

Forage Research in Texas

1983

Soil Fertility Management for Selected Forages:
 "The Effect of Nitrogen and Phosphorus Fertilization
 on the Performance of Improved Forage Cultivars"

A. S. Mangaroo*

SUMMARY

The forage yield of Callie, Tifton-44 and SS-16 bermudagrasses, Klein and Limpo were significantly increased by N fertilization. A significant N x P interaction was observed in the yields of Klein and Callie bermudagrass. Crude protein concentration of the various forages ranged from 12-13% in the bermudagrass and 9-10% in Klein and limpograsses. Increasing the soil N level resulted in Small nonsignificant increases in protein concentration.

PROCEDURE

Kleingrass (Panicum coloratum), Limpograss (Hermarthria altissima), and three bermudagrasses (Cynodon dactylon) - Callie, SS-16, and Tifton-44, were studied in a field experiment being conducted 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 2nd year of a 3-year study, so that the respective forages have been similarly treated for the last 2 years (1981-82) with one more year (1983) to follow. 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 502 kg/ha N applied as NH_4NO_3 . The first level being 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 applications of 50 and 100 kg/ha each in the spring and following each harvest. In the spring all the plots were similarly treated once with K at 120 kg/ha and limed to pH 6.2. Cuttings were taken in May, June, July and September and dry matter yields (DMY) and crude protein determined.

* Professor, Prairie View A&M University Cooperative Research Center, Prairie View, Texas 77445.

RESULTS

The mean seasonal DMY of the cultivars for '80, '81 and '82 regardless of N and/or P fertilization is presented in Figure 1. A very significant increase in seasonal DMY was obtained from all the forages in 1982 over previous years, with Tifton-44 showing the most significant gain. This great increase in seasonal DMY was probably the result of the increases in ground-cover development.

The mean seasonal DMY of the forages as a function of the various soil N and/or P levels are shown in Tables 1 to 5. These yields of all the grasses were significantly influenced by soil N level in some cases as N x P interaction was observed. The greatest mean seasonal DMY obtained from Limpograss shown in Table 1 was 22,271 kg/ha, which was obtained at the second soil N level (262 kg/ha and the native P level (7 kg/ha). For Kleingrass (Table 2) the mean seasonal DMY of 22,555 kg/ha obtained at the third soil level of N (502 kg/ha) and second level of P (207 kg/ha) were significantly greater than those found at the other N x P combinations. The highest yields obtained from Callie bermudagrass (Table 3) were 22,363 kg/ha, which were obtained at the same soil N and P level at which Kleingrass yielded highest. For Tifton-44, the highest seasonal DMY of 22,451 kg/ha, as shown in Table 4, were also obtained at the same soil N and P level (502, and 207 kg/ha resp.) at which the highest seasonal DMY were obtained from Callie bermudagrass and Keling. However, at the same soil N level and the native level of P (7 kg/ha) seasonal DMY of 19,651 kg/ha were obtained from this forage which were not significantly different (statistically) from the 22,451 kg/ha obtained from the other N x P combination. For SS-16 bermudagrass hybrid, the greatest mean seasonal DMY, as indicated in Table 5 of 19,674 kg/ha, was obtained at the third level of soil N (502 kg/ha) and the native level of soil P (7 kg/ha). The data also indicated that for this cultivar when the soil N level was held at 502 kg/ha and the level of soil P was increased, small reductions were not statistically significant. A look at the bottom of Table 1 through 5 simultaneously will indicate that the lowest mean seasonal DMY of all of these 5 forage cultivars were 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. Decreases in seasonal DMY were obtained in most cases presented here. All of the various forage plots that have not received an N fertilizer for the duration of this study (soil N level 1) show drastically reduced groundcover which in the cases of SS-16 and Callie bermudagrass is now less than 10%.

The crude protein concentration of the various forages as a function of the soil N and P levels is given in Table 6. The bermudagrass cultivars - Tifton-44, SS-16, and Callie showed protein concentrations ranging from 12 to 13% whereas the forages from Keling and Limpograsses contained 9 to 10% protein. In general, the data indicated that increasing soil N level resulted in small increases in crude protein concentration in the forages but there was no consistent trend in protein concentration associated with increasing soil P level.

Figure 1. Comparison of the mean seasonal DMY of the cultivars for '80, '81, and '82 regardless soil N and/or P levels.

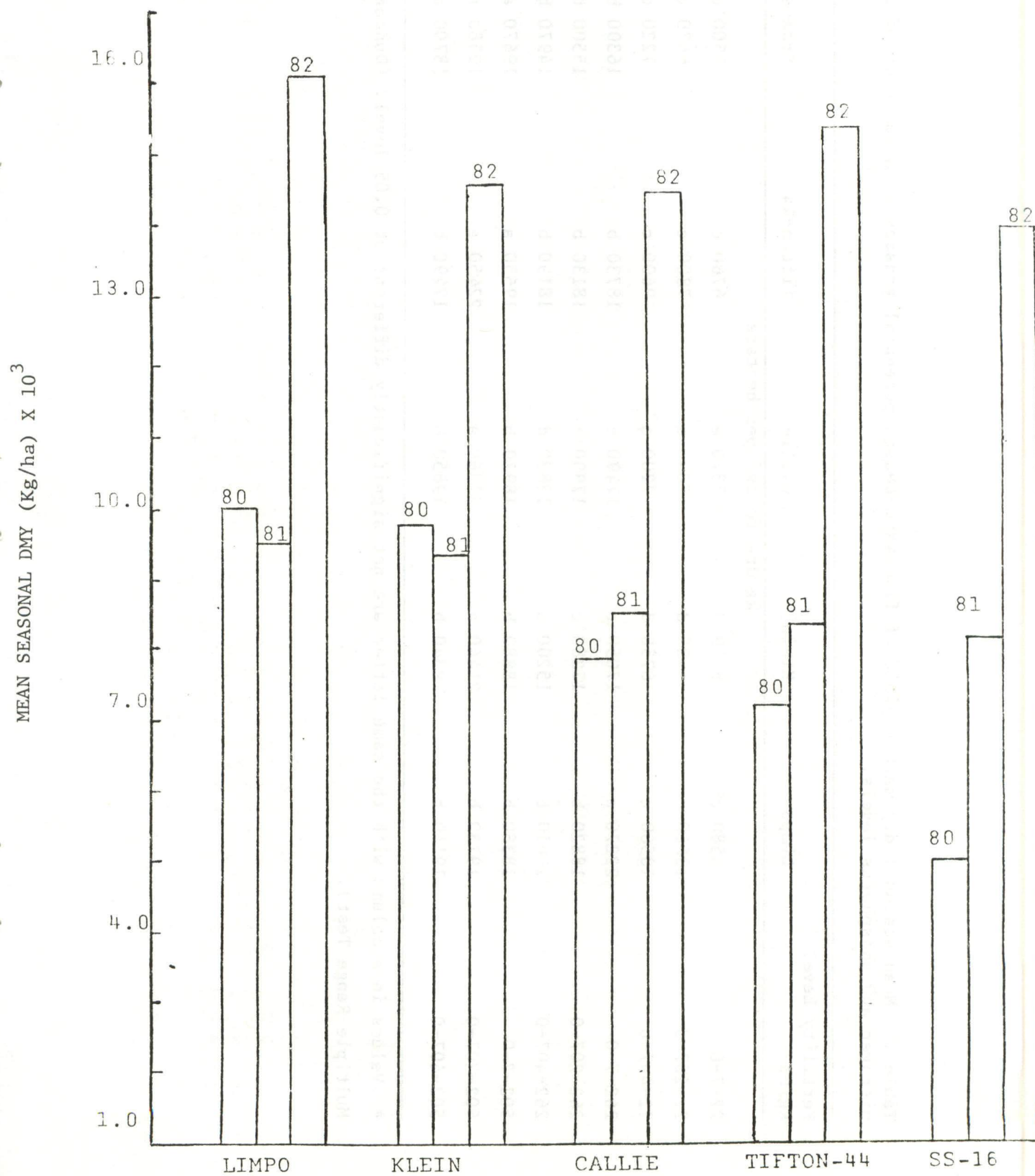


Table 1. Mean seasonal dry matter yield of five warm-season perennial grasses as a function of soil nitrogen and phosphorus levels.

Fertility Level kg/ha	Limpo	Klein	Callie	Tifton-44	Brazos
	kg dry forage per hectare				
22-7-0	8580 c*	8140 d	7370 e	6760 c	7500 c
22-207-0	10660 c	7400 d	7040 e	7800 c	6670 c
22-407-0	10560 c	6750 d	7200 e	9600 c	7220 c
262-7-0	22270 a	17050 c	17490 c	18730 b	16300 b
262-207-0	18820 b	17280 c	17990 c	18130 b	15500 b
262-407-0	16810 b	15200 c	12830 d	18190 b	14970 b
502-7-0	18380 b	18880 b	18970 b	19650 a	19670 a
502-207-0	19730 b	21440 a	22360 a	22450 a	19580 a
502-407-0	19140 b	19340 b	19850 b	17490 b	18700 a

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

Table 2. Mean crude protein concentration (%) of five warm-season grasses as a function of soil nitrogen and phosphorous levels.

Fertility Level kg/ha	Limpo	Klein	Callie	Tifton-44	Brazos
22-7-0	7.2	8.9	11.5	12.3	10.6
22-207-0	10.4	9.1	11.7	12.5	9.9
22-407-0	9.7	9.1	12.8	11.8	10.0
262-7-0	9.7	9.2	13.1	12.8	12.0
262-207-0	10.2	9.8	13.5	12.7	12.1
262-407-0	9.4	8.9	13.1	12.7	12.1
502-7-0	9.1	10.3	13.4	12.2	13.2
502-207-0	10.6	9.8	11.9	13.1	13.1
502-407-0	10.7	9.9	13.3	13.0	13.4