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NITRATE- AND AMMONIUM-NITROGEN (N) CONCENTRATIONS IN DARCO SOIL FROM TWO N SOURCES AND RATES APPLIED TO TIFTON 85 BERMUDAGRASS

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Background. Tifton 85 bermudagrass [*Cynodon dactylon* (L.) Pers.] was the test forage on Darco loamy fine sand in a comparison study of Nurea-10 (42% N) with urea (46% N) at N rates from zero to 120 lb/ac (Table 1). This experiment included four replications of 10 treatments in a randomized complete block statistical design with individual plot sizes measuring 10 x 20 ft. The site was uniformly fertilized with 100 lb P₂O₅, 150 lb K₂O, 25 lb Mg, and 50 lb S/ac on 13 April. Additional potassium was applied at a rate of 100 lb K₂O/ac to the experimental site on 17 July. Nitrogen treatments indicated in Table 1 were applied 18 April, 25 May, 14 June, 29 July, and 16 September.

Table 1. Nitrogen sources and rates applied for Tifton 85 bermudagrass production.

Treatment #	N rate ¹ , lb/acre	N source and concentration
1	0	None
2	30	Nurea-10, 42% N ²
3	60	Nurea-10, "
4	90	Nurea-10, "
5	120	Nurea-10, "
6	30	Urea, 46% N
7	60	Urea, "
8	90	Urea, "
9	120	Urea, "
10	60	Ammonium nitrate, 34% N

¹Rate of N applied for each regrowth of bermudagrass.

²An occluded form of urea containing 10% of the total N from Nitamin 30L.

Individual plots were sampled by one-foot depths to 48 inches for nitrate and ammonium N at mid-season on 25-26 July and on 8-10 November using a Giddings hydraulic soil probe. Soils were dried at 60 °C, ground < 20-mesh, and analyzed for nitrate N in saturated Ca(OH)₂ extracts using the chromotropic acid color method and for ammonium N in 2 M KCl extracts using the modified salicylate/nitroprusside and hypochlorite color method.

Research Findings. Data in Table 2 indicate that concentrations of NH₄-N consistently appear to be greater than concentrations of NO₃-N. Only small amounts of NO₃-N remained in the Darco soil regardless of the source of urea or the rate of N applied. This indicates that Tifton 85 bermudagrass is quite efficient at removal of NO₃-N from the soil to at least 4-feet deep. The NH₄-N level in the 1-ft depth appears to be decreased at this sampling compared to the pre-study samples. Ammonium levels in the lower depths are similar to those found in pre-study samples. Nurea-10 produced a significant increase in NH₄-N in the 24-36-inch depth compared to urea.

Table 2. Soil nitrate-N and ammonium-N levels by treatment and depth in Darco soil in late July.

Treatment	0 – 12-in depth		12 – 24-inch depth		24 – 36-inch depth		36 – 48-inch depth	
Urea source	NO ₃ -N	NH ₄ -N	NO ₃ -N	NH ₄ -N	NO ₃ -N	NH ₄ -N	NO ₃ -N	NH ₄ -N
	-----ppm-----							
Nurea-10	1.0	8.0	0.1	8.2	0.5	6.0 a	0.1	5.4
Urea	1.1	8.5	0.1	8.4	0.6	3.6 b	0	5.4
N, lb/acre								
0	0.7	7.0	0	7.2 b	0.3 ab	4.6	0.4	4.0
30	0.5	8.4	0	7.9 ab	0.2 b	5.1	0	5.6
60	1.0	8.8	0	8.3 ab	0.5 ab	4.9	0	5.4
90	1.2	7.5	0	9.1 a	0.8 a	5.0	0.1	5.4
120	1.6	8.2	0.3	7.7 b	0.7 ab	4.3	0	5.3
R ²	0.36	0.23	0.30	0.55	0.58	0.77	0.45	0.50
C.V.	84.5	32.3	372	11.0	59.7	33.0	222	33.0

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

Data for NO₃-N and NH₄-N in soil samples collected in November indicate slightly higher concentrations of NO₃-N and lower levels of NH₄-N (Table 3) compared to similar samples collected in July. The NO₃-N level was significantly increased at the highest N rate in the top three feet while NH₄-N levels were unchanged with increasing N rate. There were negligible amounts of NO₃-N and NH₄-N in the 36 - 48-inch depth. The source of urea had no significant effect on either form of N in the Darco soil. The low levels of NO₃-N in the 0- to 48-in depth indicate little likelihood of NO₃ contamination of ground water tables from N fertilization of Tifton 85 at the rates tested in this study.

Table 3. Soil nitrate-N and ammonium-N levels by treatment and depth in Darco soil in early November 2005.

Treatment	0 – 12-in depth		12 – 24-inch depth		24 – 36-inch depth		36 – 48-inch depth	
Urea source	NO ₃ -N	NH ₄ -N	NO ₃ -N	NH ₄ -N	NO ₃ -N	NH ₄ -N	NO ₃ -N	NH ₄ -N
	-----ppm-----							
Nurea-10	3.4	2.9	1.8	0.5	0.6	3.3	0	0.5
Urea	3.0	3.2	1.8	1.5	0.5	3.2	0	0.2
N, lb/acre								
0	2.0 b	1.9	1.8 b	0.2	0.2 b	2.7	0	0
30	2.3 b	2.7	1.1 b	0.6	0.1 b	2.9	0	0.6
60	2.7 b	2.8	1.1 b	1.0	0.2 b	3.1	0	0.2
90	3.5 ab	3.9	1.5 b	1.3	0.6 b	3.5	0	0.3
120	4.3 a	2.7	3.5 a	1.1	1.3 a	3.6	0	0.4
R ²	0.50	0.24	0.61	0.43	0.57	0.43		0.54
C.V.	35.8	67.9	54.2	163.1	96.6	34.7		230.1

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