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

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Background. Nitrogen (N) rates of 80 and 160 lb/ac for each regrowth of bermudagrass were applied to strip plots to evaluate the response of Tifton 85 bermudagrass to potassium (K) rates and sources at two N rates on a Darco soil. The Darco soil was previously treated with 3 tons of ECCE 100% surface-applied limestone/ac. In 2001, the initial year of the study, 2 tons/ac additional ECCE 72% limestone and 100 lb ammonium nitrate/ac were disk-incorporated into the soil. Tifton 85 bermudagrass was sprigged in April, and 200 lb ammonium nitrate (34% N) and one-half inch of water were applied to start the bermudagrass. Variable N rates/ac/cutting were 60 and 120 lb/ac the first three years. A single rate of 120 lb of P_2O_5/ac/year as triple superphosphate (0-46-0) was surface-applied at growth initiation of the bermudagrass each spring. Potassium sources were potassium chloride (KCl, 0-0-62-47%Cl), potassium sulfate (K_2SO_4, 0-0-50-17% S), and KCl plus elemental sulfur (S). Potassium rates were 0, 134, 268, and 402 lb K_2O/ac split-applied, one-third at growth initiation and one-third each following two in-season harvests to 10- x 18-foot plots. Samples of Tifton 85 plant material for dry matter/chemical analyses were collected from each plot at each harvest using a Swift Machine forage plot harvester (Swift Machine Co., Swift Current, Saskatchewan, Canada.) Plant samples were dried at least 48 hours at 60 °C, ground in a Wiley Mill to < 20-mesh, digested in sulfuric acid, and the solution was analyzed for N on a continuous-flow auto analyzer.

Research Findings. In the early season harvests with slower plant growth and lower dry matter yield, N concentrations in the bermudagrass were similar across treatments (Table 1). Tifton 85 N concentration was significantly increased by raising the fertilizer N rate from 80 to 160 lb/ac/cutting in mid- to late-summer harvests. The N content of the bermudagrass was significantly lower as the yield of Tifton 85 was increased by increasing the K rate and by adding S with the applied K. Even though the N concentration declined as yield increased, plant N uptake was significantly increased because of greater dry matter yield (Table 2). Nitrogen uptake for the season ranged from 249 lb/ac at the lower N rate to 383 lb/ac at the higher N rate.

Application. Nitrogen is essential for plant growth as a constituent of all proteins and protoplasm. As the N level in the plant increases compared to other nutrients, the extra protein produced allows plant leaves to grow larger and have a greater surface for photosynthesis. The effect of N in increasing the proportion of protoplasm to cell wall material makes the leaves more succulent and less harsh. Crude protein (CP) produced ranged from 13.9% to 17.8%. The

highest CP percentage in bermudagrass occurred at the high N rate. Crude protein production ranged from 1,630 lb/ac at the low N rate to 2,459 lb/ac at the high N rate.

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

N rate	Plant N concentration†					
lb/ac/harv.	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Season avg.
	----------%----------					
80	2.48	2.42 b	2.38 b	2.13 b	1.72 b	2.23 b
160	2.75	2.88 a	3.27 a	2.81 a	2.49 a	2.84 a
K rate						
lb K_2O/ac						
0	2.72	2.63	3.29 a	2.85 a	2.50 a	2.80 a
134	2.61	2.62	2.82 b	2.47 b	2.12 b	2.53 b
268	2.58	2.64	2.77 b	2.41 b	2.06 b	2.49 b
402	2.62	2.70	2.72 b	2.40 b	2.01 b	2.49 b
K Source						
KCl	2.60	2.67	3.06 a	2.55 a	2.22 a	2.62 a
K_2SO_4	2.57	2.64	2.61 b	2.40 b	2.04 b	2.45 b
KCl + S	2.63	2.64	2.65 b	2.34 b	1.93 c	2.44 b
R^2	0.74	0.63	0.92	0.88	0.92	0.94
c.v.	6.70	9.10	7.00	7.30	7.20	4.20

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

Table 2. Tifton 85 bermudagrass N uptake response to N and K rates and K and S sources in 2004.

N rate	Plant N uptake†					
lb/ac/harv.	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Harvest 5	Total
	----------lb/ac----------					
80	26	35 b	62 b	71 b	55 b	249 b
160	33	46 a	84 a	115 a	104 a	383 a
K rate						
lb K_2O/ac						
0	26 b	29 c	60 b	77 b	76	268 c
92	29 ab	39 b	71 a	92 a	78	308 b
268	31 a	42 ab	77 a	96 a	79	325 ab
402	31 a	44 a	76 a	97 a	83	332 a
K Source						
KCl	29	39 b	69 b	91	82	310 b
K_2SO_4	30	43 a	76 a	96	76	322 ab
KCl + S	32	43 a	78 a	98	82	333 a
R^2	0.71	0.77	0.78	0.88	0.88	0.93
c.v.	16.9	13.0	12.5	11.5	14.2	7.8

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