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Short note [Nota Corta]

CHEMICAL COMPOSITION OF CAATINGA POTENTIAL FORAGES SPECIES

[COMPOSICIÓN QUÍMICA Y POTENCIAL FORRAJERO DE ESPECIES DE LA REGIÓN DE CAATINGA]

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SUMMARY

Chemical composition of some potential forages species, natives from Caatinga region, were evaluated. Samples of *Macroptilium heterophyllum*, *Stylosanthes humilis*, *Rhynchosia mínima*, *Desmodium tortuosum* Sw. Dc, *Merremia aegyptia*, *Mimosa tenuiflora* Wild, *Bauhinia cheilantha* and as well *Macroptilium lathyroides*, *Caesalpinia pyramidalis* and *Mimosa tenuiflora* hays were collected in Rio Grande do Norte Stated, during 2011 rainy season. The analyses: dry matter (DM), crude protein (CP) mineral matter (MM) ether extract (EE) neutral detergent fiber (NDF), acid detergent fiber (ADF), lignin (LIG), insoluble neutral detergent nitrogen, (INDN) insoluble acid detergent nitrogen, (ADIN), total phenol (TF) and total tannin (TT) were done at Embrapa Caprinos e Ovinos in Ceará State. Plants analyzed, as expected, for tropical species, exhibited high level of cell wall constituents, high lignifications rate and revealed substantial presence of anti nutritional compounds. However, regardless of this data, the main problem, for grazing animals, is due to its xerophytes characteristics. Most of the shrubs and trees are deciduous, losing its leaves during the dry season. In addition, herbaceous presents a very rapid lifetime cycle, germinating and senescing during the brief wet season.

Key words: Caatinga; chemical composition; Jitirana; legume; tannin.

RESUMEN

Se evaluó la composición química de algunas especies forrajeras potenciales nativas de la región de Caatinga. Muestras de *Macroptilium heterophyllum*, *Stylosanthes humilis*, *Rhynchosia minima*, *Desmodium tortuosum* Sw. Dc, *Merremia aegyptia*, *Mimosa tenuiflora* Wild, *Bauhinia cheilantha* y así como de heno de *Macroptilium lathyroides*, *Caesalpinia pyramidalis* y *Mimosa tenuiflora* se colectaron en Rio Grande do Norte durante la temporada de lluvias de 2011. Las muestras fueron analizadas para determinar su contenido de materia seca (MS), proteína cruda (PC), minerales (MM), extracto etéreo (EE), fibra neutro detergente (FND), fibra detergente ácido (FDA), lignina (LIG), nitrógeno insoluble detergente neutro (INDN), nitrógeno insoluble detergente ácido (ADIN), fenoles totales (FT) y taninos totales (TT). Como se esperaba, para las especies tropicales, las plantas exhibieron alto nivel de componentes de la pared celular, alta tasa de lignificación y reveló la presencia sustancial de compuestos antinutricionales. Sin embargo, el principal problema para los animales de pastoreo se debe a sus características Xerófitas. La mayoría de los arbustos y los árboles son de hoja caduca, perdiendo sus hojas durante la estación seca. Además, las herbáceas presentan un ciclo de vida muy rápido, germinando y llegando a senescencia durante la breve temporada de lluvias.

Palabras clave: Caatinga; composición química; Jitirana; leguminosas; tanino.

INTRODUCTION

The northeast semiarid region is characterized by its heterogeneity of natural conditions as clime, soil, and mainly its particular xerophytes vegetation, called Caatinga. This region presents a distinct rainfall regime (700 to 900 mm/year) divided in two very well defined seasons: the rainy season with approximately 80% of rain, lasting from three to five month, generally, from Mars to July and the dry season with 20% of rainfall, lasting from seven to nine month, from August to February Azevedo and Silva (2007).

Caatinga vegetation is composed by shrubs and small trees, usually thorny and deciduous, which lose their leaves in early dry season. Annual plants, cacti, bromeliads, and an herbaceous component (composed of grasses and dicotyledons) are further complements to the botanical composition of this biome Santos *et al*. (2010).

Tropical dry forests are usually rich in legumes species that grow in soils with low organic N Radaad *et al*. (2005). The nodulation capacity of most of these species is unknown and no one determined the proportion of N derived from fixation in plants growing this area Freitas *et al*. (2010).

This native vegetation represents the forage support for the livestock, in most of the Brazilian semiarid regions, because in general it assumes a fundamental role in ruminant diets. Although, forage exotic species could be more productive, most of them do not express their genetic potential, in semiarid conditions Gonzaga Neto *et al*. (2001).

However, a very little data from dry matter production, chemical composition and eventual presence of antinutritional compounds are related about those native species. The lack of information about Caatinga plants was informed by Araújo Filho and Carvalho (1997). The authors reported that knowledge deficiency of this floristic richness could generate problems involving the selection of species useful to improve the native pastures and may contribute to the extractive management of this vegetation, making difficulty the adoption of appropriated technology to ensure the sustainability to the biome.

In search for information about forage potential of Caatinga plants, mainly legumes, chemical composition, phenols and tannin contents were determined from the natives species: "oró" (*Macroptilium heterophyllum*), "erva de ovelha" (*Stylosanthes humilis*), "feijão de rolinha" (*Rhynchosia minima*), "rapadura de cavalo" (*Desmodium tortuosum* (Sw) Dc.)), "jitirana" (*Merremia aegyptia*), "jurema preta" (*Mimosa tenuiflora* Wild), "mororó" (*Bauhinia cheilantha*), "feijão de rola" (*Macroptilium lathyroides*) leaves *in natura* and , "catingueira" (*Caesalpinia pyramidalis*) and "jurema preta" (*Mimosa tenuiflora* Wild), hays.

This information, it is expected, can contribute for the scientific knowledge, as well as, for improving the management and conservation of natural resources in northeastern Brazil.

MATERIALS AND METHODS

The analyses were done in the laboratory of animal nutrition from the Embrapa Caprinos e Ovinos in Ceará State.

The plants were sampled during the rainy season in three distinct region of Rio Grande do Norte, State, located between parallels 4 ° 49'53 "and 6 ° 58'57" S and 34 ° 58'03 "and 38 ° 36'12 "W.

The oró (*Macroptilium heterophyllum)*, herbaceous legume native from the dunes areas, was sampled in northern coast of the State, which features semiarid climate with rainfall 400 - 600 mm/year and a mean temperature of 27º C. The jitirana (*Merremia aegyptia*) a convolvulaceae and jurema preta (*Mimosa tenuiflora* Wild) and feijão de rolinha (*Rhynchosia mínima*), both legumes, were sampled in the west region of the state, close to Mossoró. The legumes as erva de ovelha (*Stylosanthes humilis*), rapadura de cavalo (*Desmodium tortuosum* (Sw) Dc) e o mororó (*Bauhinia cheilantha*), were collected in specific region of the State called "Seridó potiguar", characterized by large dry periods with average temperatures above 27.5°C, and rainy precipitation between 150 a 400 mm per year concentrate between Mars and June (Ayoade, 2001; Idema, 2006).

The catingueira (*Caesalpinia pyramidalis*), Feijão de rola (*Macroptilium lathyroides*) and Jurema preta (*Mimosa tenuiflora* Wild) hays, were confectioned in central "sertão" of the State, classified as semi-arid climate with a hot wet season delayed to autumn and with dry periods exceeding eight month Nimer (1979).

The samples were obtained from leaves and thinner branches, at the beginning of the reproductive phase. After cutting, material were weighted and dried in oven at temperature of 65° C for 48 hours, then ground in a Wiley mill, with 25 meshes, and stored in plastic recipients. In laboratory, the follow analyzes were done: dry matter , (DM), mineral matter (MM), organic matter (OM), crude protein (CP), ether extract (EE) as recommended by Silva and Queiroz (2002). Neutral detergent fiber (NDF), acid detergent fiber (ADF), neutral insoluble detergent nitrogen

(NIDN), acid detergent insoluble nitrogen (ADIN) and lignin (LIG) were determined as methodology described by Van Soest (1991). The total phenolic concentration was done following the Follin Ciocalteau, with the lecture realized at 725 nm. The quantity was calculated as equivalent of tannic acid in calibration curve. Total tannin determination was done according the methodology described by FAO (2000), the lecture was made using a spectrophotometer at 700 nm utilizing as standard curve the tannic acid (PVPP; of Sigma – P6755) and estimated by the equation: $Y = 0.092322X - 0.00280$, $R^2 = 0.99853$.

RESULTS AND DISCUSSION

The Dry matter (DM); Mineral matter (MM); Organic matter (OM); Crude protein (CP); Ether extract (EE); Neutral detergent fiber (NDF); Acid detergent fiber (ADF): Neutral insoluble detergent nitrogen (NIDN); Acid detergent insoluble nitrogen (ADIN); Lignin (LIG); Tannin (TAN); Phenol (Phe) of the above described plants showed the heterogeneity and different potential as forage of the studied species from Caatinga (Table 1).

Table 1. Chemical composition (%) of Caatinga native plants with forage potential characteristics*.

Species	DM	MM	CP	EE	NDF	ADF	LIG	CEL	ADIN	NIDN	TAN	Phe
Mimosa tenuiflora[2]	91.8	4.1	14.2	5.4	50.9	45.8	27.4	18.4	2.58	2.72	2.8	4.6
Caesalpinia pyramidalis	90.5	5.1	10.2	7.4	43.8	27.6	8.4	19.2	0.78	1.50	4.4	5.2
Macroptilium lathyroides	63.4	6.9	9.8	3.5	46.4	32.4	6.7	25.7	0.51	0.79	0.8	2.5
Macroptilium heterophyllum	60.8	18.0	14.9	3.0	41.6	30.6	6.1	24.5	0.40	1.16	2.7	6.5
Rhynchosia mínima	60.3	9.8	21.4	4.6	44.4	28.6	10.3	18.3	1.47	3.04	1.1	5.2
Merremia aegyptia	61.4	7.3	10.3	3.5	51.1	36.1	6.5	29.6	0.44	1.04	0.9	6.1
Bauhinia cheilantha	30.7	7.5	18.9	2.8	46.9	26.6	9.2	17.4	1.12	2.89	0.9	9.2
Mimosa tenuiflora	30.3	6.58	14.7	5.4	49.9	40.3	16.8	23.5	1.77	2.34	2.3	7.7
Desmodium tortuosum	87.7	7.5	20.0	3.4	31.9	20.8	3.83	16.6	1.16	3.86	8.5	10.8
Stylosanthes humilis	90.5	9.94	16.9	2.3	50.8	35.4	3.83	30.1	0.44	2.22	18.5	22.0

*Dry matter (DM); Mineral matter (MM); Organic matter (OM); Crude protein (CP); Ether extract (EE); Neutral detergent fiber (NDF); Acid detergent fiber (ADF): Neutral insoluble detergent nitrogen (NIDN); Acid detergent insoluble nitrogen (ADIN); Lignin (LIG); Tannin (TAN); Phenol (Phe). [2]Hay.

The CP contents varied from 9.8 to 21.4, respectively, for the *Macroptilium lathyroides* hay and *Rhynchosia minima* leaves *in natura*. It should be noticed that although the CP contents presented values relatively high, part of them were as ADIN, 0.51 and 1.47%, respectively, that become, this nitrogen unavailable to the ruminant. Those data are corroborating by Araújo Filho *et al*. (2002) evaluating native's species leaves. The authors cited that values met for CP of most of the Caatinga plants were higher than the minimum necessary to the developing of ruminal micro flora. However, regarding forage nutritive value, it is necessary to study N availability for ruminants in Caatinga plants, since large proportion of this element may bind to fiber components (ADIN), as reported by Santos *et al*. (2010).

Feijão oró, *Macroptilium heterophyllum* or *Desmodium heterophyllum*, according to the nomenclature, presents a CP content around 17 – 18% and moderate levels of tannins, moreover its palatability is good as described in Tropical Forage (2012). Data of this trial showed 14.9% CP content and tannin 2.7%, values not far from the results observed in bibliography Tropical Forages (2012).

Vieira *et al*. (2010), cited 31.1 and 14.7% of CP and 44.4 and 52.1% of NDF content, respectively, for

leaves and branches, of *Macroptilium lathyroides*. Although the NDF is similar to the results reported here, the CP content observed in leaves is much higher than that found in this trial. These differences can be attributed to the sampling criteria and local.

Herbaceous legume (*Rhynchosia minima*) is widely spread out in tropical areas from South America, Caribbean, Africa and Australia. However, very little research results were found in the literature. N values of 1.81% or 11.3% of CP were described by Barnes (1996) at two moist savannas in Ghana. The African results were slightly higher than the (9.8%), reported in Caatinga samples.

Pinto (2008) studying plants in "Sertão" from Ceará State observed CP values of 11.9 and 18.2% for *Stylosanthes humilis* and *Desmodium tortuosum* respectively. These results are lower than that met in this survey (Table 1). However, it should be noticed that sampling conditions were distinct and variations could be observed.

The EE content ranged from 2.3% to 7.4 in *Stylosanthes humilis* and *Caesalpinia pyramidalis* hay, respectively. Lower EE content (1.9%) was cited by Mendonça Junior et al. (2008). However, the same authors working with Caatinga plants, cited CP (10.0%) and LIG percentages (8.4%) similar to results reported in this trial, for the legume hay analyzed. Nascimento (1996) described for *Stylosanthes humilis* CP (19.1%) and EE (1.95%) contents, quite similar than the reported here.

The EE value for "Jitirana" (*Merremia aegyptia*), convolvulaceae specie, of 3.5% was higher than 2.0% cited by Linhares *et al*. (2006). The spite of its low dry matter content *in natura*, its crude protein and ether extracts contents, besides the production of green mass were satisfactory.

The tree legumes species: "Catingueira", 'Jurema preta" and "Mororó" are frequently used, as roughage, for the local farmers during the long dry season, trying to minimize the problem due to shortage in semiarid region Vieira *et al*. (2005).

The "jurema preta" *Mimosa tenuiflora* pioneer specie abundant in degraded areas of Caatinga is taken as indicative of natural regeneration of native vegetation Pereira (2011). This tree legume is considered one of the species with great N_2 fixation capacity Freitas *et al*. (2010).

"Jurema preta" presented CP content around 14% before and after dried for hay production. This value may be considered high for tropical legumes. However, this very high LIG content (27.4%) associated its phenolic compounds between 4.6 to 7.7%, respectively, for hay and *in natura* plant, certainly will contribute for low acceptation for ruminants, suggesting low dry matter intake.

Botanical composition of Caatinga woody plants species contributing to the diets from small ruminants is already cited. In the dry season goats and sheep selected *Caesalpinia pyramidalis* (16 and 13%, respectively) and *Bahuinia cheilantha* (9 and 5% respectively) as reported by Araujo Filho *et al*. (1998).

Among the trees species studied, the "mororó" *Bahuinia cheilantha* showed the higher CP content (18.9%), becoming this legume a very promising plant in semiarid scarce rainfall. This data is according to the cited in literature. CP contents ranging from 12.2 to 20.3% were described by Moreira *et al*. (2006), Damasceno (2007) and Araújo Filho *et al*. (2002).

The cell wall constituents represented by NDF and ADF percentages that may be directly correlated with intake and digestibility, although these data were not evaluated, showed values ranged between 51.1 to 31.9% for NDF for *Merremia aegyptia* and *Desmodium tortuosum*, respectively. The ADF varied from 45.8 and 20.8% in "jurema preta" hay and *Desmodium* respectively, demonstrating the highest cellular content of this herbaceous legume.

The analysis of total phenolic and tannins, secondary compounds known as antinutritional factors, revealed its relatively high presence in Caatinga plants. The highest contents 22.0% of total phenolic and 18.5% of tannin were observed in *Stylosanthes humilis*, while the lowest levels were shown in *Macroptilium lathyroides*, 2.5% and 0.8% respectively for total phenolic and tannin percentages.

Regardless of the data observed in this trial, that may limit the ruminant production based in Caatinga biomass, as high level of cell wall constituents, high lignification rate and presence of antinutritional compounds, the main problem is due to xerophytes characteristics of those plants. Most of the shrubs and trees species are deciduous, losing its leaves during the dry season, although, this fallen leaves remain in the ground (litter) potentially constituting a considerable forage source to the ruminants in dry periods. In addition, the herbaceous species presented a very rapid lifetime cycle, germinating, flowering, fruiting and senescing during three to four months (wet season) that reduces substantially their use as grazed forage.

The Caatinga native species must be more studied, emphasizing new approach as: overcoming dormancy of seeds, responses to the irrigation, dry matter

production in different seasons, phytosociological growing in the field, and breeding in order to create new germoplasma adapted to grazing conditions of biome, as well as, their dry matter intake by ruminants species.

CONCLUSIONS

The analyzed plants showed the heterogeneity and different potential as forage of the studied species from Caatinga.

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