Effect of Feeding Bypass Protein with Urea Treated Grass on the Performance of Red Kandhari Calves

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ABSTRACT : An experiment was carried out to assess the effect of feeding concentrate mixtures varying in bypass protein levels with urea-treated or untreated grass on the performance of twelve Red Kandhari calves (14 months of age and 78.15 kg body weight) for a period of 75 days. Dry grass was treated with 4 percent urea solution and ensiled for 30 days. The CP (N×6.25) content in urea treated grass increased from 3.96 to 8.89 percent. Two iso-caloric and iso-nitrogenous concentrate mixtures (CM-I and CM-II) varying in RDP to UDP ratio viz., 65:35 and 55.45 were prepared. The calves in control group (T_1) were fed concentrate mixture-I with *ad libitum* untreated dry grass and those in experimental group (T_2) were fed concentrate mixture-II with *ad libitum* urea treated dry grass. The dry matter consumption in group T_2 was significantly ($p<0.01$) higher as compared to group T_1. The total DMI in T_1 and T_2 was 146.92 and 166.95 kg respectively, whereas the DMI per day and per 100 kg body weight was 1.94 and 2.22 and 1.90 and 2.35 kg, respectively. The average total gain in body weight (kg) and average daily gain (g) of calves in T_2 was significantly ($p<0.01$) higher as compared to those in T_1 the values being 28.66, 18.33 and 382.16, 244.44, respectively. Feed efficiency in terms of kg DM per kg gain in body weight was significantly ($p<0.01$) lower in group T_1 than in T_2. The cost of feed per kg gain in body weight for T_2 and T_1 group was Rs. 21.14, 28.22, respectively. The digestibility coefficients of DM, CP, EE, CF, NFE, NDF and ADF were 59.60, 57.50, 53.00, 65.04, 45.82, 48.48, 52.48 and 55.73 for T_1 group. The coressponding values were 68.78, 67.80, 59.83, 71.41, 49.93, 53.37 and 57.81, respectively for T_2 group. The digestibility coefficients for all the proximate principles in T_2 were significantly ($p<0.01$) higher as compared to T_1. However, NDF and ADF digestibilities were not significantly different. Nutritive value determined in terms of DCP and TDN for The experimental ration was significantly ($p<0.01$) higher than control ration, the values being 7.32 and 47.34 and 9.39 and 52.40% respectively. The blood urea nitrogen levels at 0, 3 and 6 h interval after feeding were significantly ($p<0.01$) lower in calves fed experiment ration as compared to control. The overall results indicated that in Red Kandhari calves an optimum growth can be economically achieved by feeding 4 percent urea treated dry and mature grass as basal roughage supplemented with a concentrate mixture containing 20 percent CP, 70% TDN and 45% UDP/bypass protein. (***Asian-Aust. J. Anim. Sci. 2001. Vol. 14, No. 7 : 970-973)***

Key Words : By-Pass Protein, Urea Treated Grass, Red Kandhari Calves

INTRODUCTION

The present protein evaluation system in India for ruminants is based on digestible crude protein (DCP). This system fails to explain the changes in rumen microbial responses and the nature of undegradable protein particles reaching the abomasum. Agricultural Research Council (ARC, 1980) and National Research Council (NRC, 1989) adopted a new system of protein evaluation which is based on Rumen degradable protein (RDP) and Undegradable dietary protein (UDP). The proposed new system envisages a greater proportion of UDP/bypass protein in the diet of ruminants for higher growth rate and milk production. The aim of the present investigation was to evaluate the feasibility of UDP/bypass protein system in practical dairy farming.

MATERIALS AND METHODS

Locally cultivated dry grass harvested at maturity was treated with 4% urea solution at 30% moisture level and was ensiled, covering the stack by polythene sheet for a period of one month. Based on the calculated protein degradability values for different raw feed ingredients, (Kalbande and Thomas, 1999) 2 iso-caloric and iso-nitrogenous balanced concentrate mixtures (CM-I and CM-II) varying in RDP/UDP contents were prepared (table 1).

Twelve Red Kandhari calves of either sex were selected, individually weighed and divided into 2 groups viz, group T_1 (control) and group T_2 (experimental) of 6 calves each, with 1:1 male to female ratio, on equal body weight and age basis. All the calves were treated for endo and ectoparasites before the start of experiment and were housed in a shed with individual arrangement for feeding, care and management.

The calves in control group (T_1) were fed untreated grass and those in experimental group (T_2) were offered urea treated grass *ad libitum* with concentrate mixture I and II respectively to meet their nutrient requirement as per standards (ICAR, 1985). Fresh and clean drinking water was made available *ad libitum* throughout the experimental period. Daily

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Table 1. Percent ingredient composition of concentrate mixture (CM) with their nutritive value (calculated)

Ingredients	CM I	CM II
Jowar		
Yellow maize	20	20
Wheat bran	10	20
Cottonseed cake	40	7
(undecorticated)	7	40
Groundnut cake	20	10
(deoiled)	2	2
Mineral mixture	1	1
Common salt	-	-
Vimicon*	100	100
Total		
DCP (%)	14.76	14.27
TDN (%)	70.47	73.19
ME (MJ/kg)	10.46	11.01
RDP (%)	13.45	11.03
UDP (%)	7.12	9.06
RDP:UDP ratio	65:35	55:45

* Vimicon contained (per 250 g) Vit. A 500000 IU, Vit D_3, 100000 IU, Vit. E 75 mg, Vit. B, 200 mg, Vit. B_{12} 600 mg, Vit. K 100 g, Nicotinamide 1 g, choline chloride 15 g, Calcium pantothenate 300 mg, mixed at the rate of 250 g per metric ton.

Table 2. Estimated chemical composition of concentrate mixture (CM-I and CM-II), urea treated and untreated grass (% DM basis)

Particulars	CM-I	CM-II	4% urea treated grass	Untreated grass
DM (%)	91.79	91.65	88.00	94.00
CP (N×6.25)	19.84	20.16	8.89	3.96
EE (%)	2.92	3.31	1.05	1.03
CF (%)	8.96	11.29	28.71	29.43
NFE (%)	64.17	60.15	49.27	54.34
Total Ash (%)	4.11	4.73	12.08	11.19
NDF (%)	-	-	46.70	44.87
ADF (%)	-	-	69.91	68.13

records of feed offered and residue left were maintained and fortnightly body weights of calves were recorded through out the experimental period of 75 days. Feed, fodder and fecal samples were analysed as per AOAC (1985).

A conventional digestion trial was conducted during the last week of the feeding experiment. Jugular blood samples were collected from each calf before feeding and at 3 and 6 hours after feeding for 3 consecutive days for the determination of blood urea nitrogen (BUN) as per Wybenga et al. (1971). The data were analysed statistically by using Completely Randomized Design (CRD) as per Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

The increase of crude protein (N×6.25) content of 4% urea treated grass from 3.96% to 8.89% is evident from the chemical composition (table 2), whereas NFE and CF contents were decreased with the increased protein content. This is in line with Kumar et al. (1988) and Vinodkumar and Walli (1984).

Significant ($p<0.01$) differences in dry matter intake (table 3) by the experimental calves in T_2 as compared to those in control T_1 group were observed. This might be due to higher UDP level in the concentrate mixture II, which is in agreement with Hosmani and Srivastava (1989) and Vinodkumar and Walli (1994). However, the difference in dry matter intake per kg metabolic body weight ($W^{0.75}$) was statistically non significant, as Vinodkumar and Walli (1994) also observed.

It is seen that the calves offered urea treated grass with concentrate mixture II with a UDP level of 45% recorded total gain of 28.7 kg as compared to 18.33 kg by those in control group (table 3). The difference in body weight changes was significant ($p<0.01$). Similarly, significantly ($p<0.01$) higher average daily gain in weight was observed in T_2 (382 g) as compared to T_1 (244 g). Dhumal (1987) reported 294 and 234 g/d average gain in body weight in Red kandhari calves of 12 and 18 months age respectively under standard managemental and feeding practices. Since both the rations (CM-I and CM-II) were iso-caloric and iso-nitrogenous the better performance of calves fed CM-II with urea treated grass can be attributed to higher level of UDP/bypass protein content and thereby better post ruminal availability of amino acids.

The efficiency of feed utilization (kg DM/kg gain in body) weight was significantly ($p<0.01$) superior (6.06) in calves fed experimental rations as compared to those fed control ration (8.42) indicating better availability and utilization of nutrients from urea treated grass and CM II with higher UDP/bypass protein level. Similar findings are reported by Bedi and Vijjan (1978), Sampath et al. (1986) and Sampath et al. (1995). However, Vinodkumar and Walli (1994) recored higher growth rate of 537 g/d in crossbred calves.

The digestibility coefficients for all the proximate principles in T_2 were significantly ($p<0.01$) higher as compared to T_1. However, NDF and ADF digestibilities were not significantly different. Those findings are in close agreement with Dutta et al. (1995), Prasad et al. (1995), Shinde et al. (1995), Pachauri and Mojumdar (1995).

The nutritive value, DCP and TDN determined for

Table 3. Performance Crossbred calves offered control (T_1) and experimental (T_2) ration

Particulars	Control (T_1)	Experimental (T_2)
No. of calves selected	6	6
Initial body weight (kg)	80.5 ± 3.90	77.5 ± 4.08
Final body weight (kg)	98.3 ± 3.96	106.2 ± 3.96
Total gain in body weight (kg)	18.3^a ± 1.98	28.7^b ± 2.68
Daily gain in body weight (g)	244.4^a ± 26.52	382^b ± 36.00
Total dry matter intake (kg)	146.9^a ± 4.30	166.9^b ± 3.12
Dry matter intake per day (kg)	1.94^a ± 0.05	2.22^b ± 0.04
Dry matter intake per 100 kg body weight (kg)	1.90^a ± 0.05	2.35^b ± 0.87
Dry matter intake/$W^{0.75}$ kg (g)	62.69 ± 2.98	67.58 ± 2.60
Feed efficiency kg DM/kg gain in weight	8.42^a ± 0.93	6.06^b ± 0.52
Cost of feed per kg gain in body weight (Rs.)	28.22	21.14

Means bearing a and b superscript in columns differ significantly ($p<0.01$).

Table 4. Estimated nutrient digestibility in calves fed control and experimental rations (concentrate plus grass) with their nutritive value

Particulars	Control ration (T_1)	Experimental ration (T_2)
DM**	59.60±2.42	68.78±1.75
OM**	57.50±1.75	67.80±2.08
CP**	53.00±1.11	59.83±1.39
EE**	65.04±0.53	71.41±1.93
CF**	45.82±0.88	49.93±1.19
NFE*	48.48±2.00	53.19±1.60
NDF	52.48±0.69	56.37±0.98
ADF	55.73±1.25	57.81±0.93
Nutritive value		
DCP**	7.32±0.12	9.39±0.02
TDN**	47.34±1.24	52.40±1.15

** $p<0.01$, * $p<0.05$.

experimental ration T_2 was significantly ($p<0.01$) higher than control ration T_1, the values being 7.32 and 47.34 and 9.39 and 52.40% respectively. The higher crude protein content and significantly ($p<0.01$) higher digestibility coefficient of crude protein in experimental ration T_2 led to higher DCP content. The total digestible nutrient content of an experimental ration reflects the significantly higher digestible coefficient of all the nutrients in that group.

Blood urea nitrogen (BUN) concentration (mg %) estimated at 0, 3 and 6 h interval after feeding was found to be 38.90, 42.63 and 40.63, respectively in control (T_1) and 28.5, 33.16 and 32.03 in experimental group (T_2) in that order. The differences were statistically significant ($p<0.01$) at all intervals. Significantly lower ($p<0.01$) concentration of BUN at all intervals in experimental group (T_2) as compared to control group (T_1) indicated that the lower concentration of BUN can be maintained by feeding urea treated grass, if the ration contains a higher level (45%) of UDP/bypass protein. This might be due to the slow release of ammonia in the rumen from slowly degradable and naturally protected protein sources, thereby resulting in better protein utilization for microbial protein synthesis in the experimental group (T_2). The present findings are in close agreement with Abe et al. (1991), Pachauri and Mujumdar (1995) and Gupta et al. (1995) who reported significantly lower ($p<0.05$) BUN values in animals fed urea treated roughage and concentrate mixture containing formaldehyde treated oil cakes.

Overall results indicated that significantly higher ($p<0.01$) intake of all nutrients with their superior digestibility led to higher nutritive value of ration offered to experimental group (T_2) resulted in significantly higher growth rate as compared to control (T_1). The growth studies revealed that on urea treated grass based diet with concentrate mixture containing 20% crude protein and 70% TDN, a UDP level of 45% may be considered optimum for higher growth and better economic efficiency in Red Kandhari calves. The results of the studies thus emphasize the need for expressing UDP/bypass protein level and for in addition to total protein in concentrate mixture expressing the protein requirements of growing calves, particularly in their early stage of growth.

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