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Effect of protein supplementation on growth performance of Buffalo calves

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Abstract
Twelve growing buffalo calves, weighed about 141 kg, were selected from Livestock Research Center of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, for this experiment. Growing buffalo calves were placed on three dietary treatments i.e. recommended plane of nutrition, improved village practice and grazing treatments. These animals were placed on dietary treatments, in a group of 4 for 6th fort nights. Significantly different body weight gain during 1st, 5th and 6th fortnights and cumulative body weight gain at the end of 5th and 6th fortnights were recorded. The cumulative body weight gain recorded on recommended plane of nutrition, improved village practice and grazing treatments were respectively 26.250±3.734^{a} kg, 38.300±2.572^{b} kg and 31.375±1.785^{ab} kg. The higher weight gain on improved village practice treatment was due to higher amount of barseem included in the diet as to meet the dry matter requirements of the animals. DCP utilization efficiency was better on grazing treatment during 6th fortnight and it was due to restriction in the fodder available for grazing. The most important is feeding cost for gain (Rs/Kg) was significantly and drastically lower on grazing treatment which indicates that waste land, bank of the rivers, road sides and railway track sides can be utilized for grazing for low cost production.

Keywords: feed, growth performance, buffalo calves

Introduction
Protein is the most important constituents of animal diets having vital role in their growth, production, and reproduction. Nutrient requirements recommended by NRC (2001) [15] are widely adopted to formulate diets for ruminant animals around the world. Nevertheless, the nutrient requirement equations presented by NRC were based on cattle (*Bostaurus*). But question arises about the use of these feeding standards to formulate diets for buffalo (*Babulus bubulis*). Buffalo is an important animal species for beef production system in several parts of the world, particularly in tropical and subtropical regions of the globe. Cost-effective production of quality beef and milk from buffalo depends upon accurate information about its own energy and protein requirements. Ludri and Razdan (1980) [9] reported that dietary protein intake level of 40% less than that recommended by NRC (1976) [14] level of crude protein (CP) showed no adverse effect on digestibility of nutrients and a positive nitrogen balance was observed. Baruah *et al*. (1988) [4] studied the feed intake, nutrient utilization and growth in male buffalo calves fed different levels of protein reported that level of energy significantly affected the gain in body weight. They also observed that 75% protein feeding than NRC has no significant effect on growth response. Adaptation to the nutrient requirement standards recommended for cattle by National Research Council (NRC) (2001) [15] for buffalo does not seem wise, unless proved by the research. The present study was conducted to investigate the effect of feeding different levels of protein and energy on growth response of male calves.
As feed supplies to the animals are closely tied to the local cropping pattern, variation in feeding regimes are observed from region to region. In the Northern part of the country, wheat straw (bhusa) is more intensively utilized while paddy straw feeding is common in Eastern and Southern regions and part of the Western region, particularly in coastal areas. Sorghum stovers are fed in the Western regions and in parts of the Southern region. Feeding millet and pulse straw is also observed in certain localities (Badve, 1991) [2].
The use of agro-Industrial by-products, either as individual concentrates or as a part of balanced concentrate mixture, is a widely observed practice all over the country. In places, farmers mix by-products with conventional feed ingredients like brans and oilcakes, sprinkle some water on the mixture and feed animals at the time of milking. Salt or mineral mixture are often added to such feeds. It has been generally observed that concentrates are fed only to lactating animals.

Supplementation of crop residues with fresh grasses and legumes or concentrate feeds, significantly improves feed intake and the performance of animals. Feeding wheat straw with berseem or lucrene is common practices in the Northern region of the country. Supplementation of the basal diet with good quality forage or concentrates helps to overcome the problem of low palatability (Badve, 1991) [2].

Materials and Methods

Twelve young buffalo calves aged about 14 to 24 months were selected from Livestock Research Center, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut. They were divided into three groups on the basis of their body weight, having four calves in each group. The entire animals were kept on grazing for a period of three months and then on similar diet for 2 months before the start of the experiment. The average initial body weights of three groups were 136.400, 141.075 and 147.000 kg and there was no significant difference in group body weight of calves. The growing buffalo calves were housed in a well ventilated and protected shed. The arrangements were made to offer feed separately in the manger during the entire period of the experimentation. Feed steal guards were used to keep the animals separately and provide them sufficient space. Thick polythene sheets were used to cover the sides of the shed to protect the animals during winter (ambient temperature is mentioned in Table 10 for the entire period. The experimental calves were kept under similar condition and the animals on grazing practice treatment were allowed to move out of shed for 7 hours/day in the fields for grazing. They were vaccinated and were given anti-parasitic medicines, to make sure that animals were free from disease and internal parasites.

Table 1: Market price of feed ingredients used in formulation of diets (labour cost was not included).

S. No.	Feed ingredients	Cost Rs./kg.
1	Paddy straw	3.00
2	Wheat straw	3.00
3	Berseem	2.00
4	Maize grain	13.00
5	Mustard oil cake	15.5
6	Mineral mixture (chileted)	100.00
7	Common salt	3.00
8	Urea	6.50
9	Dub grass (cynodondactylon)	0

Table 2: Chemical composition of feeds and fodders on dry matter basis.

S. No.	Ingredients	DM %	CP %	CP* (Table value) %	DCP* (Table value) %	EE %	Ash %	ME Mcal/kg** (Table value)
1	Maize Grain	90.500	10.150	10.600	05.86	04.310	01.800	03.100
2	Mustard oil cake	91.000	35.050	36.370	30.920	07.310	09.200	03.030
3	Barseem	16.910	16.530	15.450	12.510	01.500	20.310	02.080
4	Wheat straw	90.000	03.350	03.260	0.000	01.200	20.100	01.730
5	Rice straw	90.100	03.200	02.400	0.000	01.250	11.100	01.620
6	Cynodondactylon ***	30.815	-	28.200	04.000	01.400	11.800	01.800
7	Urea	-	-	-	-	-	-	-

Table 3: The average ambient temperature, humidity and rainfall during experimentation period.

Fortnights of experimentation	Maximum Temperature (°C)	Minimum Temperature (°C)	Rainfall (mm)	Maximum Relative Humidity %	Minimum Relative Humidity %
1st	16.0	5.0	0	85.0	62.3
2nd	20.9	4.9	0	84.6	36.5
3rd	24.6	8.5	5.8	85.2	48.4
4th	23.0	8.3	9.9	86.8	48.2
5th	26.6	10.82	4.0	87.7	44.33
6th	32.06	15.73	0	83.26	38.2

***Source*:** Project Directorate Farming System Research, Modipuram, Meerut.

Results & Discussion

Growing buffalo calves fed experimental diets showed significant difference in their body weight gains (Table-4). During 1st fortnight, growing buffalo calves fed on recommended plane of nutrition and on improved village practice dietary treatments gained statistically similar body weight. The weight gain recorded on recommended plane of nutrition was 0.566 kg /day and on improved village practice treatment was 0.623 kg/day. The body weight gain recorded on grazing treatment (0.017 kg/day) was significantly lower than the calves fed on recommended plane of nutrition and on improved village practice treatments. The average ambient temperature recorded was 16 ℃ maximum and 5 ℃ minimum. The humidity was 85% maximum and 62.3% minimum. The rainfall was 0 mm during 1st fortnight of experimentation (Table-3). Similar findings were also observed by Kearl, Leonard 1982 [8], Yadav, J. (1986) [23], Garcia-Bojalil, M. *et al.*, (1988) [4] and Malik Raman (1998) [22].

Table 4: Average Body weight gain (kg/day) in growing buffalo calves during different fortnights.

Treatment	1st fortnight mean	2nd fortnight mean	3rd fortnight mean	4th fortnight Mean	5th fortnight mean	6th fortnight mean
Rec	0.566±0.024^{b}	0.198±0.057^{a}	0.193±0.082^{a}	0.390±0.082^{a}	0.201±0.022^{a}	0.210±0.046^{a}
IVP	0.623±0.142^{b}	0.353±0.179^{a}	0.175±0.113^{a}	0.700±0.167^{a}	0.470±0.058^{b}	0.270±0.056^{a}
Gr	0.017±0.102^{a}	0.240±0.057^{a}	0.463±0.068 ^{a}	0.410±0.083^{a}	0.215±0.016^{a}	0.755±0.071^{b}
CD	0.331	N.S.	N.S.	N.S.	0.120	0.189

Growing buffalo calves fed experimental diets showed non-significant difference in body weight gains (Table-4). The weight gain recorded on recommended plane of nutrition was 0.198 kg/day, on improved village practice treatment was 0.168 kg/day and on grazing treatment was 0.240 kg/day. The average ambient temperature recorded was 20.9℃ maximum

and 4.9°C minimum. The humidity was 84.6% maximum and 36.5% minimum. The rainfall was 0 mm during 2nd fortnight of experimentation (Table-3). Growing buffalo calves fed experimental diets showed non significant difference in body weight gains (Table-4). The weight gain recorded on recommended plane of nutrition was 0.193 kg/day, on improved village practice treatment was 0.170 kg/day and on grazing treatment was0.463 kg/day. The average ambient temperature recorded was 24.6°C maximum and 8.5°C minimum. The humidity was 85.2%maximum and 48.4%minimum. The rainfall was 5.8 mm during 3rd fortnight of experimentation (Table-3). Growing buffalo calves fed experimental diets showed non-significant difference in body weight gains (Table-4). The weight gain recorded on recommended plane of nutrition was 0.390 kg/day, on improved village practice treatment was 0.700 kg/day and on grazing treatment was 0.410 kg/day. The average ambient temperature recorded was 23°C maximum and 8.3°C minimum. The humidity was 86.8% maximum and 48.2%minimum. The rainfall was 9.9 mm during 4th fortnight of experimentation (Table-3). These results were also similar to Mishra *et al.*, (1995) [12], Basra *et al.* (2003) [5], Thakur S. S. *et al.*, (2006) [22] and Mahmouddzadeh, H. *et al*. (2007).

During 5th fortnight, growing buffalo calves fed experimental diets showed significant difference in their body weight gains (Table-4). Growing buffalo calves fed on recommended plane of nutrition and grazing treatment gained statistically similar body weight gain. The weight gain recorded on recommended plane of nutrition was 0.201 kg /day and on grazing treatment was 0.210 kg/day. The body weight gain was recorded 0.470 kg/day on improved village practice treatment was significantly higher than the calves fed on recommended plane of nutrition and grazing treatment. The average ambient temperature recorded was 26.6°C maximum and 10.8°C minimum. The humidity was 87.7% maximum and 44.3% minimum. The rainfall was 4 mm during 5th fortnight of experimentation (Table-3). During 6th fortnight, growing buffalo calves fed experimental diets showed significant difference in their body weight gains (Table-4). Growing buffalo calves fed on recommended plane of nutrition and on improved village practice treatments gained statistically similar body weight. The weight gain recorded on recommended plane of nutrition was 0.210 kg /day and on improved village practice treatment was 0.270 kg/day. Highest body weight gain recorded was on grazing 0.755 kg/day. The average ambient temperature recorded was 32°C maximum and 15.7°C minimum. The humidity was 83.2%maximum and 38.2% minimum. The rainfall was 0 mm during 6th fortnight of experimentation (Table-3). Similar findings were also observed by Burque, A.R. *et al.*, (2008) [3], S Singh *et al.*, (2009) [19] and Muhammad *et al.*, (2011) [13].

Table 5: Cumulative body weight gain (kg) in growing buffalo calves at the end of different fortnights.

Treatment	1st fortnight Mean	2nd fortnight mean	3rd fortnight mean	4th fortnight Mean	5th fortnight mean	6th fortnight mean
Rec	8.500±0.363^{b}	10.875±1.644^{b}	14.300±2.192^{a}	20.075±3.144^{a}	23.100±3.299^{a}	26.250±3.734^{a}
IVP	9.350±2.134^{b}	14.650±3.448^{a}	17.300±2.828^{a}	27.000±3.133^{a}	34.050±2.318^{b}	38.300±2.572 ^{b}
Gr	0.115±1.528^{a}	3.850±0.895^{b}	10.800±1.710^{a}	16.950±1.120^{a}	20.050±1.106^{a}	31.375±1.785^{ab}
CD	4.963	7.349	N.S.	N.S.	7.832	9.127

Average cumulative body weight gains recorded at the end of 1st fortnight were significantly different (Table-5). Average body weight gain recorded on recommended plane of nutrition (8.5 kg) and on improved village practice treatment (9.350 kg) were significantly higher than cumulative body weight gain recorded on grazing treatment (0.115 kg). Average cumulative body weight gains recorded at the end of 2nd fortnight were significantly different (Table-5). The average cumulative body weight recorded on recommended plane of nutrition (10.875 kg) and on grazing practice treatment (3.850 kg) were statistically similar and were statistically lower than the weight gain on improved village practice treatment (14.650 kg). Average cumulative body weight gains recorded on all three treatments were statistically similar. The cumulative body weight gain recorded on recommended plane of nutrition was 14.300 kg, on improved village practice treatment was 17.300 kg and on grazing practice treatment was 10.800 kg. Average cumulative body weight gains recorded on all three treatments were statistically similar (Table-5). The cumulative body weight gain recorded on recommended plane of nutrition was 20.075 kg, on improved village practice treatment was 27.000 kg and on grazing practice treatment was 16.950 kg. Average cumulative body weight gains recorded at the end of 5th fortnight were statistically different (Table-5). The body gain recorded on recommended plane of nutrition was 23.100 kg and was statistically similar to the weight gain on grazing treatment (20.050 kg). Cumulative body weight gain recorded on improved village practice treatment (34.050 kg) was statistically higher than other two treatments. Average cumulative body weight gain (kg) at the end of 6th fortnight differ significantly (Table-5). Significantly lower body weight gain was recorded animals fed on recommended plane of nutrition (26.250 kg) but it was statistically similar to the animals when fed on grazing treatment 31.375 kg during 6th fortnight. Body weight gain recorded on improved village practice 38.300 kg was significantly higher but it was statistically similar to the animals fed on grazing treatment. These results were also similar to S G Vahora *et al.,* (2012) [18], D.A. Sadrsaniya *et al.,* (2015) [6], Sultan Singh *et al.*, (2015) [21], Anuradha Kumari *at al.*, (2016) [1] and P K Sharma (2016) [16].

Conclusion

The most important factor in this experiment was cost of body weight gain. Significantly low cost was recorded during all six fortnight on grazing treatment. It reveals that if the animal kept on grazing, the cost of gain can be reduced drastically. Considering the demand and production of feeds and fodders available for live stock in India, grazing is the only alternative, if waste land road sides, railway track sides and bank of the rivers are utilized as a grazing field for ruminants. The small ruminant like sheep and goat, at village level in form of small herds, are still surviving on above fields by grazing.

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