

EFFECT OF RATIO OF CONCENTRATE TO ROUGHAGE ON THE RUMEN DEGRADABILITY OF CRUDE PROTEIN IN ITALIAN RYEGRASS AND CUBED ALFALFA HAYS

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Introduction

Determinations of the rumen degradability of protein (D_g) have been mainly done on protein supplement feedstuffs (Okubo et al., 1986). Zhao and Fujita (1989) have studied the effect of different types of dietary protein and energy on d_g of forage protein and suggested the needs for a study on effect of ratio of concentrate to roughage on d_g of protein.

The present study was to determine the effect of ratio of concentrate to roughage on d_g of crude protein in grass and legume hays.

Materials and Methods

Rations consisting different ratios of commercial formula feed for fattening beef cattle and grass or legume hay were given to 2 mature Saanen castrated male goats cannulated with the rumen

(avg. weight, 45.2 kg) and 2 Suffolk x Corriedale rams with rumen cannula (40.3 kg). In the first trial, formula feed and Italian ryegrass hay cut in 5 cm length were mixed with ratios of 0:100, 30:70, 60:40 and 85:15 on air dry matter basis (ryegrass diet). In the second, cubed alfalfa hay was used in place of ryegrass hay (alfalfa diet). After 7-day preliminary period, bags with duplicates were incubated in the rumen for 3, 6, 12, 24, 48 and 72 hours. The chromium mordant cell wall constituents (Cr-CWC) were administered through the rumen cannula to determine the rate of ruminal passage of digesta. After administration of Cr-CWC, feces were collected at 4-hour intervals for 5 days.

Results

One goat died with aspiration pneumonia in the course of experiment. Data of this animal was

TABLE 1. PROTEIN DEGRADABILITY OF ITALIAN RYEGRASS HAY AND CUBED ALFALFA HAY

Diet given to animals	D_g ¹⁾	%		hr^{-1}	
		Dr	Ds	K_d	K_p
Ryegrass diet		Crude protein of Italian ryegrass hay			
Conc. : Hay					
0 : 100	0.60	32.2	57.2	0.023	0.025
30 : 70	0.51	29.6	49.2	0.029	0.034
60 : 40	0.55	37.0	45.9	0.029	0.032
85 : 15	0.52	21.3	36.2	0.063	0.034
Alfalfa diet		Crude protein of cubed alfalfa hay			
Conc. : Hay					
0 : 100	0.84	33.6	59.6	0.093	0.037
30 : 70	0.78	34.3	56.1	0.103	0.031
60 : 40	0.75	43.4	50.5	0.044	0.026
85 : 15	0.76	37.9	54.9	0.050	0.022

1) Abbreviated notations are as follows; D_g , protein degradability; Dr, rapidly degradable fraction of protein; Ds, slowly degradable fraction; K_d , degradation rate of Ds; K_p , passage rate of digesta from the rumen.

discarded. There were no significant differences in the results computed individually. Thus, results were pooled to determine parameters for protein digestion and flow of digesta. Table 1 shows the values of dg of forage proteins together with parameters for protein digestion and flow of digesta. The dg value of crude protein of Italian ryegrass hay ranged 0.51 to 0.55 when animals were given ryegrass diets containing 30 to 85 % of concentrate. The dg value determined when animals were given the same hay alone was a little higher value (0.60) than those obtained in the feeding of mixed diets containing concentrate. The dg value for cubed alfalfa hay ranged 0.75 to 0.78 when it was determined by incubation in the rumen of animals given alfalfa diets containing 30 to 85 % of concentrate. When the dg value was determined by incubation in animals given alfalfa hay alone, it gave a little higher value (0.84) than those obtained by the feeding of mixed diets as observed in ryegrass diets.

Discussion

Changes in the ratio of concentrate to hay did not markedly affected the dg values of Italian ryegrass and cubed alfalfa hays in this study, although determinations in the feeding of hay alone tended to estimate a higher dg value both in ryegrass and alfalfa hays when it was determined by animals fed the same hay. Zhao and Fujita (1989) have found that the dg values of forage proteins have not been markedly affected by changing the type of protein and energy sources. Results of the present study and of Zhao

and Fujita (1989) show that the dg value of forage protein may be unaffected when it is determined using mature ruminants. Sekine et al. (1986) have shown that the dg value may be estimated in an additional fashion by using the composition of ingredients and the dg values for individual ingredients determined using a test animal with a highly developed ruminal function. Thus, it is concluded that the dg values of hay protein is able to determine using mature ruminants given a mixed ration with any ratio of concentrate to hay within the range studied in the present study, while the dg value determined in the feeding of hay alone appears to be estimated a little higher than those determined in the feeding of a mixed ration.

(Key Words: Protein Degradability, Concentrate Ratio, Hay)

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