CHEMICAL-BROMATOLOGICAL COMPOSITON OF LEUCAENA HAY AS FUNCTION OF DRYING AND STORAGE TIMES

COMPOSIÇÃO QUÍMICO-BROMATOLÓGICA DE FENO DE LEUCENA EM FUNÇÃO DO TEMPO DE SECAGEM E DE ARMAZENAMENTO

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ABSTRACT: The leucaena is a leguminous that has high protein content and digestibility, can be supplied fresh or made into hay. The objective was to verify the influence of dehydration time of leaves and fine stems of leucaena and storage time on their chemical-bromatological characteristics. Cutting the fractions to be haymaking (leaves and stems smaller than one centimeter) was deposited on a plastic canvas for dehydration, being collected samples of the material at 0, 4th, 8th, 24th and 48th hours of dehydration to determine the levels of dry matter (DM), crude protein (CP), neutral detergent fiber (NDF), total carbohydrates (TC), not fibrous carbohydrates (NFC), ether extract (EE) and mineral matter (MM). The bales of hay were made using a manual baler and were kept stored in environment shaded, ventilated and protected of rain for 90 days. In that bales also were collected samples monthly to determine if occurred losses in nutritional quality. The dehydration time for 24 hours and storage for 30 days in water and allowed to dry to obtain the best chemical-bromatological composition of leucaena hay. The levels of CP, NDF, EE and MM decrease as function of drying time and storage both during the rainy as in the dry season, while the DM, TC and NFC increased due to these variables for both periods.

KEYWORDS: Fabaceae. Forage. Haymaking point. *Leucaena leucocephala*.

INTRODUCTION

Feeding represents the major operational cost in cattle raising, being therefore considered one of the main factors for the success of such activity. Knowledge of the chemical composition of foods is the first step in the formulation of diets. This allows for the adjustment of the nutritional requirements of animals, in order to maximize performance and reduce the costs of production (PRADO et al. 2013).

The use of preserved forages in the ruminant diets has become increasingly common in intensive or semi-intensive systems given that the pasture does not provide nutrients in sufficient quantity and quality for feeding the flocks during droughts (CAVALCANTE et al., 2004).

The process of haymaking stands out, especially in forage that has lower soluble carbohydrates and physiological and morphological traits that allow rapid and uniform dehydration (SILVA et al., 2013). The hay should remain with their chemical composition similar to fresh forage even if it has been stored for several months (CALIXTO JÚNIOR et al., 2007).

This process tends to minimize or mitigate the phytotoxic or anti-nutritional effects of food by its partial dehydration, which is extremely important in alternative food for animals (ARRUDA et al., 2010). Quality hay should have greenish coloration, nice smell and high percentage of leaves, be free from impurities and molds and have good digestibility (SILVA et al., 2013). The ideal harvesting moment is the pre-flowering, when the forage yield reaches the maximum value without having significantly reduced its digestibility (CALIXTO JÚNIOR et al., 2008).

The leucaena [*Leucaena leucocephala* (Lam.) de Wit (*Mimosaceae*)] is a woody and perennial leguminous which comes originally from Central America and it is currently disseminated throughout the tropical region. It has wide versatility for usage in animal production systems as a forage plant given its extraordinary chemical composition and agronomic traits, as well as its high palatability and the fact that it may be supplied fresh or as hay (POSSENTI et al., 2008). Its leaves and branches are thin and rather nutritious, thus constituting complete food for ruminants. The protein fraction is

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around 25%, with a high biological value and its amino acids are in balanced proportions. The leucaena is also an excellent source of minerals and its digestibility ranges from 50 to 70% (MANELLA et al., 2002). However, there are no studies on the growth of such plant, which establishes the optimal time for haymaking and storage, which justifies the present research.

Under the hypothesis of physico-chemical changes in the hay as a function of drying time and storage, this study aimed to verify the influence that the time of dehydration in leucaena leaf and its fine stems and the storage time have on their chemical-bromatological traits

MATERIAL AND METHODS

The experiment was conducted in 2005/2006 at the State University of Mato Grosso do Sul, located in the municipality of Aquidauna-MS, in the High Pantanal region (20º27'S and 55º40'W) with altitude of 149 meters. The climate according to the Köppen classification is Aw with humid and hot summers and dry winters (TEODORO et al, 2015).

The soil was identified as Ultisol sandy loam texture with the following chemical characteristics in the layer 0 – 0.20 m: pH (H_2O) = 6.2; Al exchangeable ($cmol_c$ dm^{-3}) = 0.0; Ca+Mg ($cmol_c$ dm^{-3}) = 4.31; P (mg dm^{-3}) = 41.3; K ($cmol_c$ dm^{-3}) = 0.2; Organic matter (g dm^{-3}) = 19.7; V (%) = 45.0; Sum of bases ($cmol_c$ dm^{-3}) = 4.51; cation exchange capacity (or CEC) ($cmol_c$ dm^{-3}) = 5.1.

The leucaena plants were grown in one hectare, with one meter between rows and 0.40 m between plants in order to obtain the greatest quantity of forage biomass per unit of forage area. In November 2005 and January, March, April, June and August 2006, the leaves and branches with under one centimeter of thickness were mown after evaporation of dew on sunny days when there was no probability of rain.

The material collected was deposited in a thin layer on a plastic tarp for dehydration, revolved with rake every 4 hours and kept covered during the night to avoid moistening.

The hay bales were made with manual baler with fresh forage and after the 0, 4th, 8th, 24th and 48th hour of dehydration. The hay was stored for 90 days on wood pallets in a shaded environment, with ventilation and protection from the rain. Twelve hay bales were produced with approximately 20 kg, with three units for each collection period.

Samples were taken from fresh material at harvest and from the bales with 30, 60 and 90 days of storage to determine the dry matter (DM), crude protein (CP), neutral detergent fiber (NDF), non-fiber carbohydrates (NFC), ethereal extract (EE) and mineral matter (MM), according to Silva and Queiroz (2002).

The variables analyzed were initially submitted to the Shapiro-Wilk's test to verify the normality of the residuals and Bartlett's test to evaluation of variances homogeneity. To evaluate the hay baling point in rainy and dry seasons, the drying time was considered (0, 4th, 8th, 24th and 48th hour of dehydration) taking into account the the variables, being the data interpreted by analysis of variance by the Tukey's test at 5% of probability and regression studies. In the evaluation of hay storage time (0, 30, 60 and 90 days), regression equation models of storage time were used according to each dehydration period for the respective variables. In both cases, three replications were used, in which each hay bale represented an experimental unit (TORRES et al., 2015). All of the analyses were conducted with free software R (R Core Team, 2012).

RESULTS AND DISCUSSION

In fresh material (0 hour of drying) the influence of sampling months was not observed in the evaluated parameters (Table 1). In hay bales made after 4th hour of drying there was a higher NDF content in the material cut in March and the opposite occurred in the fraction NFC. With 8th hour of drying there was an increase in the fractions of NDF and steady decline of NFC over the course of the rainy season. In bales made with dehydrated material for 24th hour there was higher NDF content in the material collected in March.

Table 1. Average contents of chemical-bromatological components of leucaena hay as function of the cutting month and drying time (DT) at rainy season, with respective probabilities (P) and coefficient of variation (CV).

Cutting Month¹	DT (hour)	DM	CP	NDF	TC	NFC	EE	MM
November		29.60 a	24.19 a	35.72 a	66.21 a	30.49 a	3.77 a	5.83 a
January	0	28.89 a	22.34 a	36.47 a	67.31 a	30.85 a	3.64 a	6.72 a
March		31.83 a	22.94 a	39.36 a	66.88 a	27.52 a	3.67 a	6.51 a

p-value		0.163	0.064	0.085	0.591	0.185	0.752	0.344
CV - %		5.44	3.99	5.15	1.36	6.71	4.09	9.03
November		86.15 a	21.03 a	34.31 b	69.77 a	35.46 a	3.63 a	5.57 a
January	4th	85.62 a	21.38 a	35.68 b	69.06 a	33.38 a	3.63 a	5.93 a
March		88.25 a	21.74 a	39.18 a	69.13 a	29.95 b	3.45 a	5.69 a
p-value		0.654	0.473	0.012	0.101	0.006	0.503	0.633
CV - %		2.89	2.36	6.38	0.57	7.70	4.43	5.50
November		93.66 a	20.78 a	33.82 c	70.32 a	36.50 a	3.45 a	5.46 a
January	8th	88.37 a	20.72 a	35.59 b	70.28 a	34.70 b	3.51 a	5.49 a
March		92.28 a	2168 a	39.14 a	69.35 a	30.21 c	3.44 a	5.53 a
p-value		0.414	0.200	<0.001	0.112	<0.001	0.953	0.965
CV - %		4.03	2.83	6.70	0.80	8.60	5.86	3.75
November		97.07 a	20.55 a	33.46 b	71.45 a	37.99 a	3.32 a	4.68 a
January	24th	96.86 a	20.65 a	35.37 b	70.94 a	35.57 ab	3.09 a	5.33 a
March		97.44 a	21.36 a	38.61 a	70.57 a	31.96 b	2.90 a	5.17 a
p-value		0.161	0.120	0.014	0.365	0.022	0.345	0.081
CV - %		0.32	2.18	6.68	0.80	8.07	8.43	6.64
November		99.13 a	20.12 a	33.10 b	72.51 a	39.41 a	3.03 a	4.35 a
January	48th	97.60 b	20.35 a	35.04 ab	71.60 a	36.57 ab	3.06 a	4.99 a
March		98.48 a	19.86 a	38.44 a	72.48 a	34.04 b	2.65 a	5.02 a
p-value		0.007	0.272	0.054	0.411	0.013	0.523	0.475
CV - %		0.71	1.44	7.35	1.03	7.70	11.8	11.19

[1] Means followed by different letters in the column, inside the respective variable, indicate significant differences according to Tukey's test at 5% probability.

Manella et al. (2003) upon collecting edible fractions of leucaena in August, November, February and May, differences among months and the following parameters were found: DM (31.8; 26.6; 23.9 and 26.3%, respectively), CP (25.4; 26.7; 25.3 and 27.6%, respectively) and NDF (40.3; 34.9; 51.5 and 32.5%, respectively). Pires et al. (2006) when dehydrating leaves and tender branches of leucaena in a stove at 65 °C average values higher than those of this study were found for DM, CP, NDF, EE and MM (26.8; 32.6; 75.9; 4.9 and 9.6%, respectively).

However, Miranda et al. (2008) found similar results for this study regarding the parameters CP and NDF (25.5; 37.1, respectively) evaluated in dehydrated leaves of leucaena. The NFC content was higher in November in comparison to March. The material with 48 hours of dehydration had lower content of NDF compared to January. The NDF content of hay made in November was lower than in March, and with NFC fraction the opposite happened.

In the cuttings carried out in April, June and August the averages verified in the cutting moment (drying time of 0 hours) were of 31.5; 22.5; 39.6; 68.6; 29.0; 3.0 and 5.8% on DM, CP, NDF, TC, EE and MM contents, respectively. Significant differences were observed in fractions NDF and EE in August, with lower and higher concentrations, respectively (Table 2).

Table 2. Average contents of chemical-bromatological components of leucaena hay as function of the cutting month and drying time (DT) at dry season, with respective probabilities (P) and coefficient of variation (CV).

Cutting Month	DT (hour)	DM	CP	NDF	TC	NFC	EE	MM
April		29.36 a	23.10 a	40.90 a	68.37 a	27.48 a	2.76 b	5.78 a
June	0	31.40 a	22.55 a	41.22 a	68.96 a	27.74 a	2.68 b	5.81 a
August		33.86 a	21.98 a	36.69 b	68.48 a	31.79 a	3.59 a	5.95 a
p-value		0.082	0.346	0.041	0.788	0.174	0.005	0.833
CV - %		7.11	3.09	6.09	1.05	8.96	15.24	4.02
April		85.04 b	21.44 a	38.89 a	70.34 a	31.45 a	2.61 b	5.61 a
June	4th	87.60 a	22.35 a	41.01 a	69.28 a	28.27 a	2.60 b	5.77 a
August		85.24 b	2.68 a	35.17 a	68.97 a	33.80 a	3.49 a	5.86 a
p-value		<0.001	0.166	0.128	0.134	0.122	0.010	0.419

CV - %		1.48	2.30	7.94	1.06	9.23	16.22	2.89
April		86.36 c	21.37 a	38.82 b	70.61 a	31.79 b	2.55 a	5.48 a
June	8th	90.79 b	22.24 a	40.44 a	69.63 a	29.19 b	2.56 a	5.57 a
August		95.53 a	21.54 a	33.80 c	69.51 a	35.72 a	3.45 a	5.50 a
p-value		0.002	0.111	<0.001	0.258	0.005	0.091	0.977
CV - %		4.55	2.17	8.24	1.00	9.25	18.22	5.93
April		87.38 a	21.20 b	38.73a	70.88 a	32.16 b	2.52 a	5.40 a
June	24th	93.44 a	22.14 a	40.42 a	70.03 b	29.61 b	2.42 a	5.41 a
August		95.96 a	21.16 b	33.54 b	70.09 b	36.55 a	3.34 a	5.41 a
p-value		0.072	0.034	0.007	0.023	0.004	0.091	0.998
CV - %		5.30	2.44	8.71	0.63	9.71	18.41	2.80
April		89.92 b	19.49 b	37.77 b	72.84 a	35.08 b	2.37 b	5.31 b
June	48th	94.63 a	22.11 a	40.10 a	70.17 b	30.08 c	2.41 b	5.31 b
August		96.36 a	21.01 a	32.67 c	70.63 b	37.97 a	3.26 a	5.09 a
p-value		0.009	0.009	0.001	0.003	0.003	0.014	0.040
CV - %		3.25	5.77	9.27	1.81	10.49	17.35	2.26

Means followed by different letters in the column, inside respective variable, indicate significant differences according to Tukey's test at 5% probability.

On the 4th hour of drying there were greater MS and EE contents in the bales produced in June and August. At the 8th hour of drying, higher contents were observed in DM, NDF and NFC in bales made in April, June and August. In dehydrated leucaena at the 24th hour a higher concentration of CP and NDF in bales made in June, CT in April and NFC in August was verified. Bales at the 48th hour of dehydration made in April had the lowest DM and CP; the greatest concentrations of TC and NFC occurred with baled material in April and August, respectively; and lower concentrations of NDF, EE and MM were observed in the material baled in August (Table 3).

Table 3. Average contents of chemical-bromatological components of leucaena hay as function of drying (DT) and storage time in the rainy and dry seasons, with respective regression equation, probability (P) and coefficient of determination (R²).

Parameters	Drying Time (hours)					Regression Equation	P	R^2
	0	4th	8th	24th	48th			
				Rainy season				
DM	30.11	86.67	91.43	97.12	98.40	$\hat{Y} = 88.18 + 0.54*TA – 0.0068*TA^2$	<0.001	0.52
CP	23.16	21.38	21.06	20.85	20.11	$\hat{Y} = 20.40 – 0.0149*TA$	0.045	0.38
NDF	37.18	36.39	36.18	35.81	35.52	$\hat{Y} = 40.75 – 0.009*TA$	0.048	0.40
TC	66.80	69.32	69.98	70.99	72.20	$\hat{Y} = 70.61 + 0.0509*TA$	<0.001	0.41
NFC	29.62	32.93	33.80	35.17	36.67	$\hat{Y} = 29.85 + 0.0416*TA$	0.017	0.39
EE	3.69	3.57	3.47	3.10	2.91	$\hat{Y} = 3.30 – 0.0119*TA$	<0.001	0.27
MM	6.35	5.73	5.49	5.06	4.79	$\hat{Y} = 5.90 – 0.0561*TA$	0.008	0.28
				Dry season				
DM	31.54	85.96	90.89	92.26	93.63	$\hat{Y} = 91.05 + 0.070*TA$	<0.001	0.47
CP	22.54	21.82	21.71	21.50	20.87	$\hat{Y} = 21,19 – 0.018*TA$	0.022	0.30
NDF	39.60	38.36	37.68	37.56	36.84	$\hat{Y} = 44,18 – 0.011*TA$	0.054	0.40
TC	68.60	69.53	69.92	70.34	71.22	$\hat{Y} = 70,54 + 0.030*TA$	0.004	0.46
NFC	29.00	31.17	32.24	32.78	34.37	$\hat{Y} = 26,36 + 0.042*TA$	0.022	0.30
EE	3.01	2.90	2.85	2.76	2.68	$\hat{Y} = 2,71 – 0.004*TA$	0.042	0.24
MM	5.85	5.75	5.52	5.41	5.24	$\hat{Y} = 5,54 – 0.008*TA$	<0.001	0.25

Souza and Espíndola (1999) state that leucaena hay with average contents of 90% DM and 23.5% CP during dry seasons is able to adequately supply the diet of ovine, providing animals with high rates of live weight gain during this period. In this study, it was found that dehydration of 4 hours in June and August provided to DM similar values to those recommended by authors for a suitable supplementation. In both periods there was significant decrease (p<0.05) in CP, NDF, EE and

MM according to increase in drying time (0, 4th, 8th, 24th and 48th hour) with averages of 21.3; 36.2; 3.3 and 5.5%, and 21.7; 38.0; 2.8 and 5.6%, respectively. This nutritional decrease was expected as the dehydration process promotes water loss and entrainment of more soluble components, especially those coming from the cell cytoplasm. Furthermore, there is a temporary continuity of the processes involved in cellular metabolism such as oxidative reactions, resulting in the increase of energy expenditure and nutrient intake.

Significant increase was observed in DM, CT and NFC with averages of 80.7; 69.9; 33.6% for rainy seasons and 78.9; 69.9 and 31.9% for dry periods, respectively. These results were expected because the cell wall has the lower aqueous portion, and it is therefore less subject to the effects of dehydration which results in the increase of percentage in the concentration of cellulose, hemicelluloses and pectin fractions, considered the main cell wall constituent of forages.

In rainy seasons Manella et al. (2002) observed that the edible fraction from leucaena showed 27.2% of DM, 25.6% of CP, 41.3% of NDF, and in dry seasons 31.6; 26.4; and 39.38%, respectively. In order for hay production to have high quality it is necessary to reap the plants at the optimal point when it comes to nutritional quality, the drying process needs to be fast and cause minimal nutrients losses. However, the quality of the hay may be decreased according to the time and storage conditions.

It was verified that in the rainy seasons the DM content of the bales was not influenced ($p<0.05$) by the increase of storage time, except for the hay produced at the 4th hour of dehydration, with an increase of 6.5% in the percentage of dry matter (Table 4).

The CP, NFC and EE fractions of the hays dehydrated decreased significantly ($p<0,05$) with an increase in storage time, with average losses in the order of 7.2; 16.3 and 12.1%, respectively. The NDF and CT contents increased significantly ($p<0.05$) with the storage time, with average increases of 21.5 and 2.9%, respectively. In relation to MM fraction, no change was caused by the storage time, possibly as a consequence of low mobility of minerals.

Table 4. Average contents of chemical-bromatological components, expressed in DM, of leucaena hay harvest at rainy season as function drying and storage time, with respective regression equation, probability (P) and coefficient of determination (R²).

	Storage time (days)				Regression equation	P	R^2
	0	30	60	90			
Drying time of 4th hour							
DM	86.67	90.54	91.81	92.31	$\hat{Y} = 86.76 + 0.144*TA\ 0.0009*TA^2$	0.051	0.77
CP	21.38	20.14	20.08	19.69	$\hat{Y} = 21.15 – 0.020*TA$	0.002	0.63
NDF	36.39	40.75	43.46	43.64	$\hat{Y} = 37.39 + 0.081*TA$	0.014	0.44
TC	69.32	70.95	71.05	71.91	$\hat{Y} = 69.62 + 0.026*TA$	0.001	0.63
NFC	32.93	30.20	27.59	28.27	$\hat{Y} = 32,23 – 0.055*TA$	0.011	0.22
EE	3.57	3.19	3.15	3.02	$\hat{Y} = 3.48 – 0.005*TA$	0.049	0.30
MM	5.73	5.72	5.71	5.69	$\hat{Y} = 5.71$	0.895	0.001
Drying time of 8th hour							
DM	91.43	91.76	92.23	92.64	$\hat{Y} = 92.02$	0.345	0.08
CP	21.06	20.74	19.97	19.52	$\hat{Y} = 21.13 – 0.018*TA$	0.039	0.38
NDF	36.18	40.02	41.69	43.74	$\hat{Y} = 36.75 + 0.081*TA$	0.012	0.50
TC	69.98	70.37	71.36	71.95	$\hat{Y} = 69.88 + 0.023*TA$	0.010	0.44
NFC	33.80	30.35	29.67	28.21	$\hat{Y} = 33.12 – 0.058*TA$	0.045	0.33
EE	3.47	3.40	3.24	3.10	$\hat{Y} =3.49 – 0.004*TA$	0.051	0.19
MM	5.49	5.48	5.43	5.42	$\hat{Y} = 5.46$	0.594	0.02
Drying time of 24th hour							
DM	97.12	97.21	97.59	97.70	$\hat{Y} = 97.41$	0.137	0.20
CP	20.85	20.24	19.80	19.70	$\hat{Y} = 20.73 – 0.013*TA$	0.030	0.38
NDF	35.81	42.38	42.64	43.91	$\hat{Y} = 37.50 + 0.081*TA$	0.005	0.55
TC	70.99	71.86	72.42	72.79	$\hat{Y} = 71.11 + 0.019*TA$	0.012	0.50
NFC	35.17	29.48	29.78	28.88	$\hat{Y} = 33.61 – 0.061*TA$	0.034	0.40
EE	3.10	2.92	2.91	2.74	$\hat{Y} = 3.08 – 0.003*TA$	0.054	0.23
MM	5.06	4.98	4.86	4.77	$\hat{Y} = 4.92$	0.277	0.11
Drying time of 48th hour							

DM	98.40	98.57	98.83	99.04	$\hat{Y} = 98.71$	0.219	0.14
CP	20.11	19.88	19.73	19.81	$\hat{Y} = 20.23 - 0.013*TA$	0.040	0.34
NDF	35.52	42.43	43.12	43.51	$\hat{Y} = 35.82 + 0.245*TA$	0.052	0.65
TC	72.20	72.63	72.95	74.16	$\hat{Y} = 72.05 + 0.020*TA$	0.007	0.52
NFC	36.67	30.20	29.83	30.65	$\hat{Y} = 36.42 - 0.243*TA + 0.002*TA^2$	0.053	0.54
EE	2.91	2.82	2.75	2.61	$\hat{Y} = 2.92 - 0.003*TA$	0.048	0.09
MM	4.79	4.67	4.57	4.43	$\hat{Y} = 4.62$	0.184	0.26

During the dry period it was found that the DM content increased due to the storaging time (Table 5). Significant decrease ($p<0.05$) of CP, NFC and EE in the hay dehydrated at the crescents hours occurred with the storage time with average losses in the order of 5.3, 24.8 and 10.6%, respectively. The concentrations of NDF and TC increased ($p<0.05$) according to the storage period, with average increases of 26.1 and 2.4%, respectively. The MM concentration was not influenced by storage time.

Table 5. Average contents of chemical-bromatological components, expressed in DM, of leucaena hay harvest at dry season as function dehydration and storage times, with respective regression equation, probability (P) and coefficient of determination (R²).

	Storage time (days)				Regression equation	P	R^2
	0	30	60	90			
					Drying time of 4th hour		
DM	85.96	92.37	92.65	92.67	$\hat{Y}=86.28 + 0.23*TA - 0.001*TA^2$	0.002	0.92
CP	21.82	20.59	20.58	20.56	$\hat{Y} =21.45 - 0.012*TA$	0.044	0.34
NDF	38.36	44.37	46.75	48.45	$\hat{Y} = 39.58 + 0.108*TA$	0.002	0.62
TC	69.53	70.91	71.15	71.57	$\hat{Y} = 69.83 + 0.021*TA$	0.010	0.47
NFC	31.17	26.54	24.40	23.11	$\hat{Y} = 30.25 - 0.087*TA$	0.005	0.55
EE	2.90	2.77	2.67	2.52	$\hat{Y} = 2.90 - 0.004*TA$	0.014	0.20
MM	5.75	5.72	5.61	5.35	$\hat{Y} = 5.61$	0.280	0.41
					Drying time of 8th hour		
DM	90.89	92.10	92.39	92.78	$\hat{Y} = 92.04$	0.314	0.09
CP	21.71	21.49	21.31	20.60	$\hat{Y} = 21.81 - 0.011*TA$	0.038	0.07
NDF	37.68	43.09	46.13	46.54	$\hat{Y} = 38.91 + 0.098*TA$	0.001	0.64
TC	69.92	70.30	70.67	71.54	$\hat{Y} = 69.82 + 0.017*TA$	0.025	0.12
NFC	32.24	27.22	24.54	25.00	$\hat{Y} = 30.90 - 0.081*TA$	0.028	0.42
EE	2.85	2.72	2.65	2.58	$\hat{Y} = 2.83 - 0.002*TA$	0.020	0.36
MM	5.52	5.48	5.37	5.28	$\hat{Y} = 5.41$	0.119	0.22
					Drying time of 24th hour		
DM	92.26	92.76	92.91	93.33	$\hat{Y} =92.82$	0.538	0.19
CP	21.50	20.75	20.63	20.34	$\hat{Y} = 21.34 - 0.011*TA$	0.001	0.65
NDF	37.56	46.02	46.61	47.74	$\hat{Y} = 37.84 + 0.296*TA$	0.006	0.89
TC	70.34	71.38	71.61	72.20	$\hat{Y} =70.50 + 0.019*TA$	0.001	0.64
NFC	32.78	25.37	25.00	24.46	$\hat{Y} = 32.20 - 0.242*TA + 0.001*TA^2$	0.006	0.86
EE	2.76	2.53	2.52	2.43	$\hat{Y} = 2.71 - 0.003*TA$	0.020	0.15
MM	5.41	5.83	5.24	5.03	$\hat{Y} = 5.25$	0.177	0.39
					Drying time of 48th hour		
DM	93.63	94.02	94.27	95.45	$\hat{Y} = 94.34$	0.158	0.40
CP	20.87	20.49	19.93	19.88	$\hat{Y} = 20.81 - 0.011*TA$	0.054	0.19
NDF	36.84	43.89	46.01	46.94	$\hat{Y} = 37.03 + 0.26*TA$	0.025	0.78
TC	71.22	71.84	72.42	72.56	$\hat{Y} = 71.31 + 0.015*TA$	0.051	0.20
NFC	34.37	27.95	26.40	25.62	$\hat{Y} = 32.76 - 0.092*TA$	0.005	0.55
EE	2.68	2.52	2.51	2.47	$\hat{Y} = 2.64 - 0.002*TA$	0.033	0.29
MM	5.24	5.15	5.14	5.09	$\hat{Y} = 5.16$	0.515	0.20

The drying time at the 24th hour combined with the storage time of 30 days provided the leucaena hay with the best distribution of average values for all parameters assessed, in both seasons, had similar results to those verified by Possenti et al. (2008), who observed that the leucaena hay (average cuttings conducted in August, November, February and April), showed contents of 92.68; 19.81; 57.25; 1.22 and 5.82% for DM, CP, NDF, EE and MM, respectively.

The majority of the Brazilian territory is located in the tropical region and the forages are subject to seasonal production. The protein content is one of the main parameters affected, resulting in qualitative deficiency of forages in dry seasons. This parameter decreased according to the increase in dehydration time and storage time, both for rainy seasons, in which the CP content ranged between 24.19 and 19.69%, as for the dry season, in which this parameter ranged from 23.10 and 19.49%. These protein contents are considered high compared with other legumes and meet the requirements of cattle, sheep and goats during gestation, lactation and growth (PUPO, 1985).

Besides this parameter, it is important to emphasize the similarity of the values of NDF, CP, NFC, EE and MM in rainy and dry season periods, evidencing the adaptability this specie to the High Pantanal region, maintaining their nutritional characteristics regardless of the season.

CONCLUSIONS

The dehydration time at the 24th hour and storage of 30 days, both during the rainy and dry seasons, allowed for the obtainability of the best chemical-bromatological composition of leucaena hay.

The crude protein, neutral detergent fiber and ethereal extract decreased according to dehydration and storage times in both seasons, while the dry matter, total carbohydrate and non fiber carbohydrates increased in relation to these variables for both periods.

RESUMO: A leucena é uma leguminosa que apresenta elevado teor protéico e digestibilidade, podendo ser fornecida fresca ou fenada. O objetivo foi verificar a influência do tempo de desidratação de folhas e caules finos de leucena e do tempo de armazenamento sobre suas características químico-bromatológicas. As frações comestíveis enfardadas (folhas e caules menores que um centímetro) foram depositadas sobre lona de plástico para desidratação, sendo coletadas amostras do material às 0, 4, 8, 24 e 48 horas de desidratação para se determinar os teores de matéria seca (MS), proteína bruta (PB), fibra em detergente neutro (FDN), carboidratos totais (CT), carboidratos não fibrosos (CNF), extrato etéreo (EE) e matéria mineral. Os fardos de feno foram confeccionados utilizando-se enfardadeira manual e foram mantidos armazenados em ambiente sombreado, ventilado e protegido da chuva por 90 dias. Mensalmente foram retiradas amostras para se determinar possíveis perdas da qualidade nutritiva. O tempo de desidratação por 24 horas e de armazenamento por 30 dias nas águas e na seca permitiram obter a melhor composição químico-bromatológica do feno de leucena. Os teores de PB, FDN e EE decresceram em função do tempo de desidratação e de armazenagem tanto no período das águas quanto no da seca, enquanto os teores de MS, CT e CNF aumentaram em função destas variáveis para ambos os períodos.

PALAVRAS-CHAVE: Fabaceae. Forrageira. *Leucaena leucocephala*. Ponto de fenação.

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