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CALCIUM CONCENTRATION AND UPTAKE BY TIFTON 85 BERMUDAGRASS IN FIVE CUTTINGS IN 2004

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Background. We evaluated calcium (Ca) in plant tissue from the study of Tifton 85 bermudagrass response to potassium (K) rates and sources at two nitrogen (N) rates. Two years before beginning of this study, the site was limed with 3 tons of ECCE 100% calcitic limestone (4% magnesium)/ac, surface applied. Two tons additional ECCE 72% calcitic limestone (\approx 1% Mg) and 180 lb P_2O_5 /ac were disked into the Darco soil at initiation of the study in 2001. Each following year (2002, 2003, and 2004) an additional 120 lb of P_2O_5 /ac as triple superphosphate (0-46-0) was surface-applied each spring at initiation of Tifton 85 bermudagrass re-growth. Potassium sources were potassium chloride (KCl, 0-0-62-47% Cl) and KCl plus elemental sulfur (S) compared to potassium sulfate (K_2SO_4 , 0-0-50-17.6% S) that contains about 2% Cl. Potassium rates from all sources were 0, 134, 268, and 402 lb/ac as K_2O split-applied, one-third at growth initiation and one-third each following an early- and a mid-season harvest to 10 x 18-ft plots that were fertilized with 80 or 160 lb of N/ac for each bermudagrass regrowth during the 2004 growing season. Yield data and samples of Tifton 85 plant material were collected from each plot at each harvest for dry matter and chemical analysis using a Swift Machine forage plot harvester. Plant samples were dried at 60 °C, ground in a Wiley mill to < 20-mesh, digested in sulfuric acid, and analyzed for Ca using a Perkin-Elmer model 1100-B atomic absorption spectrophotometer.

Research Findings. The concentration of Ca in bermudagrass ranged from 0.42% to 0.74% and was not changed by the main effects of N rate averaged over K rates and sources, or by K sources averaged over N and K rates (except in the fifth harvest, Table 1). However, as DMY increased with increasing K rate, the amount of Ca in the plant was significantly lowered. With total yield at 13,856 lb/ac and Ca concentration at 0.50% at the high N rate, total Ca uptake by Tifton 85 bermudagrass was 69 lb/acre. As the K application rate increased from zero to 134, 268, and 402 lb K_2O /ac, total yield increased from 9,614 to 12,469, 13,246, and 13,662 lb/acre; season average Ca concentration declined from 0.58% to 0.54, 0.49, and 0.48%; while Ca uptake by the bermudagrass increased from 56 to 67, 65, and 66 lb/ac, respectively. The highest concentration of Ca occurred in forage collected at the third harvest and no reason for this increased Ca concentration is apparent at this time. In the other four harvests, the Ca concentration was relatively constant in early through late season harvested bermudagrass.

Table 1. Tifton 85 bermudagrass Ca conc. response to N and K rates and K and S sources in 2004.

N rate lb/ac/harv.	Plant Ca concentration [†]					
	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Season avg.
80	0.49	0.49	0.65	0.49	0.49	0.52
160	0.43	0.48	0.68	0.45	0.47	0.50
-----%-----						
K rate						
lb K ₂ O/ac						
0	0.57 a	0.49	0.74 a	0.54 a	0.55 a	0.58 a
134	0.48 b	0.48	0.73 a	0.49 b	0.51 b	0.54 b
268	0.43 c	0.48	0.64 b	0.46 bc	0.47 c	0.49 c
402	0.42 c	0.49	0.58 c	0.44 c	0.45 c	0.48 c
K Source						
KCl	0.46	0.48	0.66	0.46	0.45 b	0.50
K ₂ SO ₄	0.44	0.49	0.64	0.46	0.50 a	0.51
KCl + S	0.44	0.48	0.66	0.46	0.47 ab	0.50
R ²	0.77	0.61	0.73	0.60	0.67	0.78
c.v.	8.30	11.6	10.3	10.2	10.3	5.4

[†]Values in a column/group followed by a dissimilar letter are significantly different statistically ($\alpha = 0.05$).

Application. The requirement of cattle for Ca depends on the intensity of milk production in lactating cows and the rate of weight gain in growing animals. More calcium is needed for higher milk production or greater weight gains. Since low levels of plant available, or extractable, soil Ca are associated with acid soils, calcium applied as limestone (calcium carbonate) is the normal way to supply calcium to the soil for uptake by forages such as Tifton 85 bermudagrass on acid soils. According to the NRC (Table 2), Ca levels in the Tifton 85 bermudagrass produced in this study are sufficient to meet the percent of the minimum daily dry matter requirement for most classes of beef cattle except steers at a high rate of gain. At 7 tons of dry matter/ac containing 0.50 % Ca, Tifton 85 contains \approx 10 lb Ca/ton of dry matter.

Table 2. Calcium requirement of beef cattle in percentage 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