IMPROVEMENT OF SUBTROPICAL NATIVE GRASSLANDS WITH THE INTRODUCTION OF FORAGE SPECIES AND PHOSPHORUS FERTILIZERS.

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ABSTRACT
The experiment took place in Guarapuava-Brazil, from May 1994 to January, 1996 to evaluate the improvement of a subtropical native grassland by the introduction of species and phosphate fertilization. It was observed that for the higher dose applied there occurred an increase over the production of dry matter and crude protein production and absorption of P and K in the plant. A response was not found to the 180 kg P_2O_5/ha application probably because of the high capacity of soil adsorption, the method of fertilizer application, non favorable climatic conditions and liming interference. The single superphosphate-SS application was superior to Thermalphosphate-YT and Arad Rock Phosphate-ARP for production of dry matter and over the others sources for absorption of P and K, and only superior to YT for production of crude protein. The levels of Ca, Mg, NDF and ADF in the plant were also discussed.

KEYWORDS
native grasslands, phosphorus, fertilizers, forage quality, dry matter production, subtropical pasture, species introduction, Brazil

INTRODUCTION
Cattle raising is one of the main economical activities in the state of Paraná, where about 1.4 million hectares of native grazing land are being utilized, which represents 23% approximately for grazing in the state.

The native grazing land improvement with seedling mixtures of grasses and annual and\or perennial legumes from cold season is a very practical alternative to solve the problem of the low availability of quality forage during autumn and winter, because they have a low cost and they contribute to a better seasonal distribution of quality forage (Quadros and Maraschin, 1987).

The soil under native grazing lands in Paraná, in its majority, shows a high acidity and a low availability of bases and phosphorus, being one of the limitations to the introduction of others forage species to improve the native pasture. The studies on the dose and phosphorus sources in the improvement of these pastures is important to the success of the settlement of the grasses/legumes mixture.

METHODS
The research took place in Guarapuava regional, Paraná State, Brazil, in a native subtropical pasture with the predominance of grasses, principally the Bahiagrass (*Paspalum saurae)*.

The regional weather is a Cfb, with an altitude of 1050 m; the soil is a dystric cambisoil derived from the basalt with the following chemistry characteristics: pH ($CaCl_2$) 4.8; P 1mg/g; C 48 g.dm^{-3}; Mg 2.6, Ca 3.4 and K 0.23 $cmol_c.dm^{-3}$, 60% clay. After preparing the soil (tillage), a liming of 10.000 kg/ha and potassium fertilization with 90 kg K_2O/ha in KCl form was executed and incorporated by railing. The treatments were 3 application rates of phosphorus (0, 180 and 360 kg of P_2O_5/ha) and 5 sources of phosphorus (single superphosphate-SS; Gafsa rock phosphate-GRP; Arad rock phosphate-ARP; Thermalphosphate (Yoorin)-YT and a mixture of 1/3 of SS + 2/3 of GRP, applied superficially without incorporation. In May 1994 it was sowed by throwing the following species: ryegrass (*Lolium multiflorum*), white clover (*Trifolium repens*), red clover (*Trifolium pratense*), birdsfood trefoil (*Lotus corniculatus*) and arrowleaf clover (*Trifolium vesiculosum*). Six cuts were realized, being the first in October, 1994 and the last in January, 1996, and the following parameters were analyzed: Dry Matter Production (DM), Crude Protein (CP), Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF), P, Ca, Mg and K, through Near Infrared Spectrography (NIRS). The experimental design was a randomized block with 4 replications.

RESULTS AND DISCUSSION
The data showed in Tables 1 and 2 indicate that there occurred effects from the doses and sources on the production of DM and CP, absorption of P and K by plants, and the doses over the levels of ADF, NDF, P and K. It was noticed that only at the greater dose applied was there an increase over the DM and CP, absorption and concentration of P and K in the plant in relation to the others treatments. A response to the 180 kg P_2O_5/ha dose was not found probably because of the high capacity of soil adsorption, the method of fertilizer application, non favorable climatic conditions and liming interference.

The SS was superior in relation with ARP and YT for DM yield, and did not show differences between the others; and for CP showed differences in relation to YT. This effect may be related to the short period studied because the solubilization velocity of natural phosphate is slow at the beginning and increases with passing time (SANZONOWICX & GOEDERT, 1984).

The P extraction by plant was higher when using SS in relation to the natural phosphates, confirming the low solubility of the rock phosphates in a short time. The improvement in the K availability was also noticed with the usage of SS, probably due to the increase of the DM production and a tendency of higher levels of K in the plant. It is suggested that the fertilization with SS increased the radicular development and the K absorption.

The improvement of the forage quality due to the usage of P, is showed on Table 2, through the increase of the level of P and K in the plant for the major P rate applied and, on Table 1, by the decrease in the levels of ADF and NDF in the usage of a minor P dose. For non-established reasons, the major dose used wasn't different from the check. Due to a small difference showed in the data it is necessary for further specific studies to confirm those results. It is important to say that K and P levels are considered normal, confirming the good supply of P to the plant even without the addition of it. Normal levels also occur with Ca and Mg (Ca between 1.01 and 1.10% and Mg between 0.28 and 0.31% of the plant) without finding out effects on the treatment over those levels.

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TABLE 1
Dry Matter (DM), Crude Protein (CP) yield and content Acid Detergent Fiber (ADF), Neutral Detergent Fiber (NDF), Phosphorus (P) and Potassium (K) content in the plant and rate absorption of the improvement natural grassland, in function of different sources of phosphate fertilizers. Average (%) of the 6 cuts and sum (kg/ha) of 6 cuts.

SOURCE	SS	GRP	ARP	YT	SS+GRP
DM (kg/ha)	13,704 a	12,078 ab	11,748 b	11,616 b	12,090 ab
CPxDMkg/h	1,962 a	1,761 a	1,706 ab	1,661 b	1,760 ab
ADF (%/DM)	40.01 a	39.38 a	39.62 a	39.73 a	39.61 a
NDF (%/DM)	60.9 a	59.8 a	60.0 a	60.1 a	60.3 a
P (%/DM)	0.28 a	0.27 a	0.27 a	0.27 a	0.27 a
K (%/DM)	1.93 a	1.88 a	1.92 a	1.86 a	1.86 a
PxDM (kg/ha)	38 a	33 b	32 b	31 b	33 ab
KxDM (kg/ha)	264 a	227 b	226 b	226 b	225 b

Mens not followed by the same letter differ significantly at the 5% level of probability as determined by Tukey test.

TABLE 2
Dry Matter (DM), Crude Protein (CP) yield and content Acid Detergent Fiber (ADF), Neutral Detergent Fiber (NDF), Phosphorus (P) and Potassium (K) in the planta and rate absortion of the improvement natural grassland, in funcion of different application rates of phosphated fertilizers. Average of the 6 cuts.

	Application Rates P_2O_5 kg/ha		
	0	**180**	**360**
DM (kg/ha)	11,220 b	11,532 b	13,986 a
CPxDM (kg/ha)	1,692 a	1,680 a	2,043 a
ADF (%)	40.0 a	39.3 b	39.8 ab
NDF (%)	61.1 a	59.3 b	60.2 ab
P (%)	0.27 b	0.27 b	0.28 a
K (%)	1.84 b	1.88 b	1.95a
PxDM (kg/ha)	30 b	31 b	39 a
KxDM (kg/ha)	206 b	217 b	273 a

Mens not followed by the same letter differ significantly at the 5% level of probability as determined by Tukey test.