TIFTON 85 BERMUDAGRASS RESPONSE TO NITROGEN RATES APPLIED AS UREA FERTILIZERS

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Background. Tifton 85 bermudagrass [*Cynodon dactylon* (L.) Pers.] was the test forage on Darco loamy fine sand in a comparison of Nurea-10 (42%-N) with urea (46%-N) at N rates from zero to 120 lb/acre applied for each forage regrowth. The initial 0-6-inch depth pH was 7.6 and Mehlich III extractable P and K were 40 and 38 ppm, respectively. Soil pH by 1-ft depths was > 7.7 to 4-ft. This site was randomly pre-sampled for nitrate and ammonium nitrogen (N) concentrations in 0-6, 0-12, 12-24, 24-36, and 36-48-inch depths with results shown below.

N form	0-6 inches	0-12 inches	12-24 inches	24-36 inches	36-48 inches
	ppm				
Nitrate	2.61	1.64	1.17	0.74	0.51
Ammonium	16.21	9.99	3.95	4.54	3.37

Nitrogen rates were 0, 30, 60, 90, and 120 lb/ac for each of four harvests, or total N rates of 0, 120, 240, 360, and 480 lb/ac. Yield data and forage samples were collected using a Swift Machine Harvester. Plant N concentration was determined by digestion of samples in sulfuric acid and analysis using cadmium reduction on an auto analyzer.

Research Findings. In a relatively low precipitation growing season (2005), dry matter yield (DMY) exceeded 5 tons/acre at the 120 lb rate of N/acre/regrowth (Table 1). Yield data indicated no significant differences between forage produced by Nurea-10 or urea, averaged over all N rates. Yield, N concentration, and N uptake in Tifton 85 bermudagrass were increased with increasing rates of N (Tables 1, 2, and 3, respectively). Although N concentration and N uptake were increased by higher N rates, N uptake efficiency that normally is decreased as the rate of applied N increases was not affected by higher N rates. Season-long N uptake efficiency for the total of 120 lb of N/ac (the lowest N rate) was 39% based on the above-ground vegetative DMY and N content. As the total rate of N applied increased to 240, 360, and 480 lb/ac, N uptake efficiency was 40, 43, and 40%, respectively. Normally, N uptake efficiency is based on DMY and N content in above-ground vegetation, but, some of the applied N also remains in rhizomes and roots. This below-ground plant material was not evaluated for yield or N content. As a result, the N uptake efficiency is expected to be somewhat greater than that determined based only on the above-ground vegetation.

Application. Normally when lower rates of N are applied for bermudagrass production, N uptake efficiency is greater than at the higher application rates because the rate of DMY

increase for each incremental increase in applied N declines. In this study, some of the applied urea N was volatilized, or lost to the atmosphere as ammonia, a gas. This is evident because at the 60 lb N/ac rate (240 lb/ac total N), bermudagrass N uptake efficiency with application of ammonium nitrate was 51% compared to 40% for the two urea materials. Texas Agricultural Experiment Station scientists are evaluating compounds added to urea and urea-containing fertilizers such as urea-ammonium nitrate to lower N losses from ammonia volatilization.

Table 1. Tifton 85 bermudagrass dry matter yield response to N rates from urea fertilizers[1].

N rates \ Harvest date	May 24	June 13	July 21	Sept. 12	Season total
	lb/acre				
lb N/ac					
0	237 c	402 e	522 e	675 e	1,836 e
30	443 bc	1,394 d	1,194 d	1,504 d	4,536 d
60	769 ab	2,344 c	1,854 c	1,962 c	6,930 c
90	946 a	3,008 b	2,546 b	2,409 b	8,908 b
120	1,032 a	3,303 a	3,068 a	2,738 a	10,142 a
R^2	0.71	0.96	0.88	0.89	0.95
C.V.	39.6	10.0	19.6	14.0	10.7

[1]Numbers followed by a different letter within a column and treatment combination are significantly different at alpha = 0.05.

Table 2. Nitrogen concentrations in Tifton 85 bermudagrass affected by rates of urea fertilizers[1].

N source \ Harvest date	May 24	June 13	July 21	Sept. 12	Season avg.
	%				
lb N/ac					
0	0.88 d	1.61 c	1.47 d	1.06 c	1.25 e
30	1.07 c	1.92 b	1.64 d	1.21 bc	1.46 d
60	1.30 b	2.12 b	1.87 c	1.30 b	1.65 c
90	1.36 b	2.47 a	2.15 b	1.50 a	1.87 b
120	1.62 a	2.65 a	2.36 a	1.54 a	2.04 a
R^2	0.87	0.84	0.85	0.66	0.90
C.V.	8.80	8.70	8.30	12.0	6.30

[1]Numbers followed by a different letter within a column and treatment combination are significantly different at alpha = 0.05.

Table 3. Nitrogen uptake by Tifton 85 bermudagrass relative to N rates from urea fertilizers[1].

N source\ Harvest date	May 24	June 13	July 21	Sept. 12	Season total
	lb/acre				
N, lb/ac					
0	2.1 c	6.4 e	7.5 e	7.2 e	23.1 e
30	4.8 c	27.1 d	19.7 d	17.9 d	69.5 d
60	9.8 b	49.6 c	34.5 c	25.3 c	119.3 c
90	12.4 ab	74.1 b	55.2 b	36.0 b	177.6 b
120	16.3 a	87.4 a	72.2 a	41.4 a	217.2 a
R^2	0.78	0.95	0.91	0.94	0.97
C.V.	36.7	13.9	21.9	12.2	10.8

[1]Numbers followed by a different letter within a column and treatment combination are significantly different at alpha = 0.05.