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Native Pasture Quality in Cattle Raising Areas on Ultramafic Groundmass

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ABSTRACT

The quality of native pasture in cattle raising areas on ultramafic groundmass, in the municipality of Minas, Camagüey, Cuba, was assessed. The area studied has brown Fersialitic, ferromagnesial soil (Inceptisol-Cambisol). The climate is tropical humid. Dry matter, calcium, phosphorous and raw protein were estimated for compound samples of the predominant pastures, using an AOAC methodology at the Provincial Soil Management, in Camagüey. Descriptive statistics for the bromatological composition (mean and standard error) were determined, considering every species, season and group. Group comparison was made by the Kruskal-Wallis test. Legume quality in both seasons had protein levels above 7 % in all the cases; whereas graminaceae quality had values under that percent. In all the cases, the contents of P are insufficient to meet the minimum needs, and the protein and calcium values are near the required limits for cattle.

Key Words: *fersialitic, bromatological composition, protein levels*

INTRODUCTION

Forage production is the nutritional base for ruminant systems in most tropical countries, where at least, between 80 and 90 % of nutrients required by animals are pastures. Therefore, the quality of that resource greatly depends on the animal productive response (Del Pozo, 2002; Curbelo, 2004; Hernández *et al*., 2008).

Multiple nutrient differences have been observed in Cuba, in several cattle raising areas, depending on the herd´s physiological indicators and the productive features. Accordingly, it is necessary to continue to study this topic, due to the current deteriorated conditions of the pasturelands (Gutiérrez and Crespo, 2003).

The economic situation of the country calls for an efficient use of local resources to cope with the production demands of the time. Recovery and rational use of native pastures is an imperative to achieve cattle raising increases (Diez *et al.*, 2005). Consequently, to meet that challenge it is important to know the nutritional value of the pasture species in each ecosystem, in order to design suitable management strategies.

The purpose of this research is to evaluate the quality of native pastures in cattle raising areas, on Camagüey´s ultramafic groundmass.

MATERIALS AND METHODS

Location

Records from Los Pinos UEB, from the *Triangulo Tres* Cattle Raising Company, in Camagüey were used to evaluate 150 calvings that took place between 2014 and 2013, in a Jersey female herd, between 38 and 126 months of age, inseminated with Jersey bull semen.

Herd Working System

Natural breeding is applied with restricted suckling (30-40 min) after each manual milking, twice; weaning is 270 days after calving.

The animals graze the year round on varied pasture, including Camagüeyan (*Bothriocha pertusa*), Texan (*Paspalum notatum*), Pangola grass (*Digitaria decumbems*), Guinea (*Panicum maximum*), and some areas with sugar cane (*Saccharum officinarum*) and *king grass* (*Pennisetum* sp) forages for the feeding troughs.

Data collection and processing

The data were collected from individual reproduction control cards. The reproductive features, as service period (PS) in days; calving interval (IPP) in days; length of gestation (DG) in days; and gestation service (S/G) days in inseminations performed, were included. To estimate the reproductive features and the effect of the non-genetic factors affecting them, SPSS (2006), version 11.5 was used to calculate the basic statgraph, analyze variable normality (Kolmogorov-Smirnov test), the Levene´s test, and multiple linear analysis of variance of each dependent variable.

The variation causes used in the mathematic model were offspring sex (2); calving number (7); calving season (2) in the dry season (November to April), and the rainy season (May to October); and the calving year (10), to study the reproductive features.

To study the different non-genetic variation causes that affected the features studied, the following mathematical model was used,

$Y_{ijklm} = \mu + S_i + N_j + E_k + A_l + e_{ijklm}$

Where:

Y_{ijklm}: dependent variable for PS, IPP, DG and S/G, corresponding to the I th individual of ijkm subclass.

M: general mean.

S_i: fixed effect of the I th offspring sex (2).

N_j: fixed effect of j th calving number (7).

E_k: fixed effect of k th calving season (2).

A_l: fixed effect of l th calving year (10).

e_{ijklm}: residual effect, or experimental error.

RESULTS AND DISCUSSION

Table 1 shows the observations, according to the effects considered in the mathematical model, with a rather stable distribution. *Bromatological composition of pastures*

The mean pasture chemical composition of the areas studied (Table 1) indicates low protein and calcium values, as well as for phosphorous, which is probably the main element limiting production on these kinds of soils (Acosta, 2003; Curbelo, 2004; Curbelo, Loyola and Guevara, 2009). The grazing animals may also select more nutritive parts of the pasture, which may be feasible, because the animal stocking rate does not exceed by far the livestock units per hectare.

The bromatological composition of the main legume species and graminaceae that make up the grassland during the rainy and dry seasons is shown in Tables 2 and 3. The quality of the former is higher than the latter in either season, with protein levels above 7% in all the cases; the graminaceae has lower values. In all the cases, phosphorous contents were insufficient to meet the minimum demands of bovines, though plants seem to have found mechanisms to grow with limited amounts of the elements (Curbelo *et al*., 2009).

Centrosema virginianum (L.) Benth. (C. de negra) and *Ateleia cubensis* (DC) Dietr. *var. cubensis* (Griseb.) Mohlenber (Capparis) stand above 10%. The latter reached 19%, higher than the values reported by Pedraza (2000) in Camagüey, for *Gliricidia sepium* (Jacq.), Kunth ex Walp (Kakaoati), a species that shows promise for use as protein supplement for bovines.

Table 4 shows the combined behavior of the species in the area, with a slight increase in the protein levels of associated graminaceae, in comparison with individual graminaceae, which also shows the benefits produced by legume population increases.

Significant differences were observed ($P < 0.001$) among graminaceae, legumes, and associated graminaceae, in terms of MS, PB, P, K and Ca contents. However, magnesium had a similar behavior for the three groups assessed.

It is remarkable that associated graminaceae had higher PB, K and Ca contents than individual graminaceae. It may shed some light on the advantages of graminaceae-legume association under these edafoclimatic conditions. Similar results were found by Benítez *et al*. (2001), Hernández (2002) and Loyola (2012), in the same agroecosystems. Research conducted on Panamanian arid soils with forest-grazing systems, show that the integration of *Acacia mangium* Wild (acacia) in pastures, with *Brachiaria humidicola*, contributed to forage quality improvement in graminaceae, as well as increases in phosphorous and soil nitrogen contents, when compared with *B. humidicola* monocultures (Alonso, 2011).

The relationship between the lack of proper management and the age of reshoots is also remarkable. The older the reshoots, the lower the quality of pastures, which is directly associated with changes in the metabolic activity and structure of the plant. It causes an increase in structural elements and a decrease in soluble carbohydrates, protein and minerals; along with digestibility (Del Pozo, 2002).

CONCLUSIONS

In all the cases, the phosphorous contents were insufficient to meet the animals´ minimum requirements. The protein and calcium values are close to the required limits for cattle.

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Table 1. Mean bromatological composition of the pasture land in the seasons of the year (Mean + ES)

Variable	Season		Year
	Rainy	Dry	
M.S	29.86± 0.386	31.05±0.401	30.46±0.280
P.B	7.55±0.340	6.96±0.338	7.26±0.240
P	0.09±0.011	0.06±0.002	0.08±0.006
K	0.42± 0.013	0.28±0.012	0.36±0.010
Ca	0.61± 0.020	0.44±0.024	0.53±0.017
Mg	0.38±0.012	0.22±0.008	0.30±0.009

Table 2. Bromatological composition of the main species (% of MS) in the rainy season (Mean ± ES)

Species	Nutrients					
	MS	PB	P	K	Ca	Mg
S. hamata	32.25±0.453	8.9±0.0402	0.08±0.003	0.5±0.016	0.9±0.007	0.5±0.007
S. viscosa	26.5±0.327	8.9±0.084	0.07±0.006	0.5±0.013	0.7±0.013	0.6±0.006
C. virginianum	26.6±0.423	11.0±0.130	0.13±0.006	0.7±0.028	1.0±0.022	0.3±0.009
D. incanum DC. var. angustifolium	15.6±0.263	7.4±0.099	0.07±0.003	0.5±0.012	0.6±0.009	0.4±0.019
A. cubensis	31.0±1.799	20.5±0.144	0.17+0.004	0.6±0.033	1.08±0.002	0.5±0.035
Graminaceae	31.1±0.292	4.50±0.076	0.12±0.044	0.3±0.009	0.4±0.016	0.4±0.006

Table 1. Bromatological composition of the main species (% of MS) in the rainy season (Mean ± ES)

Species	Nutrients					
	MS	PB	P	K	Ca	Mg
S. hamata	36.7±0.590	8.1±0.253	0.06±0.002	0.3±0.009	0.7±0.011	0.2±0.005
S. viscosa	30.3±0.453	8.1±0.100	0.06±0.001	0.3±0.014	0.4±0.007	0.3±0.007
C. virginianum	27.6±0.375	10.2±0.149	0.10±0.003	0.5± 0.012	0.8±0.007	0.1±0.004
D. incanum DC. var. angustifolium	16.38±0.653	6.6±0.046	0.05± 0.000	0.3± 0.004	0.4±0.019	0.2±0.004
A. cubensis	31.5±0.267	19.9±0.377	0.17+0.004	0.58±0.026	1.03±0.012	0.47±0.025
Graminaceae	34.25±0.588	3.8±0.126	0.06±0.002	0.1±0.012	0.1±0.015	0.1±0.008

Table 4. Bromatological composition of pastureland components (Mean ± DS)

Variable	Components		
	Legumes	Graminaceae	Associated graminaceae
M.S.	28.9±5.631	32.72±2.399	31.78±1.693
P.B.	9.5±0.359	4.45±0.423	5.21±0.729
P	0.08±0.041	0.09±0.129	0.08±0.128
K	0.45±0.136	0.25±0.096	0.27±0.155
Ca	0.72±0.214	0.30±0.141	0.35±0.151
Mg	0.31±0.156	0.31± 0.123	0.28±0.132