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NITROGEN TO SULFUR RATIO IN TIFTON 85 BERMUDAGRASS IN FIVE CUTTINGS IN 2004

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Background. The response of Tifton 85 bermudagrass to sulfur (S) was evaluated in a potassium rate and source at two N-rates study that was adequately fertilized with 180 lb P_2O_5/ac disked into the Darco soil at initiation of the study in 2001. In 2002, 2003, and 2004, an additional 120 lb of P_2O_5/ac/yr as triple superphosphate (0-46-0) was surface-applied at growth initiation of the Tifton 85 bermudagrass each spring. Potassium sources were potassium chloride (KCl, 0-0-62-47% Cl), potassium sulfate (K_2SO_4, 0-0-50-17.6% S), and KCl plus elemental S. 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 two in-season harvests to 10 x 18-ft plots that received 80 or 160 lb of N/ac for each bermudagrass regrowth during the 2004 growing season. Sulfur as K_2SO_4 was applied at rates of 47, 94, and 142 lb/ac. Equal S rates were applied as granular elemental S (Dispersal, 90% S) in the KCl + S treatments. Yield data and samples of Tifton 85 plant material were collected from each plot at each harvest for dry matter/chemical analysis using a Swift Machine forage plot harvester (Swift Current, Saskatchewan Canada.) Plant samples were dried at 60 °C, ground in a Wiley mill to < 20-mesh, and analyzed for S in a VarioMax CNS analyzer, (Elementar Americas Inc, NJ).

Research Findings. The N: S ratio was increased by the higher N rate and, except at harvest three, these N: S ratios at the high N rate were in, or better than, the range (14 to 16) suggested for adequate plant growth (Table 1). Where no K was applied, or where the K source was KCl, dry matter yield was lowest and the N: S ratio in Tifton 85 bermudagrass was pushing the limits of the range established for Coastal bermudagrass, or was above it in several harvests and in the season average N: S ratio. Adding S as K_2SO_4 or as KCl + S lowered the N: S ratio into a non S-deficient range below 12. As expected, increasing the K rate, averaged over all K sources that included two S sources, also lowered the N: S ratio.

Application. Unpublished data from J. E. Matocha indicate N: S ratios for Coastal bermudagrass ranging from 12 to 16 appear ideal for medium-to high-intensity forage production with 14 suggested as the critical level for Coastal bermudagrass (Jordan and Bardslery, 1958). Matocha (1971) suggested a critical range of 14 to 16 for Coastal bermudagrass and showed that, when subjected to high levels of soil S, this grass can absorb excess S, and indicated that plant age and interval between clippings have a substantial bearing on S concentrations.

Sulfur is an important component of certain amino acids. Many sandy soils that are low in organic matter may be low in available sulfate forms of S, especially where S has not been applied. High rates of nitrogen fertilization with low S-containing fertilizers can cause an imbalance in the N: S ratio in bermudagrass forages growing on low organic matter, S-deficient soils. In our study with Tifton 85 bermudagrass, S deficiencies, based on the N: S ratio near or above 14, appeared in mid-season when the N rate applied for each harvest was 160 lb/acre, when the K rate was zero, or when the K source was KCl minus S. Where the K sources included S application, the N: S ratios are well within the range suggested as adequate based on previous research on Coastal bermudagrass (Matocha, 1971).

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

N rate	**N: S ratio**[†]					
lb/ac/harv.	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Season avg.
80	7.91	8.31 b	13.48 b	9.34 b	7.77 b	9.36 b
160	9.96	11.09 a	19.69 a	13.98 a	11.49 a	13.24 a
K rate						
lb K_2O/ac						
0	10.89 a	13.48 a	26.42 a	20.29 a	15.63 a	17.34 a
134	9.13 b	10.41 b	18.28 b	12.05 b	9.69 b	11.91 b
268	8.80 b	9.40 bc	15.11 c	10.26 c	9.33 b	10.58 c
402	8.23 b	8.04 c	13.09 c	9.79 c	7.87 c	9.40 d
K Source						
KCl	10.28 a	13.18 a	24.66 a	18.01 a	15.32 a	16.29 a
K_2SO_4	8.14 b	7.03 b	10.92 b	5.90 c	5.53 b	7.50 b
KCl + S	7.74 b	7.64 b	10.90 b	8.20 b	6.05 b	8.10 b
R^2	0.80	0.73	0.91	0.94	0.91	0.96
c.v.	13.5	27.6	19.3	17.1	20.8	11.1

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

Literature cited

Jordan, H.V., and C.E. Bardsley, 1958. Response of crops to sulfur on southeastern soils. Soil Sci. Soc. Am. Proc. 22:254-256.

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