EFFECT OF THE N AND P ON YIELD AND SWARD AND DWARF ELEPHANT GRASS *PENNISETUM PURPUREUM* CV. MOTT.

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ABSTRACT

The effect of nitrogen and phosphorus application on yield and sward structure as height and leaf, stem and dead forage composition of dwarf elephant grass (*Pennisetum purpureum* Schumach) cv. Mott was studied under field conditions and complementary irrigation, during one year at very dry tropical forest with a semiarid climate in Venezuela. The nitrogen (N) and Phosphorus (P) rate were 0, 150, 350, 450, kg ha^{-1} year and 0, 50 and 100 kg P_2O_5 ha^{-1} year respectively. The N rate increased the plant height (81.52 cm), leaf, stem and death production (10, 8.13, and 1.62 t DM ha^{-1} respectively) and cumulative total dry matter yield (19.8 t DM ha^{-1}) from seven cuttings each 45 days. Neither P alone nor NxP interaction had any discernible effect on dry matter production.

KEYWORDS

Fertilization, dwarf elephant grass, napier grass, N-75 and Mott elephant grass.

INTRODUCTION

Venezuela is a tropical country with a low animal productivity, mainly due to the seasonal climate, acid and poor soils and bad grazing management. The research in the last years has worked on the introduction of better species and right now the pastures management systems for animal production mainly at the Maracaibo Lake Basin regions are based on a wide variety of pasture, including the dwarf elephant grass. The dwarf elephant grass was released by Dr. W. Hanna from Tifton experiment station, Georgia and studied by Dr. Mott and his group at the University of Florida.This specie was introduced at Zulia state, Venezuela about 1984. The results so far at Zulia farmers show that this pasture cultivar has high performance in dry matter production, digestibility, crude protein and animal response under cutting or grassing intensive management systems. However, even we need to now more about the dwarf elephant grass management, mainly on fertilization response sward structure, grazing management, etc.

The objectives of this experiment were to study the effect of several nitrogen and phosphorus rates on cumulative dry matter yield and sward structure of this pasture.

MATERIALS AND METHODS

The experiment took place at the San Tome farm, 48 Km. from Maracaibo, Venezuela (10° 28' N, 72° 05' W). The mean annual rainfall is 750 mm and the average month temperature is 28°C. The soil was a 6.1 pH sandy loam (Udic Paleustalf) with about 0.57 % organic matter, low phosphorus and medium potassium status. A factorial 4x3 with 12 treatments replicated three times in a randomized block design was used. Treatments consisted of four nitrogen rates (0, 150, 300 and 450 kg ha^{-1}) added as Urea (N:46%) and tree phosphorus rates (0, 50 and 100 kg P_2O_5 ha^{-1}) using triple super phosphate (P_2O_5:46%) as source. The P was applied once year at the beginning of the experiment, whereas the N was spreaded seven times a year with the cuttings time, at equal quantities by cutting. Plot size was 1440 m^2 (60 x 24 m), the pasture was one year old of 0.5 x 0.5 m. spacing density and 50 mm. by week irrigation. The experiment area was subdivided into plots of 12 m^2 by treatments. Seven cuttings each 45 days were made and harvest samples for field, sward structure and dry matter content analysis were taken. The analysis of variance and mean comparisons were made using the general linear model procedure of the Statistical Analysis System (SAS).

RESULTS AND DISCUSSION

Dry matter yield. The dwarf elephant grass showed increased (P-0.05) of dry matter yield with increasing rates of N. As noted in Table 1, the cumulative total dry matter yield for 150, 300 and 450 kg N ha^{-1} from seven cuttings (315 days) was 18.43, 22.9 and 24.81 t ha^{-1} , which is equal to 1.41, 1.75 and 1.9 times the values obtained with 0 kg N ha^{-1} .

These results are higher than those found in two studies (Valentim et al., 1988; Soto, 1993), but lower to reported by González (1990), this would be explained by a better soil fertility and climate conditions for the González experiment. The best N rate efficiency was obtained with 150 kg, which showed a dry matter yield of 35.67 kg per kg N. These findings confirm observations made in two studies (Herrera, 1977; Iturbide, 1969), in which the N efficiency tendency was to reduce as the N rate at high levels increased. The P fertilization did not improve (P(0.05) the dry matter yield in relation to 0 kg P_2O_5 ha^{-1}.

Sward structure. The plant height was affected (P-0.05) by nitrogen rate. The plant height values for 300 and 450 kg ha^{-1} was 90.87 and 86.8 cm respectively, which was 16 and 20 cm taller than that 0 kg N ha^{-1}. The study shows the positive relationship between dry matter yield and plant height as the N rate increase.These results well agreed with others studies (Ortega and González, 1990; Soto, 1993) in star grass and elephant grass respectively. As is showed in Fig. 1 the dwarf elephant grass showed (P-0.05) increased cumulative dry matter partitioned into leaf, stem and dead material with increasing rate of N. The maximum response to N fertilization of 94, 86 and 84 % for leaf, stem and dead dry matter forage was reached with 450 kg ha^{-1} in relation to 0 kg N ha^{-1} production, whereas the leaf: stem ratio with 1.23, 1.25, 1.18 and 1.29 for 0, 150, 300 and 450 kg N ha^{-1} was no affected (P-0.05) by N fertilization. These values were higher than those reported by Velez and Arroyo (1981) working with seven elephant cultivars.

In conclusion the 150 and 300 kg N ha^{-1} produced (P-0.05) greater amounts of dwarf elephant grass forage; whereas the P fertilization did not increase dry matter yield at least first year of study, therefore should be necessary to continue this research to observe any response to P applications in next years.

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Table 1

Effect of nitrogen on cumulative average dry matter yield of dwarf elephant grass (means of 7 cuttings and 3 replications).

Nitrogen rates (kg ha^{-1})	Dry matter yield (kg ha^{-1})
0	13.08 ± 1.24 c
150	18.43 ± 2.23 bc
300	22.90 ± 2.08 ab
450	24.81 ± 3.09 a

Means followed by the same letter are no significantly different (P-0.05) according to the tukey test.

Figure 1

Effect of N on cumulative average dry matter fraction yield of dwarf elephant grass (means of seven cuttings)