

PROTEIN DEGRADABILITY EFFECT AND SUPPLEMENTATION LEVEL ON PASTURE UTILIZATION

A. V. M. FRANCO, P. de ANDRADE and G. L. FRANCO

Departamento de Nutrição Animal e Pastagens, UNESP Jaboticabal, SP Brasil

ABSTRACT

The objective was to determine the effect of protein degradability and supplement level on forage degradation. Steers fistulated were utilized in *Brachiaria brizantha* pasture. A randomized block design was used with a control treatment and supplements according to a factorial scheme combining low, medium and high protein degradability with supplementation levels: low, medium and high analysed as principal treatments and incubation time as split-plot by SAS. Nylon bags were incubated at 4; 8; 12; 24; 48; 72; 96 and 120 hours to determine DM, CP and NDF degradation. There was no effect ($P>0.05$) of protein degradability and supplementation levels on ruminal degradation being not different ($P>0.05$) from control. The exponential model indicated that 29% of CP constituted the soluble fraction and the insoluble potentially degradable was 50% with degradation rate of 4.15%. Concerning the NDF 57% was potentially degradable at a rate of 4.02%.

KEYWORDS

Brachiaria brizantha, cattle, forage, grazing, nylon bag

INTRODUCTION

Nowadays, more emphasis on protein nutrition of ruminants is directed to supply degradable protein to microbiota. Advanced systems for ration formulation have estimated this demand of degradable protein (AFRC, 1994; FOX et al. (CNPCS), 1990 and INRA (PDI), 1981). However, the physiological basis concerning the difference between optimal ammonia concentration for ruminal digestion of fiber and microbial protein synthesis remain unclear (MORRISON and MACKIE, 1996).

In Brazil, where there is a predominance of extensive systems of cattle production, studies were conducted to evaluate the effect of supplements on animals maintained in pastures, but all were empirically formulated (VILELA et al., 1976; BENINTENDI et al., 1974; ALLEONI et al., 1980). Therefore it is necessary to study the effects of supplements on the more important variables in the rumen in tropical conditions, mainly dry matter, fiber, and protein degradation.

The objective of this work was to evaluate the effects of protein degradability (low, medium, and high) and supplement levels (0.5; 1.0; and 1.5 kg of dry matter) on the dry matter (DM), crude protein (CP), and neutral detergent fiber (NDF) with animals grazing *Brachiaria brizantha* (Hochst. ex A. Rich) Stapf cv. Marandu during the dry season.

METHODS

Ten crossbred steers (Holstein x Zebu) at 2.5 years of age, 400 kg of live weight, and cannulated in the rumen were utilized in a *Brachiaria brizantha* pasture of 3.6 ha, after flowering, with high availability of forage. A randomized block design was used, with a control treatment and supplements, according to a factorial scheme combining low (L=30%), medium (M= 50%) and high (H= 70%) protein degradability with supplementation levels: low (Sl= 0.5 kg DM), medium (Sm= 1.0 kg DM) and high (Sh= 1.5 kg DM), analysed as principal treatments and incubation time as split-plot. The analysis were run by SAS-GLM procedure.

In the periods (block) with 23 days, the two first weeks were for adaptation and the third for nylon-bag incubation.

The supplements constituted by soybean meal, corn gluten meal, corn, and urea were introduced into the rumen fistula at 7:00 h AM and 18:00 h PM, daily. The sealed nylon-bags with the dimension of 7x21 cm with porosity of 50 μ m, containing 5 g of forage sample obtained by manual harvest simulating grazing, with the following average composition: DM= 45%; CP= 6.7%; and NDF= 70%. The nylon-bags were suspended in the rumen at times 4; 8; 12; 24; 48; 72; 96; and at 120 hours, placed in the rumen in the inverse order and removed all at once, being washed and dried in oven at 55°C for DM, CP, and NDF determination.

RESULTS AND DISCUSSION

Table 1 shows the results of DM, CP, and NDF degradation. There was no effect ($P>0.05$) on protein degradability and supplementation level on ruminal degradation of DM; CP; and NDF, being not different ($P> 0.05$) from the control. The kinetics of ruminal degradation can be seen by degradation means (Table 2).

The CP potential degradation could be reached at 48 hours and that of NDF at 72 hours. The exponential model parameters (a = soluble fraction; b = insoluble fraction potentially degradable; c = fractional constant degradation rate) indicated that approximately 29% (a) of forage CP is rapidly degradable, the b fraction is around 50% of CP and c equals 4.02%/h. Considering that the forage presented a very low content of CP (6.7%) it was surprising that the supplements with a wide variation in degradable protein were not effective to stimulate NDF degradation; this wouldn't make possible a higher intake of forage, as generally accepted. How to explain this? We would suspect that the nylon-bag technique is not appropriate for this type of study; or that the principles of ruminant nutrition concerning rumen degradable protein for microbiota, especially for fiber degradation are not correct; or factors other than those studied in this work are involved.

REFERENCES

- AFRC, Energy and protein requirements of ruminants. Farnham Royal: CAB, 1993. 159p.
- ALLEONI, G.F., ABRAMIDES, P.L.G., MATTOS, H.B. 1980. Efeito da suplementação proteica na "performance" de bovinos machos leiteiros mantidos em pastos consorciados. B. Indústr. Anim., Nova Odessa, V.37, n.1, p.33-45.
- BENINTENDI, R.P., ANDRADE, P. 1982. Suplementação com alimentos volumosos e concentrados durante a seca, a novilhas zebus mantidas no pasto. B. Indústr. Anim., Nova Odessa, V.39, n.1, p.11-28.
- BLAS, J.C.; FRAGA, M.J. 1981. Alimentation de los rumiantes. INRA, Versailles, Francia, 697 p.
- FOX, D.G., SNIFFEN, C.J., O'CONNOR, J.D., RUSSEL, J.B., VANSOEST, P.J. 1990. The Cornell net carbohydrate and protein system for evaluating cattle diets. Ithaca, Cornell, 128 p.

MORRISON, M.; MACKIE, R.I. 1996. Nitrogen metabolism by ruminal microorganisms: current understanding and future perspectives. *Aust. J. Agric. Res.* **47**: 227-246.

VILELA, H. et al. 1976. Efeito das suplementações de melaço, uréia e potássio, sobre o ganho em peso de novilhos zebu em regime de pasto, durante o período da seca. *Arq. Esc. Vet. UFMG, Belo Horizonte*, V.28, n.2, p.141-146, 1976.

Table 1

Degradability of DM; CP and NDF (%).

	DM	CP	NDF
Control	45.62	61.59	34.72
Low protein deg.	44.36	60.24	33.18
Medium protein deg.	45.83	61.66	34.82
High protein deg.	44.62	60.20	33.29
Low level suppl.	45.49	61.52	34.50
Medium level suppl.	45.65	61.38	34.62
High level suppl.	43.67	59.21	32.16

Table 2

Degradability of DM; CP and NDF (%).

Time (h)	DM		CP		NDF	
	factorial	control	factorial	control	factorial	control
4	17.24 e	17.01 e	35.74 e	33.79 e	0.000 f	- 0.02 f
8	21.03 de	22.22 de	43.56 de	46.10 de	4.94 e	6.26 e
12	25.48 d	27.14 d	47.69 cd	48.40 cd	10.87 d	13.33 d
24	40.58 c	43.42 c	56.87 bc	61.05 bc	28.74 c	32.21 c
48	56.10 b	56.07 b	70.82 ab	71.14 ab	46.85 b	46.58 b
72	62.41 a	64.36 a	74.88 a	76.19 a	54.70 a	56.89 a
96	65.66 a	65.58 a	76.47 a	77.21 a	59.00 a	58.88 a
120	69.02 a	69.15 a	78.62 a	78.87 a	63.30 a	63.63 a

a,b,c,d,e,f Means in the same column with different letters differ (P< .05).