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Response of growing buffalo calves to various energy and protein concentrations

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ABSTRACT

The current study was planned to examine the response of altered dietary protein and energy concentrations on nutrients utilization, nitrogen metabolism and weight gain in growing male *Nili Ravi* buffalo calves to know optimum protein and energy requirements in comparison with those documented by the Nutrient Requirement for Cattle (NRC) for calves. Thirty six calves of 6–7 months of age weighing (77±05 kg) were divided into 6 groups, six animals in each group, according to 3×2 factorial arrangements of treatments. Six experimental diets were formulated containing three levels of crude protein (CP; 11.85, 14.20 and 16.50%) each with two levels of metabolizable energy (ME; 1.86 and 2.23 Mcal/kg). The animals were fed individually *ad libitum* for 100 days; the first 10 days was the dietary adaptation period while the last 10 days of each of the remaining month served as the collection period. Daily feed consumption in calves fed all the experimental diets remained unaltered. However, the intake of fiber fractions was significant ($p<0.05$) among treatment groups. The digestibility of dry matter (DM) was significant ($p<0.05$) while neutral detergent fiber (NDF) and CP digestibilities were similar among treatment groups. However, the intake of DM, CP, ME and fiber fractions indicated significant ($p<0.05$) difference among treatment means with respect to protein levels. On the other hand, the intake of ME and fiber fractions was significant ($p<0.05$) with respect to ME levels of the diets. Similarly, digestibilities of DM and fiber fraction also showed significant ($p<0.05$) difference among treatment means. Weight gain, and feed conversion efficiency of buffalo calves didn't show any treatment effect. The findings of the present study suggested 14.20% and 2.24 Mcal/kg ME as optimum CP and energy requirements for growing male buffalo calves with less than 1 year of age.

1. Introduction

Reduced weight gain in growing buffalo calves is usually attributed to poor or imbalanced nutrition because of farmer's adherence to traditional feeding system. In this system, animals are predominantly raised under grazing system or available seasonal fodder where growth is compromised due to poor quality pasture characterized by low energy, nitrogen and high fiber contents (Sarwar et al., 2002). Contrary to this, feeding system or nutritional programme based on scientific basis in ruminants not only eliminates the hazards associated with excess or deficiency of any nutrient, particularly protein and energy, but also ensures maximum rumen microbial proliferation and fermentation activities which intern optimizes energy production and post ruminal amino acid supply. Both these significantly contribute towards growth biosynthetic activities. Coupling of carbon (energy) and nitrogen (protein) units at ruminal level actually ensures the sustainable availability of structural components at ruminal level, required by the microbes for their body formation during multiplication (Sarwar et al., 1996).

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The above state of affairs narrates feeding dietary protein and energy as one of the most important factors which governs ruminant animal productivity. Inadequate supply of either of these primary nutrients leads to inefficient utilization of nutrients and thereby reduced productivity (Preston, 1966; Oldham, 1984). Lammers and Heinrichs (2000) also reported that balancing CP and ME optimized the nutrient utilization and growth of prepubertal heifers. Baruah et al. (1988) observed unaltered growth rate in growing buffalo calves when dietary CP was only 75% of the recommended CP concentration by NRC (1989). Furthermore, Sengar et al. (1985) and Baruah et al. (1988) reported that male buffalo calves had lower CP requirements than those advised by NRC (1976). However, Sengar et al. (1985) reported that the ME requirement of buffalo male calves is the same as suggested by NRC (1976) for exotic calves.

Feeding growing calves according to their protein and energy needs offers a practical nutritional tool to enhance profitability of this enterprise, However, inconsistent and controversial outcome by the above sated scanty studies necessitates executing a well planned study to know optimum CP and ME needs for growing male buffalo calves. Sufficient scientific literature regarding CP and energy requirements of growing exotic calves is available, however, CP and energy requirements of exotic cattle established in temperate countries cannot be applied directly to buffalo reared in tropical countries because of differences in their physiology and feeding regimens. Furthermore, the relative optimum CP and energy requirements also depend on feeding system, rumen ecology, animal productivity, efficiency of nutrient utilization, breed and species etc. Keeping in view the limited and unauthentic scientific information regarding the energy and protein requirements of male growing buffalo calves, the present study was designed to examine the influence of altering CP and ME concentrations on nutrient utilization, nitrogen metabolism and growth performance of *Nili Ravi* calves to know the optimum CP and energy requirements.

2. Materials and methods

2.1. Animals, diets and management

Thirty six male buffalo calves of similar age (180 ± 10 days) and body weight (77 ± 05 kg) were fed six plans of nutrition with three levels of CP (11.85, 14.22 and 16.50%) each with two levels of ME (1.86 and 2.23 Mcal/kg) in a 3 × 2 factorial arrangement of treatments. The experimental diets low protein–low energy, low protein–high energy, medium protein–low energy, medium protein–high energy, high protein–low energy, and high protein–high energy were denoted as LPLE (11.85% CP and 1.86 Mcal/kg ME), LPHE (11.85% CP and 2.23 Mcal/kg ME), MPLE (14.22% CP and 1.86 Mcal/kg ME), MPHE (14.22% CP and 2.23 Mcal/kg ME), HPLE (16.50% CP and 1.86 Mcal/kg ME), and HPHE (16.50% CP and 2.23 Mcal/kg ME), respectively.

The animals were randomly allotted to experimental diets. The ingredients and chemical composition of experimental diets are shown in Table 1. Diets were mixed daily and fed twice a day *ad libitum*. Feed intake was recorded daily and their representative samples were taken for chemical analysis. Calves were housed on concrete-floor in separate

Table 1
Ingredients and chemical composition (%) of experimental diets.

	Experimental diets					
	LPLE	LPHE	MPLE	MPHE	HPLE	HPHE
Ingredients						
Berseem fodder	10.5	10.5	10.5	10.5	10.5	10.5
Maize fodder	24.5	24.5	24.5	24.5	24.5	24.5
Maize broken	3.25	39.00	1.95	33.80	1.95	30.55
Wheat bran	14.95	0.00	10.40	0.00	10.53	0.00
Maize bran	25.35	1.30	25.35	0.00	19.50	0.00
Maize oil cake	2.93	0.00	2.93	0.00	2.93	0.00
Cotton seed meal	2.60	0.00	2.60	0.00	3.90	0.00
Maize gluten meal 30%	0.33	8.45	0.00	10.4	0.00	13.0
Maize gluten meal 60%	0.98	0.00	4.55	1.30	6.37	6.18
Sunflower meal	4.55	1.30	4.55	1.30	4.55	0.00
Canola meal	0.66	2.60	1.63	2.60	1.63	0.98
Soybean meal	0.33	3.25	1.95	6.50	4.55	6.50
Vegetable oil	0.00	1.30	0.00	1.30	0.00	1.30
Cane molasses	7.80	6.50	7.80	6.50	7.80	5.20
Mineral mix	1.00	1.00	1.00	1.00	1.00	1.00
DCP pliner	0.29	0.29	0.29	0.29	0.29	0.29
Total	100.0	100.0	100.0	100.0	100.0	100.0
Chemical composition						
Dry matter	64.10	64.20	64.18	64.25	64.18	64.53
Crude protein	11.85	11.89	14.22	14.20	16.55	16.51
Metabolizable energy, Mcal/kg	1.86	2.23	1.87	2.24	1.86	2.23
Neutral detergent fiber	26.91	13.30	26.34	13.79	25.10	14.86
Acid detergent fiber	12.01	6.88	11.88	7.14	11.69	6.95
Acid detergent lignin	2.60	1.58	2.59	1.58	2.59	1.42
Total ash	6.73	6.86	6.68	6.79	6.69	6.52

LPLE, LPHE, MPLE, MPHE, HPLE and HPHE stand for low protein–low energy, low protein–high energy, medium protein–low energy, medium protein–high energy, high protein–low energy and high protein–high energy, respectively.