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Digestible Dry Matter of Brazos, Tifton-44 and Callie-Bermudagrasses, and Klein and Limpo Grasses Under Soil Nitrogen and Phosphorus Fertilization

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Summary

Digestible dry matter percentages for 1982 and 1983 irrespective of fertilizer treatments were: Callie (58.6, 58.1), Tifton-44 (57.4, 56.9), Brazos (54.9, 54.4), Kleingrass (55.4, 54.4), and Limpograss (48.1, 48.6). Digestibility of the forages was not influenced by soil nitrogen and/or phosphorus. Digestibility was highest in May (the first cutting) and decreased significantly with each successive cutting. Digestible dry matter in 1982 ranged from a high of 8,966.4 kg/ha for Tifton-44 to a low of 7,692 kg/ha for Brazos in 1982, whereas, in 1983 it ranged from 8,829 kg/ha for Tifton-44 to 6,242 kg/ha Limpograss.

Introduction

The quality and quantity of all feed crops depend heavily on the fertility of the soil on which they are grown. Much of the land which is currently used for forage production cannot support yielding row crops but can profitably support forage and pasture production (1.2). In the southern United States, particularly Texas, forages serve as the foundation for the livestock industry, supplying 80 percent or more of the nutrients required for cattle, sheep, and goats (6). The importance of forages as feed in livestock production also increases as grain export pressures continue to escalate. The importance of having an abundance of green feed to satisfy most of the nutrient requirements of livestock in the Texas Coastal area and the Southwest is therefore well known. With the availability of improved agronomic quality traits in recently developed forage cultivars and with pastures and ranges producing only at 22 percent of their potential (2), there is great opportunity for increasing forage yields of much better quality. The growing season in the Texas Coastal Prairie is approximately 272 days with an annual rainfall of 32 to 58 inches. These conditions make the area quite conducive to the production of an abundance of forage for livestock. Since levels of fertilization for row crops have been fairly well established for many years, forage production was considered at the start of the 1970's to be the last frontier for fertilizer use in Texas. With the high cost of fertilizer (particularly nitrogen) it is desirable that proper soil fertility management be utilized to maximize forage production at a much greater level than the 22 percent potential mentioned earlier. The most responsive soil nitrogen and phosphorus levels for each forage season dry matter yields and crude protein concentration was during the 1981-83 period. This part of the study was designed to determine the digestibility of the forages, the seasonal digestible dry matter produced, and the variation in digestibility of the forages of the different cultivars during the growing season.

KEYWORDS: Dry matter digestibility/fertilization/feed crops.

Procedure

Dry matter digestibility, an accepted index of quality was utilized in comparing the quality of Kleingrass, Limpograss, Callie, and Brazos and Tifton-44 produced under different soil nitrogen and phosphorus levels. Samples of the five forage cultivars were collected during 1982 by Williams (7) and in 1983 by Crowder (3) from the experiment plots at Prairie View A&M University Experiment Station, which had been established in 1980 by Ireland (5). The main plots were cultivars and the sub-plots were nitrogen levels (22, 262 and 504 kg/ha nitrogen applied as NH_4NO_3). The first level was native nitrogen and the others were split applications of 60 and 120 kg/ha of N applied in early spring and following each harvest. Each sub-plot was split into three sub-sub plots to accommodate soil phosphorus levels of 7, 207, and 407 kg/ha phosphorus added as superphosphate. Again, the first level being native phosphorus and the others being split applications of 50 and 100 kg/ha P_2O_5 each in the spring and following each harvest. Each spring all the plots had been similarly treated once with potassium (K_2O) at 120 kg/ha and limed to pH 6.2. The dry matter yield response and protein concentration of the cultivars at the indicated soil nitrogen and phosphorus levels, had been studied by Williams (7) and Crowder (3), each using a randomized split-split plot designated, hence this design will be utilized in this study.

Harvest dates were determined by Williams (7) in 1982 as just before Kleingrass seeded (May 23, June 21, July 28, and September 22) and, similarly by Crowder (3) in 1983 as May 28, June 15, July 25, August 28, and September 28. The samples were dried in a mechanical convention oven for 36 hours at 60°C, weighted, ground to pass 1 mm sieve, then stored in air tight plastic containers at room temperature (23°C) until the dry matter digestibilities were determined. In vitro digestibility determinations were made in the laboratory by an adaptation of the method of Goering and Van Soest (4).

Results and Discussion

The mean percent in vitro digestibility of the forages obtained from the cultivars and the seasonal digestible dry matter (percent digestibility × seasonal dry matter yields) produced in 1982 and 1983 are given in Table 1. The mean percent in vitro digestibility of the forages obtained 1982 from the cultivars were listed in decreasing order of magnitude. The values ranged from 58.6 percent for Callie to 48.1 percent for Limpo. The corresponding data obtained from the forages produced in 1983 showed essentially the same trends in digestibility with the values ranging from 58.1 percent for Callie to 48.6 percent for Limpograss.

Seasonal digestible dry matter production was greatest for Tifton-44 in both years (8,966 and 8,829 kg/ha), followed by Callie with 8,536 and 8,448 kg/ha respectively. The data indicate that Klein, Limpo, and Brazos produced less seasonal digestible dry matter than Tifton-44 and Callie and that the amounts from Klein and Limpo showed decreases in 1983 from 82, whereas, the amounts from Brazos showed increases in 1983 from 1982.

In all cases in vitro digestibility of the forage was greatest in May and decreased through September as shown in Tables 2 and 3. The greatest decreases were found in Callie and Tifton-44 bermudagrasses, in which values decreased from over 60 percent in May to just above 50 percent in September. Very little variability was found in the values obtained in 1982 compared to those obtained in 1983. Limpograss forage showed the lowest digestibility in both years ranging from about 50 percent in May and decreasing to about 46 percent in September.

The data further indicated that the digestibility of the forages of these cultivars was not influenced by soil nitrogen and phosphorus levels. Also, no correlation was found between protein content of the various forages and their in vitro dry matter digestibility.

TABLE 2. THE IN VITRO DIGESTIBILITY OF THE FORAGES OF EACH CUTTING IN 1982

Cutting	Klein	Limpo	Callie	Brazos	Tifton-44
May	58.7 a	50.3 a	65.2 a	57.9 a	65.0 a
June	58.1 a	49.1 a	61.6 b	56.2 a	60.6 b
July	53.3 b	46.8 b	55.5 c	53.3 b	53.5 b
September	51.7 c	46.3 b	52.2 d	52.3b	50.3 d

TABLE 3. THE IN VITRO DIGESTIBILITY OF THE FORAGE AT EACH CUTTING IN 1983

Cutting	Klein	Limpo	Callie	Brazos	Tifton-44
May	58.5 a	50.6 a	65.4 a	57.9 a	64.9 a
June	57.6 b	49.4 b	61.6 b	56.9 b	60.4 b
July	53.7 c	48.4 b	56.2 c	53.5 c	53.7 c
August	52.9 d	47.8 d	53.7 d	52.4 d	53.3 d
September	44.6 e	46.8 d	53.5 d	51.4 e	52.1 d

TABLE 1. MEAN IN VITRO DIGESTIBILITY (PERCENT IVDMD) AND SEASONAL DIGESTIBLE DRY MATTER (SDDM) PRODUCED BY THE FORAGES IN 1982 AND 1983

	1982		1983	
Cultivar	% IVDMD	SDDM (KG/HA)	% IVDMD	SDDM (KG/HA)
Callie	58.6 a	8536.2	58.1 a	8448.3
Tifton-44	57.4 b	8966.4	56.9 b	8829.7
Klein	55.4 c	8093.3	54.5 c	7712.8
Brazos	54.9 c	7692.5	54.4 c	7849.6
Limpo	48.1 d	7743.6	48.6 d	6242.1

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