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Micronutrients and Sulfur on Newly Established Bahiagrass

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In the 1990's, Deseret Cattle and Citrus undertook a pasture development program which involved clearing native vegetation and establishing bahiagrass pasture. Keeping cost to a minimum was important, and ranch management wanted to do only what was needed to successfully establish bahiagrass.

University of Florida extension guidelines for pasture on mineral soils suggested application 10 lb/A each of copper (Cu), iron (Fe), manganese (Mn), and zinc (Zn) sulfates, with reapplication every 5 to10 years. This would supply about 2.5 lb Cu/A; 3.0 lb Fe/A ; 3.0 lb Mn/A, and 3.5 lb Zn/A. At the time this Deseret research was initiated, Cu, Fe, Mn, and Zn were \$ 2.02, \$0.63, \$0.80, and \$0.78 /lb of the element, respectively, when supplied as sulfates. For cattlemen with small ranches, this may not amount to a large expense, but on a large, extensively managed ranch, it could be prohibitive.

To determine the effect of various micronutrients and sulfur (S) had on establishment and yield, six treatments were applied in May 1996 to a March seeding of Tifton-9 bahiagrass and carpon desmodium. These nutrients were applied as sulfates: (1) 3 lb Cu + 22 lb S /A; (2) 9 lb Zn + 22 lb S /A; (3) 3 Cu + 9 lb Zn + 22 lb S /A; (4) 3 lb Cu + 9 lb Zn + 18 lb Fe + 9 lb Mn + 22 lb S /A; (5) no micronutrients + 22 lb S /A; and (6) no micronutrients or S. Relative micronutrient rates were based on the Cu:Fe:Mn:Zn ratio of 1:6:2.5:2.3 contained in TEM 300 G (Traylor Chemical & Supply, Inc., Orlando, FL), a commercial form (not sulfates) of micronutrient fertilizer commonly applied on Florida pasture. Nitrogen, P2O5, and K2O were also applied at 30, 50, and 66 lb/A in May. Nitrogen at 50 lb/A was applied in March 1997 and 1998. Phosphorous, K, S, and micronutrients were not applied again. Soil pH was 5.3.

Bahiagrass was allowed to establish for about 23 months, and in April 1998 wire-mesh exclosures were placed on the experiment to prevent cattle from grazing the sample area. Exclosures were sampled from April to October 1998. Sampled forage was used to determine yield and concentrations of N, S, P, K, Ca, Mg, Cu, Fe, Mn, and Zn in tissue.

After 23 months, soil from treatments receiving Cu had significantly higher levels of Cu (avg. 0.6 parts per million [ppm]) than treatments not receiving Cu (avg. 0.1 ppm). Copper in bahiagrass tissue from plots receiving Cu (avg. 3.2 ppm) was higher at all dates than treatments without Cu (avg. 2.7 ppm). The level considered to be adequate for bahiagrass is 2.5 ppm. Taking into consideration the low amount of Cu in the soil where none had been applied, the soil test seemed to greatly underestimate the ability of these soils to supply Cu to bahiagrass.

Soil from all treatments supplying Zn (2.9 ppm) was higher in Zn compared with soil from treatments not containing Zn (0.7 ppm). Concentrations of Zn in bahiagrass tissue were greater at all sample dates in treatments supplying Zn (avg. 32 ppm) compared to tissue where Zn was not supplied as a treatment (avg. 21 ppm).

Concentrations of Fe were greater in soil that received Fe as a treatment (6.7 ppm) compared with treatments not containing Fe (avg. 5.4 ppm), but there was no difference among treatments for concentration of Fe in bahiagrass tissue (avg. 65 ppm). Since bahiagrass did not take up more Fe where it had been applied, this leads to questions about availability of Fe from iron sulfate. Studies at the University have indicated that iron sulfate was often not an effective soil-applied Fe source. Our interest in Fe was because of its association with the wide-spread yellowing problem on bahiagrass, which was not observed in any treatment in this study.

Manganese concentrations in soil were about 5 times higher where Mn had been applied (2.8 ppm) compared to treatments without Mn (avg. 0.6 ppm). Concentrations of Mn in tissue were higher in the treatment containing Mn (73 ppm) compared to treatments without Mn (avg. 25 ppm).

There were no differences among treatments for concentrations of S in tissue at any sample date (avg. 0.1%). After 23 months this is not surprising because the water-soluble, mobile sulfate anion (SO4) is not retained for long, especially in sandy soils.

There were no differences among treatments for yield of bahiagrass and carpon desmodium at any sample date or for annual yield, which averaged 5660 lb dry matter/A. Treatments did not affect ground cover of bahiagrass (65 %) or carpon desmodium (20 %). These percentages seem low because they were obtained in May during the dry season.

This study demonstrated that applying Cu, Fe, Mn, and Zn could increase the amount of these elements in soil and bahiagrass tissue, but they did not improve forage establishment or yield. On extensively managed bahiagrass pastures where N, P, and K fertilizer input is minimal, such as at Deseret Cattle and Citrus, micronutrients and S may not be factors limiting bahiagrass establishment and yield.