ForageToday

December 1999

Sulfur Surprise

Air cleanup leaves forage crops short of sulfur

It's the old story: One guy's solution is the next guy's problem. In this case, crops—especially forage crops such as alfalfa—seem to be suffering from air pollution cleanup.

Efforts to remove sulfur dioxide from the air, through the 1970 and 1990 Clean Air acts and the 1995 Title IV Acid Rain Program, could be starving crops of needed sulfur.

"As sulfur emissions are reduced, we see a lot more sulfur deficiency," says Sulphur Institute agronomist Don Messick. Forage crops tend to have high sulfur requirements, he says, and alfalfa requires the most.

"Crops are not getting as much sulfur as they used to from traditional sources, and farmers don't realize their crops are getting short-changed," Messick says. Sulfur is the fourth major nutrient, after nitrogen, phosphorus and potassium.

There may be even less "free" sulfur in the future. "Between 1988 and 1997, we've seen a 39% decrease in sulfur dioxide concentration in the air," says Rona Birnbaum of the Environmental Protection Agency acid rain section. There's been a drop of 4 million tons of sulfur dioxide since the 1995 acid rain program began. About 70% of that came from plants generating electrictricity, she says.

Breathe it in. The sulfur cleanup, or deficiency, will become more intense in coming years. The next phase of the program begins in 2000, Birnbaum says, and will remove another 6 million tons of sulfur dioxide from the air.

Other sulfur-related complications come from higher crop yields and more intensive land use, Messick says. "As we increased crop production per acre, we created a demand for all nutrients, and sulfur is no exception." Add to that a gradual shift by farmers away from fertilizers such as ammonium sulfate and superphosphate—fertilizers that carried incidental, but critical, sulfur.

PHOTO: BOB HOEFT, UNIVERSITY OF ILLINOIS

Pale, sulfur-starved alfalfa is stunted compared with dark sulfur-fed plants.

By Alan Knight

Conventional agronomic wisdom says sulfur deficiencies show up in sandy, coarse-textured soils with low organic matter. True, says Texas Tech agronomist Vivien Allen. "But there is increasing evidence of deficiency in other types of soils, even though soil testing would indicate no sulfur deficiency." The best test for deficiency is a plant tissue analysis.

Response to sulfur fertilization increases where roots are restricted, she says. That occurs when soil is high in aluminum content or underlain by hardpan.

Cool, wet conditions boost crop response to sulfur, too. "Our biggest yield responses [to sulfur] in cool-season forages occur in years when spring is delayed, [bringing] conditions that inhibit organic breakdown," says Raymond Lamond, Kansas State University agronomist.

On irrigated alfalfa growing in soil with 3.5% organic-matter, the biggest response to sulfur comes with the first cutting, says George Rehm, University of Minnesota Extension agronomist. "That's when it's the coolest. The increase in tonnage decreases with each cutting as temperatures are climbing," he adds.

Bottom line. Studies show that cows grazing sulfur-fertilized pastures produce calves with higher weaning weights. The added sulfur—a building block of protein—results in higher milk production or alters milk in a positive way. "Calf weaning weights probably translate into $5 to $10 per acre increase in value as a result of the added sulfur," Allen says.

Cost-benefit ratios for adding sulfur to responsive fields are positive, says Lamond. "Based on the work we've done for hay production with brome, and assuming brome hay garners about $75 a ton, we're consistently seeing an additional income of $20 to $30 an acre after topdressing with 15 lb. of sulfur, which costs less than $5 an acre." FJ