

# EFFECT OF THE CUTTING FREQUENCY ON YIELD, CRUDE PROTEIN AND MINERAL CONTENTS OF A PANICUM MAXIMUM/CENTROSEMA MACROCARPUM MIXTURE

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## ABSTRACT

Dry matter (DM) yield, crude protein (CP) and mineral composition of *Panicum maximum-Centrosema macrocarpum* association as affected by three cutting frequencies (28, 42 and 56 days) were compared in a tropical dry forest of Venezuela. No differences ( $P < 0.05$ ) among defoliation frequencies for any of the variables were detected. All mineral concentrations evaluated in Guinea grass (*P. maximum*) were considered adequate for grazing ruminants. In *C. macrocarpum* only P (0.24%) and N (0.08%) were close to critical level for deficiencies in ruminants. *P. maximum-Centrosema macrocarpum* mixture offered adequate levels for grazing ruminants for all nutrients evaluated.

## KEYWORDS

*Centrosema*, cutting, yield, protein, minerals

## INTRODUCTION

One of the problems of raising cattle in the tropics is the fluctuating liveweight of animals through the year as a consequence of poor performance during dry season. Integration of pasture based on *Centrosema*-improved grass can help overcome dry-season constraints (CIAT, 1990). *Centrosema macrocarpum* is one of the most promising of *Centrosema* species in tropical forest ecosystem (CIAT, 1992). Guinea grass (*Panicum maximum*, Jacq) is an important pasture plant for the moist ecosystem of America tropics (CIAT, 1992). Guinea grass develops good association with climber legumes such as *C. macrocarpum* (CIAT, 1990). However little information is available on yield and quality of *Panicum maximum-Centrosema macrocarpum* associations. Thus, the purpose of this study was to evaluate dry matter (DM) yield, crude protein (CP) content and mineral composition of a *Panicum maximum-Centrosema macrocarpum* mixture as affected by three cutting frequencies in a tropical dry forest.

## MATERIALS AND METHODS

The experiment was conducted in 1992 and 1993 at a farm located in Zulia State, western region of Venezuela (10½ 32' 32" N and 72½ 12' 30" W), with climate and vegetation corresponding to a tropical dry forest. Mean annual rainfall is 1063 mm, distributed in alternate dry (four and two months) and rainy (two and four months) seasons. Average annual temperature is 28 ½°C. Soil is a sandy loam Typic Haplustalf with pH=5.2, 2.68 % organic matter, and 8, 60, 100 and 324 ppm of P, K, Ca and Mg, respectively.

Twelve experimental plots (3x4 m) of a *P. maximum-C. macrocarpum* association were used to evaluate three cutting frequencies, 28, 42 and 56 days, in a randomized complete block design with three replications. Before each cutting, plant height was measured separately at three randomly selected sites in the plots to be cut. The available forage 30 cm above the ground in the central 2x2-m area from each plot was cut using hand shears. Species were separated manually, individually weighed and a sample (ca. 500 g) for each one consisting of 10 grab samples was taken to determine DM content at 60½°C and to estimate DM yield. Samples from the first, mid and last cuttings for each frequency in two replications, corresponding to rainy, intermediate and dry periods, respectively, were analyzed

for CP content (AOAC, 1980), and Ca, P, Mg, K, Na, Cu, Fe and Mn concentrations using the methods compiled by Fick *et al.* (1979).

Analysis of variance for dry matter yield per cutting and total production, plant height data from 12, 6 and 4 cuttings for 28, 42 and 56 days, respectively, over the total experimental period (336 days), and CP and mineral data, were carried out separately for each forage species and least-square mean were compared using Duncan's multiple range test. Forage composition results are discussed in relation to nutritional requirements of grazing ruminants.

## RESULTS AND DISCUSSION

**Dry matter (DM) yield, crude protein (CP) content and plant height (PH).** Average DM yield, CP content and PH of the *P. maximum-C. macrocarpum* association as affected by the defoliation frequencies are presented in Table 1. No differences ( $P < 0.05$ ) among defoliation frequencies for any of the variables were detected. However average DM yield and PH at 56 days tended to be higher than the other two frequencies, but the difference did not reach statistical significance. DM yield and PH obtained in this study were lower than those reported by other research in a humid tropic (CIAT, 1990) and can be a consequence of water deficit due to the extended dry season during the experiment. Water deficits reduce growth, yield and quality of pasture (Buxton and Fales, 1994). CP average of *P. maximum* was lower than that of *C. macrocarpum*, but considerably higher than 7% which is the minimum CP content indicated by Minson (1990) to avoid a depression in forage voluntary intake by grazing livestock.

**Ash and mineral concentrations.** Overall means for ash and mineral concentrations of the *Panicum maximum-Centrosema macrocarpum* association as affected by the cutting frequencies are shown on Table 2. No differences ( $P < 0.05$ ) among cutting frequencies were observed for ash and mineral concentrations. Overall means and individual mineral concentrations in Guinea grass are regarded as adequate according to the MER suggested for ruminants (McDowell, 1992). In *Centrosema macrocarpum* P and Na were near the critical level for deficiency in ruminants (McDowell, 1992). The *Panicum maximum-Centrosema macrocarpum* mixture evaluated in this study can provide satisfactory levels of all nutrients for grazing ruminants, reducing the need for protein or mineral supplements.

## REFERENCES

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**Table 1**

Average dry matter (DM) yield, plant height (PH) and crude protein (CP) content of *a. P. maximum-C. macrocarpum* as affected by the defoliation frequency

Species	DM yield		PH,		PC,	
	kg/ha		cm		%	
	Mean <sup>z</sup>	SE <sup>y</sup>	Mean	SE	Mean	SE
<i>P. maximum</i>	4237.2	329.9	63.8	11.4	11.4	0.86
<i>C. macrocarpum</i>	1792.7	340.3	44.6	16.2	16.2	1.4
Total	6029.9	-	-	-	-	-

<sup>z</sup>Least-square means based on 12, 8 and 6 cutting every 28, 42 and 56 days respectively, and three replications.

<sup>y</sup>Standard error of the mean.

**Table 2**

Overall mean ash and mineral concentrations of *Centrosema macrocarpum*

	Ash,	Ca,	P,	Mg,	K,	Na,	Ca:P,	Cu,	Fe,	Mn,
	%	%	%	%	%	%	ratio	ppm	ppm	ppm
Overall	9.63	1.10	0.29	0.55	2.27	0.107	3.93:1	12.2	117	231
SE <sup>z</sup>	0.27	0.16	0.02	0.08	0.21	0.02	0.54	3.3	5	44
Legume	9.28	1.43	0.24	0.52	1.96	0.08	6.0:1	13.2	170	138
SE	0.48	0.02	0.01	0.03	0.10	0.004	0.4	2.5	23	7
MER <sup>y</sup>	-	0.30	0.25	0.18	0.60	0.08	-	8.0	50	40

<sup>z</sup> Standard error of the mean (18 observation per mean).

<sup>y</sup> Minimum element requirement or critical concentration for deficiency (McDowell, 1992).