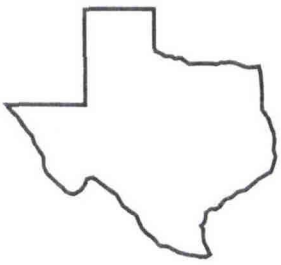
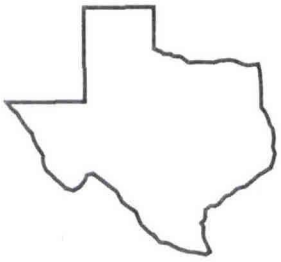
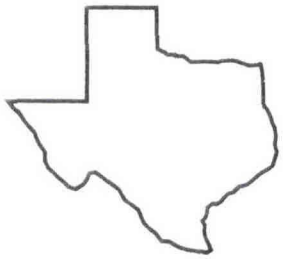
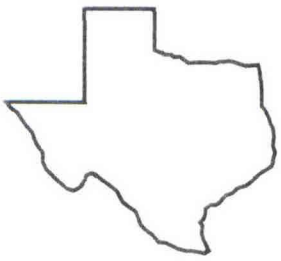
Texas Agricultural Experiment Station
Texas Agricultural Extension Service
The Texas A&M University System





Overton Field Day Report - 1994





1994 Research Center Technical Report No. 94-1

Texas Agricultural Experiment Station • Edward A. Hiler, Director
The Texas A&M University System • College Station, Texas

USE OF LIMESTONE TO CORRECT LOW pH SOILS FOR COASTAL BERMUDAGRASS PRODUCTION

V. A. Haby

Background. Acid soils are a common problem in East Texas. Soil acidity is intensified by nitrification of ammonium to nitrate in acid, sandy soils. Ammonium forms of nitrogen (N) fertilizers vary in the amounts of acidity they produce. Accepted averages indicate that ammonium nitrate and urea nitrogen fertilizers create 1.8 lb of calcium carbonate neutralizable acidity for each pound of N nitrified in the soil. Ammonium sulfate produces 5.4 lb of acidity per pound of N applied to the soil and nitrified. Coastal bermudagrass requires high rates of N to produce quality forage. Coastal bermudagrass, developed on acid soils, has a natural tolerance to varying intensities of soil acidity. This is a discussion of the limestone needs of Coastal bermudagrass for optimum growth and calcium availability to grazing livestock.

Research Findings. The requirement of cattle for calcium depends on the intensity of milk production in lactating cows and the rate of weight gain. More calcium is needed for higher milk production or greater weight gains (Table 1). Acid soils are generally low in calcium. Calcium applied as calcium carbonate (limestone) is the normal way to supply calcium to the soil for uptake by forages such as Coastal bermudagrass. Graphs in Figure 1, related to data in Table 1, show that Coastal bermudagrass is deficient in calcium for steers developing at a high rate of gain. The second cutting of bermudagrass treated with the 1.7 tons of limestone/ac three years earlier barely had sufficient calcium to support superior lactating cows. The second cutting of grass contained the most calcium. The last

Table 1. Calcium requirement of beef cattle in percent of the minimum daily dry matter requirement (NRC 1984).

Class	Calcium
	%
Dry cows, middle third of pregnancy	.19
Lactating cows, average production, 3.5 month calf	.29
Lactating cows, superior production, 3.5 month calf	.43
Steers, weight maintenance	.17
Steers, high gain rate	.75

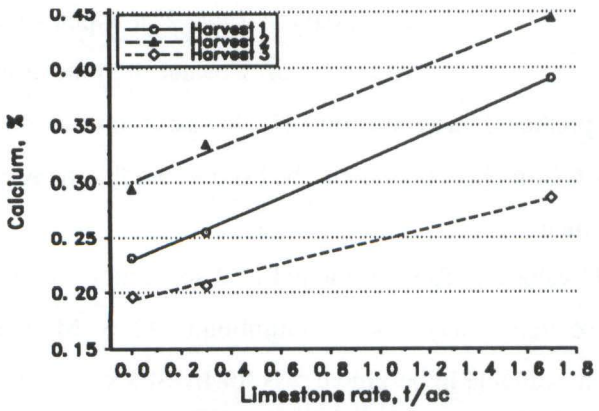


Figure 1. Effect of limestone on the calcium percentage in Coastal bermudagrass at three harvests three years after treatment.

cutting, growing in soil limed with 1.7 t/ac three years earlier, contains only sufficient calcium to support dry cows or steers on a weight maintenance program. Regular lime treatment of acid soils producing Coastal bermudagrass is needed to sustain the calcium requirements of beef cattle.

Coastal was selected from hybrid bermudagrass cultivars growing in acid soil, so it was inadvertently selected to be tolerant to moderate levels of soil acidity. As the concentration of soil acidity increases, Coastal bermudagrass will respond to limestone (Fig. 2). The soil pH at which the response of Coastal bermudagrass to limestone treatment will occur is unpredictable and varies by soil and location (Table 2). Research in the early 1960's found the critical pH at which to lime soils was 5.1 in two Tifton soils and 5.6 in a Rains soil. Studies on a Cecil soil showed the critical pH was 4.8 and 5.4. Data from recent research in Texas indicate the critical pH at which to lime soils established to Coastal bermudagrass varies from 5.5 to 5.9. From data in Table 2, it appears that the response of Coastal bermudagrass to limestone applied to acid soils cannot be predicted based on soil pH. Research on this problem will continue in search of the soil factor or factors that can reliably be used to predict the response of hybrid bermudagrass to limestone treatment.

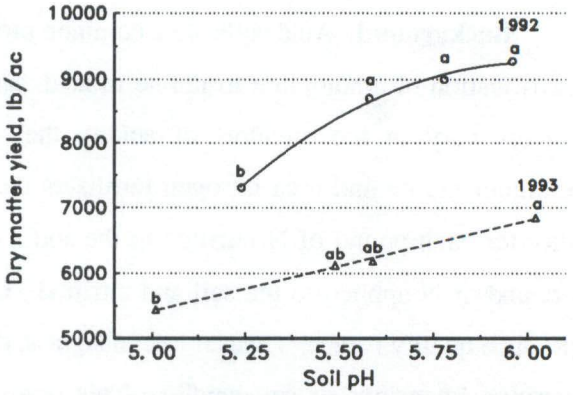


Figure 2. Effect of soil pH on Coastal bermudagrass yields at limestone rates of 0, 1, 2, and 3 t/ac.

Table 2. Coastal bermudagrass response to limestone.

Scientist	Year	State	Soil	Low pH	Critical pH	Response
						%
Jackson	1961	GA	Tifton	4. 3	5. 1	+ 23
Jackson	1961	GA	Tifton	4. 0	5. 1	+ 50
Jackson	1961	GA	Rains	4. 3	5. 6	+ 11
Adams	1967	GA	Cecil	4. 4	4. 8	+ 9
Adams	1967	GA	Cecil	4. 0	5. 4	+ 300
Haby	1969	TX	Boy	5. 2	---	0
Elchhorn	1981	LA	Ruston	4. 9	---	- 7
Young	1984	TX	Darco	4. 7	5. 9	+ 25
Young	1984	TX	Nacogd.	4. 8	5. 5	+ 11
Haby	1992	TX	Darco	5. 2	5. 6	+ 27

Application. From the critical pH values in Table 2, the pH (1:2 soil:water) at which to lime acid soils for Coastal bermudagrass production may be set at a minimum of 5.6. Maintaining soil pH above 5.6 will improve the calcium available in bermudagrass for livestock consumption. A soil pH above 5.6 will help maintain nutrient use efficiency and prevent accumulation of aluminum (Al^{3+}) that can be toxic to forage plants.