IMPROVING THE RUMINAL DEGRADATION OF LOW-QUALITY TROPICAL GRASSES

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ABSTRACT

Rumen cannulated cattle and sheep were used to study the effect of supplementation with several nitrogen sources on rumen digestion of tropical grasses. Supplementation of cattle grazing guinea grass (*Panicum maximum*) with dehydrated poultry excreta had no effect on rumen DM disappearance of the grass consumed. On the other hand, supplementation with fish meal increased rumen digestion of DM of pangola (*Digitaria decumbens*) and buffel (*Cenchrus ciliaris*) grass above that found when soyabean meal was given. DM intake was significantly increased when fish meal was given in relation to that found when soyabean meal was supplied. Supplementing sheep with the foliage of tropical trees was able to increase DM digestion and voluntary intake of low-quality tropical grasses. Possible mechanisms for such responses are discussed.

KEYWORDS

Rumen digestion, tropical grasses, supplementation

INTRODUCTION

Feeding systems for ruminants in Mexico are based on the grazing of native and introduced grasses. In the tropics, during the dry season, dry matter production and nutritive value of the grasses generally decreases leading to low rates of gain in cattle and delaying the time animals reach the weight for slaughter. Under those conditions, supplementation with critical nutrients (N, S,) to optimize rumen digestion of the basal diet is warranted (Leng, 1990). The purpose of this work was to evaluate different strategies of supplementation with nitrogen sources on rumen digestion and voluntary intake of low-quality tropical grasses by ruminant animals.

MATERIALS AND METHODS

Bos indicus entire male cattle (300 kg LW) and Pelibuey sheep (35 kg LW) were fitted with flexible (plastisol) rumen cannulas (10.0 and 7.5 cm internal diameter respectively; Bar Diamond Inc., ID, USA) and housed in metabolic stalls to carry out *in situ* digestion trials. In another experimental site, rumen cannulated cattle grazing guinea grass (*Panicum maximum*) supplemented with or without dehydrated poultry excreta plus molasses in Southeastern Mexico were employed to measure kinetics of DM disappearance of the diet actually selected and consumed. The rumen evacuation technique was employed to obtain representative samples of rumen ingesta.

The nylon bag technique (Orskov and McDonald, 1979) was used to measure kinetics of rumen digestion of dry matter. Three or five grams of sample (grass or rumen ingesta) were weighed into nylon bags (10 x 20 cm or 5 x 10 cm; 53 micron pore size; Bar Diamond Inc., ID, USA). Bags were incubated by triplicate in the rumen for 6, 12, 24, 48, 72 and 96 h. After withdrawal from the rumen, bags were introduced into a forced-air oven for 72 h at 60°C. Rumen disappearance data was fitted into the exponential model

$$p = a + b\,(1 - \exp^{-ct})$$

where: a is the y intercept representing the rapidly soluble material, b is the insoluble but potentially digestible material, c is the rate of degradation of b and t is time (McDonald, 1981). Suitability of fit was assessed by the residual standard deviation (van Milgen and Baumont, 1995).

RESULTS AND DISCUSSION

Table 1 shows rumen digestion constants for pangola grass *(Digitaria decumbens*) and buffel grass (*Cenchrus ciliaris*) supplemented with soyabean meal (SBM) or fish meal (FM) in cattle fed buffel grass (*Cenchrus ciliaris*) ad libitum. It can be observed that pangola grass had a higher rumen digestion than buffel grass and that FM increased rumen digestion of DM irrespective of pasture. DM intake of cattle supplemented with FM was 5.5 kg/day whereas for animals given SBM it was only 4.9 kg/day ($P < 0.05$).

Table 2 shows degradation constants for the diet selected and consumed by cattle grazing guinea grass (*Panicum maximum*) supplemented with or without dehydrated poultry excreta. It can clearly be shown that rumen digestion of DM is very high for this tropical grass and that non-protein nitrogen (i.e. uric acid in poultry excreta) had no effect on rumen digestion of the basal diet. On the other hand, Hunter and Siebert (1985) were able to improve rumen digestion of low-quality tropical grasses when they supplemented *Bos indicus* cattle with rumen degradable nitrogen (urea). In a separate trial, Valdivia-Salgado and Ku-Vera (1996) were able to significantly increase DM intake (from 35 to 84 g/kg $W^{0.75}$/d) of Pelibuey sheep when the level of foliage of ramon (*Brosimum alicastrum*) was increased in the diet from 0 to 45% (DM basis). Similarly, Alayon-Gamboa, Ramirez-Aviles and Ku-Vera (submitted) were able to increase DM intake (from 45 to 71 g/$kg^{0.75}$/day) of Pelibuey sheep when the level of foliage of matarraton (*Gliricidia sepium*) was increased from 0 to 30% in the diet. Supplementation with protein foliage significantly increased rumen DM disappearance of the whole diet in the above mentioned experiments. Nitrogenous supplements can significantly increase DM digestion in the rumen and voluntary intake of low-quality tropical grasses in Mexico, although more work is required to assess the effect of nitrogen supplementation during the dry/wet season on rumen DM digestion under practical conditions.

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Table 1
DM degradation of pangola and buffel grass in the rumen of cattle supplemented with fish meal (FM) or soyabean meal (SBM) (Castillo-Limon, 1997)

	Pangola		Buffel	
Parameter	FM	SBM	FM	SBM
a (%)	10.88	10.88	10.04	10.04
b (%)	67.53	53.28	46.44	41.40
a + b (%)	78.41	64.16	56.48	51.44
c (%)	0.017	0.023	0.017	0.053
RSD	2.0	1.6	0.7	3.0

$p = a + b (1 - exp^{-ct})$

Table 2
Kinetics of DM disappearance in the rumen of the diet selected by cattle grazing guinea grass supplemented or unsupplemented with poultry litter mixed with molasses

Parameter	Supplemented	Unsupplemented
a (%)	21.18	24.67
b (%)	61.26	60.83
a + b (%)	82.44	85.50
c (/h)	0.048	0.034
RSD	2.1	1.9

$p = a + b (1 - exp^{-ct})$