PUBLICATIONS
2006

CALCIUM DISTRIBUTION AT VARIOUS SOIL DEPTHS IN COMMON AND COASTAL BERMUDAGRASS PASTURES UNDER LONG-TERM STOCKING AND FERTILIZER REGIMENS

M.L. Silveira, F.M. Rouquette, Jr., J.L. Kerby, G.H. Nimr, V.A. Haby, and G.R. Smith

Background. A detailed description of stocking rates and fertility regimens from 1969 through 2005 are presented in a companion 2006 Field Day Report by Rouquette et al. The objective of this study was to examine long-term changes in soil calcium (Ca) concentrations over 29 years of continuous stocking and 19 years of fertilizer/limestone regimens.

Table 1. Limestone applications and rates on bermudagrass pastures

Date	Limestone Rate (tons/ac)	Pastures
1969 to 1980	2	all
1981 to 1984	1	all
1985[1]	2	all
1987	1	all
1991	1.25	N +ryegrass
1994	1	N +ryegrass
1997	0.5	N +ryegrass
2002	1	all

[1]Initiation of N fertility regimens (ryegrass with N fertilizer and clover with no N applied).

Research Findings. All bermudagrass pastures received limestone applications (~ 10 tons/ac) during 18 years (1969-1987) of continuous stocking (Table 1). Limestone rates were intended to correct soil pH for optimal forage growth. Large amounts of Ca as a constituent of lime were added to the soil. In 1975, average soil Ca concentrations (0- 48") were less in Coastal bermudagrass (~ 235 ppm Ca) than that in common bermudagrass (~590 ppm Ca). Differences in forage uptake, dry matter production, and root distribution were likely affecting soil Ca concentrations.

Soil Ca increased with time and shifted from low (0-250 ppm) and medium (251-750 ppm) levels in 1975 samples to medium and high (751-2000 ppm) in 2004. In general, the surface 0-6-in soil depth did not show significant changes in Ca concentrations with continuous stocking. Large increases in Ca concentrations were observed below 12" soil depth. This suggests some vertical movement of Ca through the soil profile. Organic ligands present in the animal manure may have contributed to complex Ca and redistributed this nutrient into deeper soil depths.

Bermudagrass pastures fertilized with N and overseeded with ryegrass continued to receive lime applications from 1987 until 2002. Continuous N application in these pastures increased soil acidity and, consequently, lime application rates were necessary to maintain adequate soil pH. In contrast, pastures that received no N and were overseeded with clover were not limed during this 15-year period. Symbiotic N_2 fixation via clover and subsequent N transfer pathways had much less effect on soil acidity. Previous history of limestone application sustained adequate pH and Ca concentrations in bermudagrass pastures receiving no N and overseeded with clover. There was no clear effect of different stocking rates affecting soil Ca concentrations.

Applications. Previously limed bermudagrass pastures subjected to continuous stocking can favor Ca redistribution within the soil profile. Mineral N fertilization can significantly affect soil pH and increase forage requirements for lime applications.

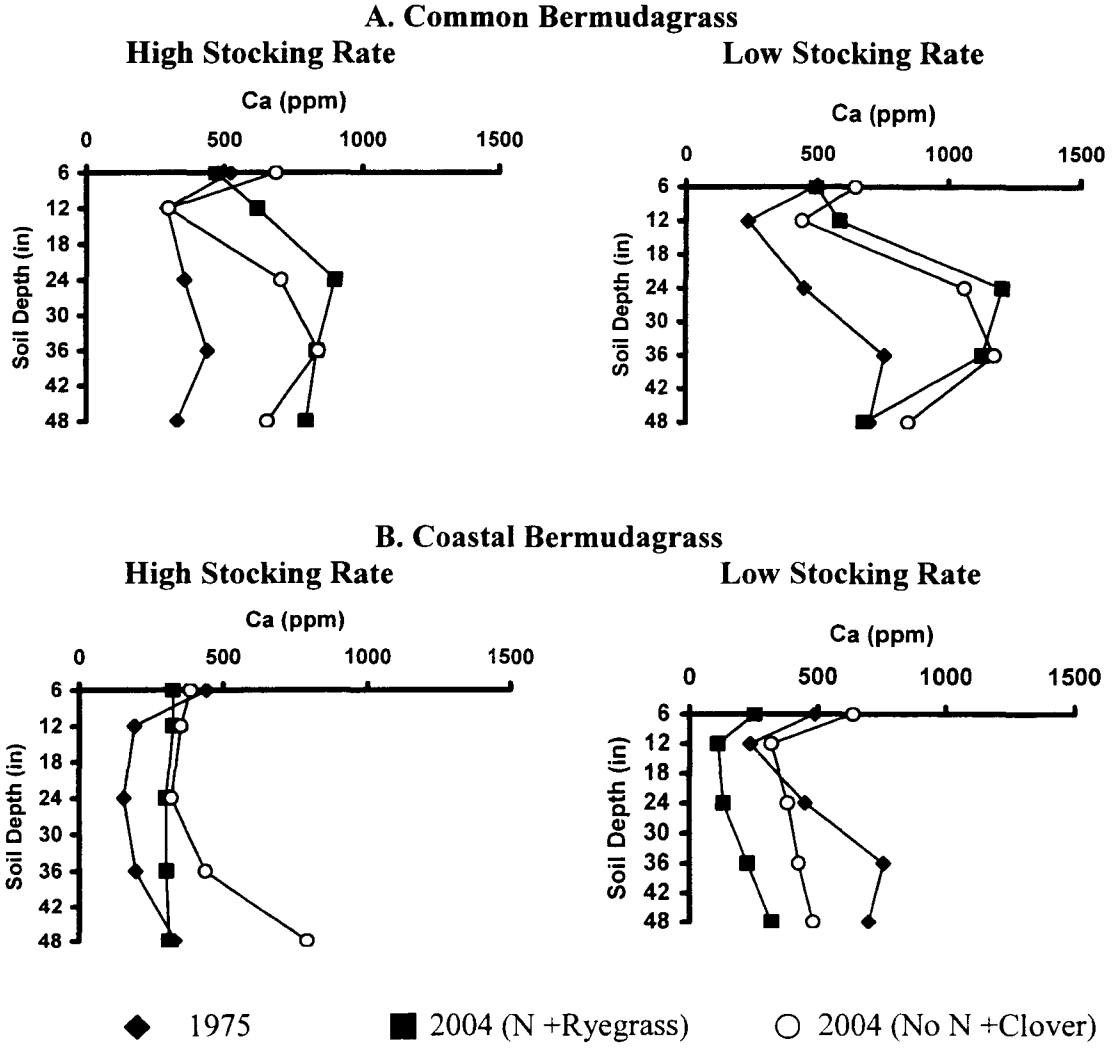

Figure 1. Changes in soil Ca concentrations with time in bermudagrass pastures under different stocking rates and fertility regimens.