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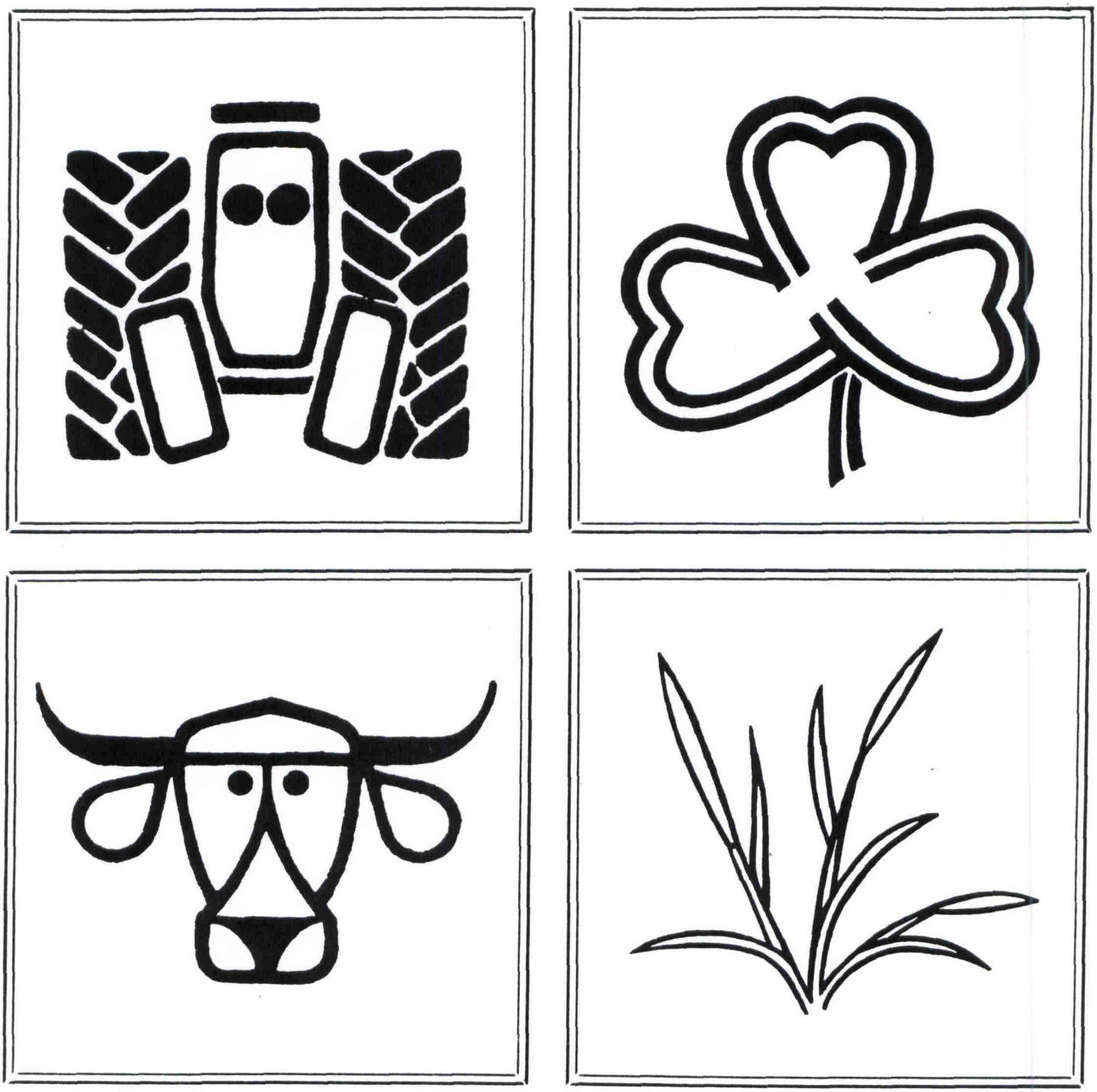

Forage Research in Texas

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Soil Fertility Management for Selected Forages: Yield Response and Quality of Five Improved Forage Cultivars

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SUMMARY

The forage yield of Callie, Tifton-44 and SS-16 bermudagrass, Klein and Limpo were significantly increased by N fertilization. A significant N x P interaction was observed in the yields of Callie bermudagrass. Crude protein concentration was significantly increased by N fertiliztion and for Tifton-44, Callie and SS-16 bermudagrasses ranged from 11.8 to 13.5% whereas for Klein and Limpograss it ranged from 7.2 to 10.7%. Relative ground cover establishment, like the seasonal forage yields, was significantly influenced by soil N level. The bermudagrasses, particularly Tifton-44, showed complete cover whereas Klein and Limpo showed significantly less.

PROCEDURE

Kleingrass (Panicum coloratum), Limpograss (Hermarthria altissima), and three bermudagrasses (Cynodon dactylon) - Callie, SS-16, and Tifton-44, were studied in a field experiment on the Hockley Prairie soil of the Prairie View A&M University Cooperative Research Center. The performance of these forages was tested for dry matter yields (DMY) and protein concentration at different soil N and/or P levels using a randomized split block design. This is the 3rd year of a 3-year study, so that the respective forages have been similarly treated for the last 3 years (1981-83). The treatments were as follows: There were 3 plots of each forage in each of 4 blocks (replications) representing 3 soil N levels of 22, 262 and 504 kg/ha N applied as NH_4NO_3. The first level was native N and the others being split applications of 60 and 120 kg/ha each in early spring and following each harvest. Each block was split in 3 equal portions to accommodate soil P levels of 7, 207 and 407 kg/ha P added as superphosphate, the first level being native P and the others being split application of 50 and 100 kg/ha each in the spring and following each harvest. In the spring all the plots were similarly

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treated once with K at 120 kg/ha and limed to pH 6.2. Cuttings were taken in May, June, July, August and September and dry matter yields (DMY) and crude protein determined. After the last cutting was taken a measurement of relative ground cover establishment was taken. On a scale of 1 to 10, 10 was used if the plot was completely covered and 1 was assigned if the plant stands were sparse.

RESULTS

The mean seasonal DMY of the cultivars for '80, '81, '82 and '83 regardless of N and/or P fertilization is presented in Table 1. A decrease in DMY was obtained in 1983 from Limpo, Klein, and Callie even though 5 harvests were obtained in 1983 as compared to 4 in other years. In Limpograss, for example, there was a significant decrease in DMY from 16,106 kg/ha in 1982 to 12,844 kg/ha in 1983. Possible explanations are: (1) Since there was no drought in late July to August 1983 the usual flush in late summer growth observed in other years following that drought period was absent. 2) Also, some forage plots now show poorer stands.

Table 1. Comparison of the seasonal DMY of the cultivars of 1980, 1981, 1982 and 1983

Variety	1980	1981	1982	1983	Mean
	*	**	***		
Limpo	10,106	9,553	16,106	12,844	12,127
Klein	9,842	9,426	14,629	14,152	12,010
Callie	7,972	9,543	14,678	14,541	11,684
Tifton-44	7,386	9,414	15,5422	15,518	11,865
SS-16	5,037	8,178	14,012	14,411	10,410
Mean	8,049	9,023	14,968	14,293	

The yields of all the grasses were significantly influenced by soil N level and in some cases a significant N x P interaction was observed. The mean seasonal DMY of the five forage cultivars as a function of soil N and P levels are given in Table 2. It can clearly be observed from the data that, except for Callie bermudagrass, all cultivars showed their most significant mean seasonal DMY at the 502 kg/ha soil N level and the native soil P level (7 kg/ha). In other words, these forage cultivars showed no significant response to soil P. In the case of Callie, the most significant response was found at the same soil N level but when the soil P level was increased to 207 kg/ha. The mean seasonal DMY for the forages being referred were: Limpo-15,774, Klein-18,026, Callie-18,675, Tifton-44-20,658 and SS-16-18,070 kg/ha. The lowest mean seasonal DMY on all of these 5 forage cultivars

Table 2. Mean seasonal DMY matter yield of the five forage cultivars as a function of soil nitrogen and phosphorus levels

Fertility level kg/ha	Limpo	Klein	Callie	Tifton-44	SS-16
N-P-K	kg dry forage per hectare				
	*	*	*	*	*
502-407-120	16647 a	21011 a	18320 a	20979 a	18294 a
502-207-120	16195 a	19729 a	18675 a	20128 a	18447 a
502-7-120	15774 a	18026 a	17242 b	20658 a	18070 a
262-407-120	14952 b	15635 c	16993 b	16897 b	16671 b
262-207-120	13037 b	15288 c	16259 b	17510 b	15884 b
262-7-120	11411 c	15005 c	17283 b	17222 b	16181 b
22-407-120	9741 d	8038 d	8566 c	8382 c	8525 c
22-207-120	9660 d	8286 d	8781 c	9007 c	8961 c
11-7-120	9180 d	7349 d	8749 c	8879 c	8663 c

* Values in a column with the same letter are not significantly different at 0.05 level. (Duncan's Multiple Range Test).

obtained when soil N level was not increased. As expected, the data further indicated that increasing soil P level without increasing soil N level did not result in significant increases in seasonal DMY.

The mean crude protein concentration of the various forages as a function of soil N and P levels are shown in Table 3. The greater, more significant percentages occur in the bermudagras forages where 12 and 13% are quite common. The average protein contents of Klein and Limpograss were significantly lower with values ranging only from 7 to 9.4%.

The effect of soil N and P levels on the relative ground cover establishment of the cultivars is shown in Table 4. Like the seasonal DMY of the cultivars the relative ground cover was significantly influenced by soil N level and dependent on variety. The Tifton-44 bermudagrass showed the most complete relative ground cover, so a value of 10 was assigned at the height N (502 kg/ha. To those plots with the next lower level (262 kg/ha) that showed relative ground cover values of ± 9.0 were found which were not significantly lower than the values at the

higher soil level. When no nitrogen was applied (22 kg/ha), relative ground cover was found to decrease to ± 8.5, but the latter relative ground cover values were not significantly lower. Callie and SS-16 showed equally significant ground cover of almost 10 for the two higher N levels (502 and 262 kg/ha), then a more drastic and significant decrease to less than 4 with a decrease in soil N to the native soil N (22 kg/ha). Limpo and Kleingrass showed relative standability values of ± 7.5 when the soil N level was 502 kg/ha and both indicated significantly decreased to ± 2 when the N was applied. It is quite evident that ground cover establishment of these forages, except Tifton-44, is significantly increased by increases in soil N level, but not affected by increases in soil P level.

Table 3. Mean crude protein concentration (%) of the five forage cultivars as a function of soil nitrogen and phosphorus levels

Fertility kg/ha N-P-K	Limpo	Klein	Callie	Tifton-44	SS-16
	*	*	*	*	*
22-207-120	7.0 f	7.2 f	12.4 b	12.4 b	11.6 c
22-207-120	7.4 f	8.0 e	13.0 b	13.6 a	7.0 f
22-407-120	7.4 f	9.4 d	10.8 c	10.0 d	8.0 e
262-7-120	7.0 f	7.0 f	10.0 d	12.6 b	12.2 b
262-207-120	8.2 e	7.0 f	13.8 a	12.5 b	13.7 a
262-407-120	7.4 f	8.0 e	13.2 a	13.0 b	13.0 b
502-7-120	7.6 f	8.0 f	12.4 b	12.2 b	12.0 b
502-207-120	8.2 e	7.0 f	11.4 c	12.8 b	11.2 c
502-407-129	7.4 f	8.2 e	12.7 b	13.4 a	12.6 b

* Values in a column with the same letter are not significantly different at the 0.05 level (DMR Test).

Table 4. The effect of soil nitrogen and phosphorus levels on relative ground cover of the cultivars

Soil levels	Forage Cultivars				
N - P	Klein	Limpo	Callie	SS-16	Tifton-44
	*	*	*	*	*
502-407	7.1 a	7.2 a	9.9 a	9.5 a	10.0 a
502-207	7.3 a	7.5 a	10.0 a	9.8 a	10.0 a
502-7	7.0 a	7.4 a	10.0 a	9.2 a	10.0 a
262-407	4.7 b	6.9 a	9.7 a	8.4 a	9.2 a
262-207	4.4 b	7.0 a	10.0 a	8.7 a	8.9 a
262-7	4.8 b	6.8 a	10.0 a	8.6 a	8.5 a
22-407	1.5 c	1.7 b	3.6 b	2.3 b	8.1 a
22-207	1.5 c	1.9 b	3.5 b	2.1 b	8.6 a
22-7	1.3 c	2.0 b	3.3 b	2.5 b	8.3 b

* Values in column with the same letters are not significantly different at the 0.05 level, (Duncan's Multiple Range Test).