soil. We suggest growers begin with a soil test," says Kelling. "To determine how much sulfur fertilizer a grower might need, we've developed a modeling approach to credit the sulfur content of rain, manure, and other sources."

### Smooth Brome grass in Kansas

Research conducted by Ray Lamond, Kansas State University Extension soil fertility specialist, has shown the addition of 15 to 30 pounds of sulfur results in consistently higher brome grass forage production. Results from 1990 test plots indicate that fertilizing with sulfur can also increase crude protein content.

"We measured a sulfur response on silt loam soils with three percent organic matter — soils where you wouldn't expect to see a response," says Lamond. "But brome grows actively in early spring. Under cool soil temperatures, there is less sulfur available from the breakdown of organic matter in the soils."

Adding either ammonium sulfate or ammonium thiosulfate increased forage production by an average of about 400 pounds per acre per year at sites in Riley and Greenwood Counties, compared to nitrogen-only test plots.

In 1990 Lamond also measured a marked increase in the protein content of hay. The crude protein content of the sulfur-treated brome grass averaged 23 percent, compared to 19.8 percent for the nitrogen-only test plot. The plots were sampled in mid-April.

The improved yields and protein content of the brome grass will be a boon to farmers, especially those who place heavy demands on the crop. It is not uncommon for growers to graze brome pastures early in spring, let the grass regrow, cut hay in June or July and then graze cattle again in the fall.

"Our results have been fairly conclusive," says Lamond. "We're recommending that growers, especially those who demand a lot from their forages, seriously consider using 15 to 20 pounds of sulfur per acre as a part of their brome grass fertilization program."