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**THE FERTILIZATION OF FORAGE GRASSES WITH PHOSPHORUS IN THE  
CERRADO AREA OF UBERABA-MG, BRAZIL**

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**Abstract**

Using an area of Cerrado at the EPAMIG Experimental Station in Uberaba - MG, it was studied the response of four forage grasses to phosphorus application. It was used the grasses: *Andropogon gayanus*, *Brachiaria brizantha*, *Hyparrhenia rufa*, and *Panicum maximum*. The phosphorus fertilizer used was a yoorin termophosphate and the doses were: 0, 50, 100, 150, and 200 kg/ha of P<sub>2</sub>O<sub>5</sub>. The experimental design was a randomized complete block with three replications. Each experimental unit measured 6x8m and the measured parameters were: dry matter production, protein production, percentage of dry matter, and protein, and the plant height at cutting time. The application of phosphorus increased dry matter production, crude protein production, and the plant height. Crude protein and dry matter contents were not influenced by the fertilization with phosphorus.

**Keywords:** Cerrado, savanna, phosphorus fertilization, forage grasses, forage quality

## Introduction

The establishment and maintenance of pastures capable of producing high quality and large quantities of forage for a long period of time requires a skillful management and a correct fertilization to overcome possible deficiencies in the soil. Under the conditions of the majority of cerrado soils in Brazil the main factor limiting forage growth is its fertility, mainly phosphorus. Various authors have reported a very good response to P application (Carneiro et al.,1992, Rossi et al., 1997, Italiano et al.,1981). Sanzonowicz et al., (1980) reported maximum dry matter (DM) production with the application of 240 kg of P<sub>2</sub>O<sub>5</sub>/ha as a 'thermophosphate of yoorin'. The present experiment was conducted under the cerrado condition and had the objective of studying four tropical forages fertilized with rates of phosphorous as yoorin themophosphate.

## Material and Methods

The experiment was conducted on an acrustox oxisol under a cerrado vegetation that did not receive any fertilizer application before the beginning of the trial. Soil analysis showed the following results: pH - 5.20; Ca<sup>++</sup> + Mg<sup>++</sup> - 0.4 meq/100cc ; K -31ppm Al - 0.9 meq/100cc; and Phosphorus - 1 ppm (using Mechlich - 1 extractor). Before grass seeding the soil was plowed and disked after the spreading of 3 t/ha of dolomite lime. The grasses used were: guinea grass (**Panicum maximum**) jaragua grass (**Hyparrhenia rufa**) , andropogon grass (**Andropogon gayanus**) and brachiaria brizantha (**Brachiaria brizantha**) "marandu cultivar". The experimental design utilized was a complete randomized block and the experiment was composed of 20 treatments. Four grasses combined with five levels of phosphorus and three replications. The P rates were: 0 , 50 , 100 , 150, and 200 kg of

$P_2O_5$ /ha as yoorin thermophosphate. Each experimental unit measured 6 x 8m and from each side of the plot it was eliminated 1 m to serve as a border. The grasses were planted in furrows spaced 0.5m from one another. Besides P and lime applications each plot received 100 kg of  $K_2O$ /ha as potash chloride at the planting time and 90 kg of N/ha as ammonium sulfate after each harvesting date. It was also applied 42 kg/ha of trace elements (FTE BR 12) in January 1985. After the establishment of the grasses all the plots were cut with the objective of making them homogeneous. After this initial cut there were another cuts according to forage growth. There were seven cuts made on 12-03-84; 02-26-85; 11-04-85; 01-23-86; 04-14-86; 11-21-86; and 03-10-86. Forages were cut at the height of 10 cm above ground level, and the cuts were done whenever forage height varied from 0.40 to 0.90m depending on the kind of forage. After each cut the forage produced was weighed and samples were taken for laboratory analyses. These samples were analyzed for dry matter and crude protein. Besides the estimation of dry matter and crude protein production the plants were also measured to find out their height. The data were submitted to an analysis of variance as well as the Tukey test to separate the means.

### **Results and Discussion**

From the seven cuttings only six are used in this paper. The 02-26-85 cutting was discarded due to identification problems of the samples. The statistical analysis showed effect of phosphorus application at the 1 % level for protein and dry matter availability, but did not show any difference for dry matter and protein contents for none of the studied grasses. There was also an effect of phosphorus application on plant height. Effects of phosphorus application on forages were observed by Mclung et al. (1958) and Novaes

(1983). It was observed differences between the forage grasses for all the studied variables. It was observed effects for sampling dates and the interaction of these sampling dates and the grasses was also significant. DM availability varied from 3,412.8 kg/ha for the no phosphorus application treatment to 4,269.6 kg/ha for the treatment with 200 kg/ha of P<sub>2</sub>O<sub>5</sub> application (Table 1).

There was no difference due to phosphorus application for DM, and CP content. Protein levels varied from 6.2 to 6.7% (Table 1) and DM content varied from 40.1 to 42.8%. Grass differences are presented in Table 2. Andropogon grass was the most productive one with a forage availability mean of 5,975 kg/ha and the least productive was jaragua with 2,918kg/ha. Application of phosphorus increased forage availability but it did not modify its quality when measured on the bases of crude protein content.

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**Table 1** -The effect of phosphorus rates on the studied variables of jaragua , andropogon, braquiaria and guiana grass.

P <sub>2</sub> O <sub>5</sub> rates		Dry matter		Crude	Protein
kg/ha	Plant height (cm)	Availability kg/ha	Content %	Availability kg/ha	Content %
0	57.7b	3,412.8b	42.8 <sup>a</sup>	185.6c	6.4a
50	58.0b	3,755.6ab	42.8 <sup>a</sup>	197.4bc	6.3a
100	61.2b	3,900.2ab	40.8 <sup>a</sup>	213.3abc	6.2a
150	61.7ab	4,163.8a	40.7a	216.3ab	6.3a
200	68.5a	4,269.6a	40.1a	236.7a	6.7a
CV(%)	24.8	30.0	15.2	31.6	15.3

Mean of 72 observations - 3 replications, 4 forage grasses, and 6 cuttings. Means within the same column followed by the same subscript do not differ according to Tukey test at the 5 % level.

**Table 2** - Plant height, biomass and crude protein availability and dry matter and crude protein content of grasses grown in the Cerrado of Brazil.

Grasses	Plant height (cm)	Dry matter		Crude Protein	
		Availability kg/ha	Content %	Availability kg/ha	Content %
Andropogon	90.6a	5975a	40.7b	284a	5.2c
Brachiaria	38.3d	3563b	40.4b	183c	6.2b
Guinea	69.4b	3245cd	41.7ab	223b	8.4a
Jaragua	47.7c	2918c	43.3a	148d	6.0b
Average	61.5	3900	41.5	209	6.4

Average of 90 observations - 3 replications, 6 cuttings, and 5 levels of phosphorus applications. Means in the same column followed by the same letters are not different according to Tukey test ( $P < 0.05$ ).