Enumeration of fungi and evaluation of losses in buffel grass hay ammoniated with urea

E.M. Santos[1], A.P.G Silva[1], H.F.C. Bezerra[1], A.F. Perazzo[2], J.P.F. Ramos[3], C.H.O. Macedo[1], G.G.P. Carvalho[2] and R.M.A. Pinho[1]

[1]Federal University of Paraiba, Areia, Paraíba 58397-000, Brazil, Email: ricardo-zootec@hotmail.com,[2]Federal University of Bahia, Salvador, Bahia, 40170-110, Brazil, Email: alexandreperazzo@hotmail.com,[3]State Company for Agricultural Research of Paraíba, Soledade, Paraíba, Brazil, Email: jpemepapb@yahoo.com.br

Introduction Forage availability in semiarid region during the year is desuniform and low production during the dry season, leading to feed shortages in this period of the year. An alternative to solve the problem of seasonality of forage is haymaking, which consists of conservation of nutritional value of forage through rapid dehydration. Allied haymaking, some researchers have used additives in order to improve in the conservation process, as well as the quality of the stored material. The use of urea reduces the growth of microorganisms in hay and can improve the quality of low quality forages, its nutritional value and intake by animals. Another important characteristic of urea is its fungal activity, which provides a reduction in deterioration of hay stored. Thus, the objective was to quantify the population of fungi and to evaluate the losses of buffel grass hay ammoniated with urea.

Materials and Methods It was used a pasture of buffel grass (*Cenchrus ciliaris* cv. Biloela) already implanted 28 years ago, at the Pendência Experimental Station, which belongs to the State Company for Agricultural Research of Paraíba. We used a completely randomized design with five treatments and four replications. The treatments consisting by urea levels (0, 5, 10, 20, 40 g/kg) were added the hay bales based in the dry matter. At the start of the experiment, conducted a uniformity cut height of 10 cm from the soil and a fertilized with 50 kg/ha of nitrogen in the form of ammonium sulfate. The grass was harvested when reached 50 cm of height, with the aid of costal mower, to the 10 cm of soil. Subsequently, the material was baled with the aid of a baler wood with dimensions of 25x40x40 cm, height, length and width, respectively. After the confection of the bales, they were weighed and then preceded to treatment with the respective urea levels. The amount of urea by treatment was diluted in 450 mL of water, with the aim of increasing the moisture content of the forage from 150 to 250 g/kg. The application was made through sprinklers, prioritizing the homogeneous distribution in order to ensure that all the material had contact with the solution. Immediately after application, the bales were covered with polyethylene bags sealed with adhesive tape and preventing entry of air. After 60 days of storage proceeded to removal of the bag and the bales were exposed to air for about 4 hours to eliminate ammonia unreacted with the hay. Past four o'clock the bales were weighed again for subsequent calculation of losses. Dry matter recovery storage (DMRs) was calculated by equation bellow:

DMRs (g/kg) = FMas*DMas / FMbs*DMbs * 100, wherein:

FMas = forage mass after storage (kg);

DMas = dry matter after storage (g/kg);

FMbs = forage mass before storage (kg);

DMbs = dry matter before storage (g/kg);

The pH determination was performed according to methodology described by Bolsen et al. (1992). The enumeration of molds and yeasts was performed from a 10 g sample of hay

added 90 mL phosphate buffer and homogenized in industrial blender for 1 minute to obtain a 10^{-1} dilution. After that, successive dilutions were performed in order to obtain dilutions ranging from 10^{-1} to 10^{-7}. It was used culture media Potato Dextrose Agar, added of 10g/kg tartaric acid at 100 g/kg, after sterilization, for enumeration of molds and yeasts after incubation for 3-7 days at room temperature. The plating was performed in duplicate in sterile Petri dishes. It was considered counted reliable plates with values between 30 and 300 colony forming units (cfu). Data of dry matter recovery and pH were submitted to analysis of variance and regression, using the statistical analyses program SISVAR (Ferreira, 2008).

Results and Discussion There was no adjustment of linear models for DMRs and pH values (Table 1), with addition of urea levels in buffel grass hay. It is observe that, except the urea level of 10 g/kg, the urea inclusion reduced in absolute values when compared to the non-ammoniated hay, demonstrating that the ammoniation is not reduced losses during storage. The losses during storage may occur due continuation cellular respiration. It was observed quadratic effect for pH, with highest value observed at urea level 5 g/kg (8.88), reducing the other urea levels. The probable explanation for this fact is that ammonia is a weak base with high buffering capacity and does not act as direct pH modifier, so that the increase addition of urea does not necessarily observed pH increase. The addition of urea levels was effective in reduced molds and yeasts populations, reducing from 6.50 log cfu/g in the hay without addition of urea to 3.65 cfu/g when added 40 g/kg of urea hay demonstrating the fungistatic effect of ammoniation. It was observed higher reduction in the number of molds and yeasts in buffel grass hay, in the levels of inclusion of 20 and 40 g/kg of urea. Almeida et al. (2006), found that addition of 20 g/kg of urea was sufficient to inhibit the growth of fungi in Bahia grass hay (*Paspalum notatum*).

Table 1 Mean values of dry matter recovery storage (DMRs), pH and molds and yeasts enumeration (MY) in buffel grass hay ammoniated with urea

Levels of urea (g/kg DM)	DMRs (g/kg)	pH	MY (log cfu/g forage)
0	928.6	8.24	6.50
5	862.4	8.88	5.45
10	932.1	8.02	5.85
20	872.7	8.04	3.78
40	884.3	7.96	3.65
CV (%)	5.16	4.34	-

CV: Coefficient of variation

Conclusions The application of urea has no benefit in related to the losses, however is effective in to reduce molds and yeasts population in storage of buffel grass hay.

References

Almeida, J. C. C., F. T. Pádua, D. D. Nepomuceno, et al. 2006. Ocorrência de fungos no feno de grama-batatais (*Paspalum notatum*) em função da dose de ureia, período de tratamento e do teor de umidade. Liv. Res. Rur. Develop. 18(6).

Bolsen, K. K., C. Lin, C. R. Brent, et al. 1992. Effects silage additives on the microbial succession and fermentation process of alfalfa and corn silages. J. Dairy Sci. 75:3066-3083.

Ferreira, D.F. 2008. SISVAR: Um programa para análises e ensino de estatística. Rev. Symp. 6:36-41.