IMPACT OF CONCENTRATES WITH VARYING LEVEL OF METABOLIZEABLE ENERGY AND CRUDE PROTEIN ON GROWTH RATE AND NUTRIENT DIGESTIBILITIY IN MALE BUFFALO GROWING CALVES

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ABSTRACT: Twenty buffalo male calves of Nili Ravi breed with 10-12 months of age and 100± 10 kg of weight were enrolled in this research to see the effect of different levels of crude protein (CP) and metabolizable energy (ME) on dry matter intake (DMI), growth rate and digestibility of nutrients in male buffalo calves. Four experimental rations A, B, C and D were prepared with two levels of CP i.e. 16.0 and 18.0% along with two varying levels of ME i.e. 2.82 & 2.94 Mcal/kg. The animals were individually fed with ad libitum feeding. Buffalo calves who had consumed B&D diets containing 2.94 Mcal/ had higher feed intake (DM basis) kilogram/day and weight gain but the difference was non significant statistically($P>0.05$) among all the treatment groups. However, feed conversion efficiency was significantly different ($P<0.05$) among the treatments and was better in calves who had consumed diets A &C comprising 2.82 Mcal/kg).DMI digestibility were significantly ($P<0.05$) higher in the animals fed on diet having high levels of energy other than low energy level while digestibility of CP was significant ($P<0.05$) among the different groups however and NDF digestibility was almost same in all groups showing non significant difference ($P<0.05$).It was concluded that Nili Ravi male buffalo calves require more metabolizable energy than beef cattle as endorsed by NRC (2001).

Key words: Buffalo calves, growth rate, crude protein levels, metabolizable energy, Dry matter

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INTRODUCTION

Livestock production is an essential part of agricultural system in the under developed countries and it plays a vibrant role in employment generation and source of quality food to the common people. Pakistan has about 27 million buffaloes. Out of which about 30% is the young stock of below three years of age (Anonymous, 2007). Under Pakistan rural conditions, young calves are often neglected and are given low quality feed. As a result these calves have poor growth, late maturity and low performance. This may lead to the uneconomical livestock production and an expensive enterprise in Pakistan.

. Buffalo is considered to be a species which has good potential for beef production especially in India, Pakistan, China, Bangladesh and Thailand etc. (Shahzad *et al*. 2011). It is a better converter of low quality roughages (high NDF) and can produce more valuable products such as meat and milk by consuming these roughages (Tipu *et al*. 2021). The majority of buffaloes are raised by small farmers. For the efficient utilization of dietary nutrients and also for the exploitation of full genetic potential of an animal, the nutrients required by the animal must be present in optimum and balanced quantities (Paul and Lal 2010).

Much of the information used in feeding and management of buffaloes was derived from research data (Ibrahim *et al*., 2001). It was desired that multiple studies should be conducted to testify the NRC feeding standards in male buffalo calves as well as other nutritional aspects to shift the trend of meat marketing toward production of quality beef in the country. A study was conducted on buffalo growing calves to test the actual requirement of CP & ME and maximum growth rate was attained at CP 12% and ME 2.16 Mcal/kg of feed (Tipu *et al*., 2012). While present study is designed to test the efficiency of ration in buffalo calves proposed by NRC (NRC, 2001) and higher levels under our environmental condition and digestibility of nutrient.

MATERIAL AND METHODS

The study was carried out at Buffalo Research Institute Pattoki. Twenty buffalo male calves of similar age (above 10 months) and weight (100 ± 10 kg) were fed from experimental diets with two levels each of Crude Protein and metablizable energy (Medium 100%

and high 120% of NRC (NRC, 2001) (nutrient requirements for Holstein Friesian calves) in completely randomized design (CRD). Four treatment combinations were formulated medium protein-medium energy (A), medium protein-high energy (B), high protein-medium energy (C) and high protein-high energy (D). The ingredients and chemical composition of experimental rations is given in table I. The calves were given ad libitum feed and orts were collected and weighed daily. Two kg of green fodder according to availability were offered to each animal as a part of feed to enhance the microflora development to meet the unidentified factors and 1 kg wheat straw to rumen fill and to ensure the NDF and ADF matters in feed were offered to every animal. Ten days adoption period was given to make the animals habitual to new regime and microflora adjustment. The animals were weighed initially and fortnightly thereafter. During these days all animals were dewormed to eradicate the worm infestation with suitable dewormer. Vaccination against Foot & Mouth disease and Hemorrhagic Septicemia was done to all the animals in the beginning of trial. All animals were tide separately with nylon string and individual feeding was practiced. The weighed quantity of feed was offered in the morning and ort was also recorded next day to calculate DMI. The feed and refusal samples were tested for dry matter (DM) and CP contents by the methods of (AOAC, 1990).At the end, three days digestibility trial was conducted, in which fecal grabs samples were collected from the rectum of animals manually after every three hours of twenty four hours between am and pm (8 times). (DM) and CP contents by the methods of (AOAC, 1990).

Statistical Analysis: Data was analyzed by using GLM procedure of SAS through completely randomized design with factorial arrangement for levels of protein and ME using SAS, 1988.The significant treatments were alienated by least significant difference (LSD) test (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Nutrient Intake: Nutrient intake (DM and fiber components) in this research showed a non-significant ($p<0.05$) difference among all diets groups (table 2).

Buffalo calves consumed more feed ($P<0.05$) containing higher energy levels. A correlation was seen among nutrients intake, energy & protein levels of rations. This was because of availability of better quality Neutral Detergent Fiber & Acid Detergent Fiber in ration. Results revealed that these values improved ($P<0.05$) with the increase in levels of metabolizable energy in the ration of experimental animals. Mahmoudzadeh *et al*. (2007) pointed out that there were no responses of protein levels on dry matter intake when compared with the energy concentration. Increased in energy increased the feed intake. Pine *et al*. (2009) had the same results in their experiment on beef heifer taking two different levels of protein. Our study is in agreement with Tauqir *et al*. (2011) who performed a research experiment to find out feed intake in young 6 - 7 month age buffalo calves having different feed formulation. They noticed that feed intake remained unaffected by buffalo calves having low (11.85%) and medium (14.2%) crude protein regime. It was concluded that calves consumed high energy feed (2.23 Mcal/kg) more as compare to low energy feed (1.86 Mcal/kg). Moreover, same type of results on DMI was also shown by Singh *et al*. (2009) in Bahawalpuri breed of buffalo. Mahmoudzadeh and Fazaeli 2009 observed no significant difference in DMI with altered energy levels among one year old male buffalo calves. In our study the intake of protein was affected by both protein and energy levels which suggested that protein utilization was effected by energy intake. Tatsapong (2009), in swamp buffalo and Basra *et al*. (2003), reported the highest CP intake in groups fed on high levels of protein and energy and lowest on low levels of protein and energy) in Nili Ravi buffalo calves. This study is also in line with Siddiki *et al*. (2021) who pointed out that crude protein intake and energy intake was significantly improved when energy and protein levels were increased in feed of buffalo calves.

Nutrient Digestibility: The digestibility of dry matter was more (65 & 66.5%) in buffalo calves which consumed high level energy feed when compared to those having low energy feed (56 & 55.5%). The results were different ($P< 0.05$) significantly across all the experimental groups. The digestibility of crude protein was also different ($P< 0.05$) in all the groups (Table2). Digestible CP consumption was improved ($P<0.05$) with increase in levels of dietary protein. In present study the highest dry matter digestibility was due to low fodder to ration ratio. Knaus *et al* (2002) conducted an experiment in growing steers. They noticed 39.8% to 48% digestibility of NDF when CP was increased from 7.9% to 15.3%. In this experiment, when protein level was changed from 16.0% to 18.0%, the digestibility of neutral detergent fiber was enhanced from 51.00% to 55.00 % respectively. Increase in protein in the feed led to NDF digestion by growing the supply of branched-chain Volatile Fatty Acids as defined by Misra and Thakur (2001). Similarly Tauqir *et al*. (2011) stated that digestibility of Dry matter (DM) was significant and NDF & CP digestibility was non-significant among all the groups .Our study is also in line with Mehra *et al* (2001) who concluded that increasing levels of protein and energy had no impact on NDF digestion in buffalo calves. This study is also in line with Tauqir *et al*.(2011).According to them, the digestibility of CP was increased with increased levels of CP .The digestibility in our study was significantly ($P<0.05$) better in CP18% as

compared to CP16%.

Growth rate and Feed Conversion Efficiency: The daily weight gain average was; 570,570,610 & 620 gm in groups A, B, C and D respectively) .It was statistically related (P>0.05) (Table-3). However, the animals fed rations containing CP 18.0% with ME 2.94 ME cal/kg resulted in better average daily gain in the present study. While Feed Conversion Efficiency was 7.71, 8.96, 8.06 & 8.18 in groups A, B, C and D respectively among all the treatment groups. Statistically difference was non-significant (P>0.05).Peak performance was noted on low protein and energy diet. These findings are in accordance with Iqbal *et al.* (2018) who had the same results in buffalo heifers on different levels of concentrate. Excess intake of energy negatively affects the feed efficiency. Similar results have been communicated by Sengar and Joshi (1986) and Barush *et al*. (1988). Similarly Hoffman *et al*. (2007) used diets in Holstein heifers containing CP 11.3%, 12.7%, and 14.2% to and found that ADG that was significantly increased 753.6, 871.7, and 835.4 g/day, respectively. However animals consumed feed having CP 18% with 2.82% to 2.94 Mcal/kg ME got more ADG which was also elaborated by Casper *et al*. (1994) and Galber & Heinrichs (2003). On the other hand, Tipu *et al*. (2012) proposed that buffalo calves has protein requirement of 12% and M.E. standard is 2.16Mcal/kg at the age of one year of age. The requirement decreases as age increases. This study is contradictory with Siddiki *et al*. (2021).According to them the final body weight change of buffalo calves was significantly (P>0.05) better on high energy levels. This might be due to environmental or some breed difference.

Table-1. Nutrient and ingredient composition of experimental diets.

Ingredients	**A**	**B**	**C**	**D**
Maize Broken	33.0	32.0	33.0	32.0
Maize Bran	20.0	18.0	20.0	13.0
Rice Polishing	16.0	17.0	12.0	15.0
Cotton Seed Meal	5.0	5.0	5.0	4.50
Maize Gluten Meal 30%	3.0	4.0	3.0	4.0
Maize Gluten Meal 60%	2.0	3.00	3.0	4.0
Canola Meal	5.0	3.00	3.0	7.0
Soybean Meal	0.0	2.00	6.0	3.0
Rapeseed Meal	3.0	1.50	3.0	3.0
Vegetable Oil	1.0	2.50	0.0	2.5
Cane Molasses	10.0	10.0	10.0	10.0
DCP Pliner	1.0	1.0	1.0	1.0
Salt	1.0	1.0	1.0	1.0
Total	**100**	**100.0**	**100.0**	**100.0**
Nutrients, %				
Dry Matter	88.70	88.82	88.47	88.94
Crude Protein	16.02	16.11	18.04	18.03
Metabolizable Energy Mcal/kg	2.84	2.95	2.82	2.94
Neutral Detergent Fiber	22.88	22.29	22.32	21.31
Cellulose	7.18	6.99	7.19	7.00
Hemicellulose	12.81	12.60	12.60	11.51
Ash	9.86	9.28	9.34	9.73

A:CP16%,M.E.2.Mcal/kg.,B:CP16%,M.E.2.9Mcal/kg,C:CP18%,M.E.2.8Mcal/kg,D:CP18%,M.E.2.9 Mcal/kg

Table-2. Nutrients Intake (Kg/Day) in buffalo calves fed different dietary protein and metaboliseable energy.

Parameters	**Group A**	**Group B**	**Group C**	**Group D**
DM intakes DM I	5.73±0.198	5.9±0.21	5.8[a]±0.15	5.95[a]±0.16
Crude Protein Intake	0.66±0.03 [a]	0.69±0.034 [a]	0.68±.027 [a]	0.832±0.029 [b]
M.E intake	0.117±0.006	0.126±0.006	0.107±0.004	0.128±0.005
NDF intake	1.92±0.044	1.96±0.047	1.85±0.034	1.83±0.034
DM Digestibility	56.0±0.068 [a]	65.0±0.014 [b]	55.5±0.024 [a]	66.5±0.027 [b]
CP Digestibility	65.5±0.012 [a]	67.0±0.022 [a]	68.6±0.03 [b]	69.4±0.04[b]
NDF Digestibility	51.24±0.04	53.5±0.033	55.2±0.011	54.5±0.067

GroupA:CP16%,M.E.2.Mcal/kg.GroupB:CP16%,M.E.2.9Mcal/kg.GroupC:CP18%,M.E.2.8Mcal/kg. Group.D:CP18%,M.E.2.9 Mcal/kg

Means within row bearing different superscripts differ significantly

Table-3 Performance (Kg) of buffalo calves fed different experimental rations.

Particulars	Group A	Group B	Group C	Group D
Initial Weight	98	109	102.6	105
Final Weight	161.6	172.8	170.4	174
Total Weight gain	128.8±4.26	140.88±4.66	136.125±5.06	139.55±5.06
Daily Weight Gain	0.57±0.06	0.57±0.06	0.61±0.07	0.62±0.06
Feed Efficiency	7.71±0.55 [a]	8.96±1.16 [b]	8.063±0.93 [a]	8.18±0.96 [a]
Total Growth	63.6	64.0	68.8	69
Growth Rate	0.636±0.51	0.640±0.22	0.688±0.34	0.690±0.55

GroupA:CP16%,M.E.2.Mcal/kg.GroupB:CP16%,M.E.2. 9Mcal/kg.GroupC:CP18%,M.E.2.8Mcal/kg.
Group.D:CP18%,M.E.2.9 Mcal/kg
Means within row bearing different superscripts differ significantly

Conclusions: It was concluded that Nili Ravi breed buffalo male calves require more metabolizable energy than beef cattle as endorsed by NRC (2001).

Conflict of Interest: The author said that there was no conflict of interest.

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