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**QUALITY OF AMMONIATED BRACHIARIA DECUMBENS HAY\***

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**Abstract**

The experiment was conducted at UNESP-Jaboticabal to evaluate the quality of *Brachiaria decumbens* hays harvested after seed ripening. The hays were submitted to the following treatments: control, anhydrous ammonia (3.0% NH<sub>3</sub> in the DM), and urea (5.0% in the DM). The chemical composition, digestibility and the performance of steers were evaluated using a complete randomized block design with three treatments and six replications. The ammoniation either with NH<sub>3</sub> or urea increased (P < 0.05) the CP content, and the IVDMD. The NH<sub>3</sub> treatment reduced (P < 0.05) the contents of NDF and ADF, and the urea application reduced (P < 0.05) the contents of hemicellulose and lignin. The ammoniation did not affect (P > 0.05) the neutral detergent insoluble nitrogen, and acid detergent insoluble nitrogen values. Steers receiving *Brachiaria* hay plus soybean meal (1.08 kg DM.day), hay treated with NH<sub>3</sub> plus corn meal (1.14 kg DM/day), and hay treated with urea plus corn meal (1.14 kg DM/day) showed DM intake of 1.97; 2.23; and 1.90% BW; weight gains of 0.60; 0.53; and 0.37 kg/day, and feed conversion of 10.8; 12.8; and 16.9 kg of DM/kg WG, respectively.

**Keywords** : Ammoniation, anhydrous ammonia, digestibility, intake, performance, urea

## Introduction

The haymaking in tropical areas during the rainy season can result in low quality forage, due to the adverse drying condition. Cutting the forage during the fall when the drying conditions are appropriated can result in hay of low quality due to the advanced stage of plant growth. Ammoniation has a high potential to increase the nutritive value of the tropical grasses hays harvested in advanced developmental stage (Rosa et al., 1998).

The main effects observed in *Brachiaria* hays treated with ammonia were: reduction in the contents of NDF and hemicellulose, increase in the digestibility and DM intake (Rosa et al., 1998), and in the animal performance (Brown, 1989; Reis et al., 1995). Urea utilization can reduce the treatment cost compared to the anhydrous ammonia. However, several factors can limit the treatment efficiency (Sundstol and Coxworth, 1984, Dolberg, 1992).

According to Brown (1989) anhydrous ammonia (NH<sub>3</sub>) treatment increased the performance of steers fed with stargrass hay (*Cynodon nlefuensis*). Reis et al. (1995) observed increase in the forage intake and animal performance of steers fed with *Brachiaria brizantha* hay treated with NH<sub>3</sub>.

The objective of this experiment was to evaluate the quality of *Brachiaria decumbens* hays treated with anhydrous ammonia or urea.

## Material and Methods

The experiment was conducted at UNESP-Jaboticabal with a *Brachiaria decumbens* hay harvested after seed ripening in July 1997. The hays were treated with urea at baling, and with NH<sub>3</sub> after baling.

The following treatments were studied: T<sub>1</sub>= *Brachiaria* hay not treated; T<sub>2</sub> = *Brachiaria* hay treated with 3.0% of NH<sub>3</sub> in the DM; T<sub>3</sub> = *Brachiaria* hay treated with 5.0% of urea in the

DM. Chemicals were applied on a DM basis according to Sundstol and Coxworth (1984), and Dolberg (1992).

The stacks were opened after the treatment period (45 days), and samples were taken after three days of aeration. The hays were analyzed to determine the contents of crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), hemicellulose, cellulose, lignin, neutral detergent insoluble nitrogen (NDIN), and acid detergent insoluble nitrogen (ADIN) according to AOAC (1984) methods. The “In vitro” dry matter digestibility (IVDMD) was evaluated following the Tilley and Terry (1963) procedures.

The hay quality was evaluated with Nelore and Brahman steers. The rations were formulated according to AFRC (1995) to maximize the microbial synthesis. The following treatments were evaluated: T1= Hay no treated plus soybean meal (1.08 kg DM/day); T2= Hay treated with NH<sub>3</sub> (3.0% DM) plus corn meal (1.14 kg DM/day), and T3= Hay treated with urea (5.0% DM) plus corn meal (1.14 kg DM/day). The following variables were evaluated: dry matter intake (DMI), weight gain (WG) and feed conversion (FC).

Changes in the chemical composition and IVDMD were evaluated using a completely randomized design with three treatments and six replications. The data of animal performance were analyzed according to a randomized complete block design with three treatments, three blocks, and two replications per block, being each plot constituted by two animals, using 36 animals (24 Nelore, and 12 Brahman).

## **Results and Discussion**

The treatments with NH<sub>3</sub> or urea increased ( $P < 0.05$ ) the CP content, and the IVDMD values of the hays (Table 1). Brown (1989), Reis et al. (1995), and Rosa et al. (1998) that evaluating tropical grasses hays treated with NH<sub>3</sub> or urea observed similar data.

The NH<sub>3</sub> treatment reduced ( $P < 0.05$ ) the NDF and ADF values (Table 1). However, the urea application decreased ( $P < 0.05$ ) the hemicellulose and lignin contents, and increased cellulose concentration. According to Sundstol and Coxworth (1984) in ammoniated forage the cellulose content can increase, probably due a dilution effect.

In general, the NH<sub>3</sub> utilization was more efficient than urea on changing the cell wall constituents, probably due to inappropriate urea distribution. Sundstol and Coxworth (1984) and Rosa et al. (1998) had the same results. Dolberg (1992) observed that the efficiency of the urea treatment depends of the forage dry matter content, urease activity, and urea distribution.

Ammoniation did not affect the NDIN and ADIN concentration. According to Reis et al. (1995), and Rosa et al. (1998) *Brachiaria* hays harvested at advanced maturation stage, with or without ammoniation, showed high contents of NDIN and ADIN.

The DM intake increased ( $P < 0.05$ ) due to the NH<sub>3</sub> application (Table 2). However, the animals fed with the control-hay or with the hays treated with urea showed lower DMI values. It was obtained higher weight gain in the animals fed with the control-hay plus SBM (0.6 kg/day), or with the hay treated with NH<sub>3</sub> plus corn (0.53 kg/day) compared to the hay treated with urea plus corn (0.37 kg/day). It was observed a worst feed conversion in the animals fed with hay treated with urea (16.9), compared with the control-hay (10.8) and with the hay treated with NH<sub>3</sub> (12.8). According to Brown (1989) and Reis et al. (1995) the treatment of tropical grasses hays with NH<sub>3</sub> increased the forage intake and the steers weight gain.

The urea treatment resulted in low performance of the steers (0.37 kg/day), probably due to the inappropriate urea distribution which resulted in ineffective changes in the nutritive value of the hay (Table1).

## References

- AFRC.** (1995). Energy and protein requirements of ruminants Agricultural and Food Research Council. Farnham Royal: CAB 59p.
- AOAC.** Association of Official Analytical Chemists. (1984): Official methods of analysis. Arlington, Virginia: AOAC, 14 ed., 1141 p.
- Brown, W.F.** (1989). Maturity and ammoniation effects on the feeding value of tropical grasses hay. *J. Anim. Sci.* **66**: 2224- 2232.
- Dolberg, F.** (1992). Program in the utilization of urea–ammonia treated crop residues: Nutritional dimensions and application of the technology on small farm. In: Simpósio Internacional de Ruminantes, 1992, Lavras. Anais...Lavras: SBZ, p.130-145.
- Sundstol, F. and Coxworth E.M.** (1984). Ammonia treatment. In: Straw and other fibrous by products as feed. Sundstol, F., Owen, E. (ed.). Elsevier, Amsterdam. p. 196-247.
- Reis, R.A., Andrade P., Rodrigues L.R. de A. and Pedroso P.** (1995). Palha de arroz e feno de braquiária brizantha amonizados e suplementados com energia e proteína na alimentação de bovinos. *Rev. Soc. Bras. Zoot.* **24**: 832-840.
- Rosa, B., Reis R.A., Resende K.T., Kronka S.N. and Jobim C.C.** (1998). Valor nutritivo do feno de *Brachiaria decumbens* Stapf cv. Basilisk submetido a tratamento com amônia anidra ou uréia. *Ver. Bras. Zoot.* **27**: 815-822.
- Tilley, J.M.A. and Terry R.A.** (1963). A two-stage technique for the “in vitro” digestion of forage crops. *J. Brit. Grassl. Soc.*, **18**: 104-111.

**Table 1** - Nutritive value of the *Brachiaria decumbens* hays according to ammoniation treatment

	Ammoniation treatment		
	Control	NH <sub>3</sub> (3.0% DM)	Urea (5.0% DM)
NDF (g/ kg DM)	839.1 a	794.0 b	820.0 a
ADF (g/ kg DM)	517.0 a	481.0 b	527.0 a
Hemicellulose (g/ kg DM)	322.0 a	313.0 a	292.0 b
Cellulose (g/ kg DM)	424.0 b	402.0 b	455.0 a
Lignin (g/ kg DM)	93.0 a	80.0 ab	72.0 b
CP (g/ kg DM)	28.0 c	96.0 b	120.0 a
NIDN (g/ kg DM)	3.0 a	4.0 a	4.0 a
ADIN (g/ kg DM)	3.0 a	3.0 a	3.0 a
IVDMD (g/ kg DM)	475.0 c	596.0 a	542.0 b

Means in the row followed by the same letter do not differ (P > 0.05).

**Table 2** - Dry matter intake (DMI), weight gain (WG), feed conversion (FC) of steers fed differently treated *Brachiaria decumbens* hays

Treatment	DMI (% BW)	Weight gain (kg/day)	Feed Conversion (kg DM/kg WG)
Brachiaria hay + soybean meal (1.08 kg DM/day)	1.97 b	0.60 a	10.8 a
Brachiaria hay treated with NH <sub>3</sub> + corn meal (1.14 kg DM/day)	2.23 a	0.53 a	12.8 a
Brachiaria hay treated with urea + corn meal (1.14 kg DM/day)	1.90 b	0.37 b	16.9 b

Means followed by the same letter, in the column, do not differ (P > 0.05).