Indian Journal of Animal Sciences **80** (8): 741–744, August 2010

Comparative nutrient utilization and growth performance of Bhadawari and Murrah buffalo calves under grazing

M M DAS[1], SULTAN SINGH[2] and A B MOJUMDAR[3]

Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh 284 003 India

Received: 23 May 2009; Accepted: 2 April 2010

ABSTRACT

Comparative nutrient utilization and growth performance were studied in Bhadawari and Murrah buffalo calves (6 each) under grazing with supplementation of concentrate mixture (1% of body weight) and wheat straw *ad libitum* at stall from July to September. The pasture crude protein content reduced from 6.82% to 5.88% whereas NDF content increased from 69.54% to 72.27% with advancement of maturity of pasture from July to September. Total DMI was comparable in Bhadawari and Murrah buffaloes. DM intake from pasture was also comparable; however, pasture intake as percentage of total DMI was higher in Bhadawari than Murrah buffalo calves. Digestibility of DM, OM and CP were comparable in Bhadawari and Murrah buffalo calves. NDF and ADF digestibility were higher in Bhadawari than Murrah buffaloes though not statistically significant. DCP intake (g/d) was higher (271 vs 225) in July in both the breeds as compared to September (218 vs 197) whereas TDN intake was similar for both the periods. Daily live weight gain (g/d) was significantly higher in Murrah buffalo than Bhadawari buffalo calves. Thus it was concluded that nutrient utilization was similar under grazing with supplementation in both the breeds however, daily live weight gain was higher in Murrah when compared with Bhadawari buffalo calves.

Key words: Buffalo, Grazing, Growth performance, Nutrient utilization, Pasture

Livestock production system in India is dependent on community pasture. Such pastures produce forages that low in quality and are unable to provide a sustained supply of nutrients to animals. Therefore, a supplementation of concentrate in addition to grazing is now being recommended for raising livestock in semi-arid regions of India (Karim *et al.* 2004). Such situations have increased the pressure on supplemental feed resources under tropical animal production system (Shem *et al.* 2001).

Bhadawari breed is found around Agra and Etawah districts of Uttar Pradesh and Bhind and Morena district of Madhya Pradesh. Nutritional requirements of Murrah buffaloes have been studied by various workers (Ranjhan and Pathak 1979, Kurar and Mudgal 1980). However, study on nutrient requirement of Bhadawari buffaloes is very scanty. Therefore the present experiment was conducted to find out the effect of supplemental grazing on comparative nutrient utilization and growth performance of Bhadawari and Murrah buffalo calves.

MATERIALS AND METHODS

Six growing each of Murrah (average bw 178 kg) and Bhadawari (average bw 165 kg) buffalo calves were randomly distributed according to their body weight. The experiment was conducted from July to September. The animals were allowed to graze for 7 h daily from 9 AM to 4 PM in pasture having *H. contotus*, *C. cilliaris*, *Dicanthium annulatum* and *Pennisetum pedicellatum*, *Leucaena leucocephala*. During the experiment, each animal was provided concentrate mixture (mustard cake 35, barley 25, wheat bran 37, mineral mixture 2 and salt 1 kg/100 kg) @ 1% of body weight and wheat straw *ad libitum* at stall about 30 min after grazing. Potable drinking water was made available to all the animals before and after grazing. All the animals dewormed at the start of the experiment, housed in well-ventilated stall. A digestion trial on grazing buffalo calves was conducted in July and September using lignin as an internal marker (Ranjhan 1994). Fortnightly body weight changes of all the animals were recorded.

Botanical composition of the diet: A direct observation and simulation method was used to determine the botanical composition of the diet consumed by the animals. Samples of the ingested species that were being taken by the animals were hand clipped for 3 consecutive days. The individual animals were observed and forage samples were collected for the entire grazing time from 9 AM to 4 PM.

Analysis of samples: Dry matter (DM), ash, ether extract

Present address: [1,2]Senior Scientists (e-mail: mmdas1964 @rediffmail.com), [3]Principal Scientist, Division of Animal–Plant relationship.

of various samples were determined according to AOAC (1995). The trial samples were analyzed for neutral detergent fiber (NDF), acid detergent fiber (ADF) and lignin (Goering and Van Soest 1970). Total nitrogen was determined by microkjeldhal method (AOAC 1995). Data obtained were statistically analyzed using t test (Snedecor and Cochran 1989).

RESULTS AND DISCUSSIONS

The crude protein content in the supplement (concentrate) was optimum to meet the growth requirements of buffalo calves. The samples that were collected during July and September reflected that the CP content reduced by13.66% whereas NDF content increased by 3.92% (Table 2). The CP content of pasture was similar as reported by Raghuvanshi *et al*. (2007). The chemical composition of pasture is influenced by season, type of soil, stocking density, type grazing pasture and climate (Shinde *et al.* 1996, Tripathi *et al.* 2001). The concentrate supplement was formulated to provide adequate protein nutrition thus had higher CP (17.86%) and lower fiber fractions.

Nutrient intake and digestibility: The forages that were selected by buffaloes under the trial primarily consisted of *H. contortus, C. cilliaris, Dicanthium annulatum, Pennisetum* and *Leucaena leucocephala*. The data on dry matter intake of grazing buffaloes during digestion trial indicated that daily DM intake (kg/100 kg body weight) in Murrah and Bhadawari was similar (Tables 2, 3) however, higher DM intake was reported in Bhadawari buffalo calves than Murrah under stall feeding condition (Das *et al.* 2007). The DM intake values in Murrah buffaloes are in well agreement with earlier report of Kumar *et al.* (2004). In the present study, pasture DM intake was comparable in both the breeds and pasture dry matter intake decreased by 37.61% in Murrah and 25.60% in Bhadawari from July to September which might be due to increase in NDF and lignin content and decrease in CP content of pasture (Kolver and Muller 1998). Pasture intake depends upon digestibility of pasture, rumen fill, metabolic factors, chemical and physical properties of concentrate and stage of growth. Pasture intake as percentage of body weight ranged from 1.17% to 0.78% in Murrah and 1.25% to 0.93% in Bhadawari and similarly Singh *et al*. (2004) reported that the grazing buffaloes meet 0.4 to 1.0% of their dry matter requirement from grazing biomass in September, October and November. However, contrary to the present findings, Kolver and Muller (1998) recorded higher DM intake in animals grazing in good quality pasture without supplementation. The pasture intake as percentage of total DMI was significantly ($P<0.05$) higher in Bhadawari buffaloes than Murrah buffalo calves indicating that Bhadawari buffaloes are more suitable for grazing. The pasture intake out of the total DM intake in the present study ranges from 32 to 50% which might be due to concentrate

Table 1. Chemical composition of wheat straw, pasture and concentrate on DM basis

Name of feed/forage	OM	NDF	CP	ADF	Lignin	EE
Trial 1(July)						
Wheat straw	89.77	73.89	3.66	51.14	6.26	1.56
Pasture	90.44	69.54	6.82	43.47	5.36	2.32
Concentrate	90.54	34.23	17.86	13.83	2.80	4.89
Trial 2 (September)						
Wheat straw	90.45	73.43	3.66	51.14	6.26	1.56
Pasture	91.78	72.27	5.88	43.90	6.68	2.27
Concentrate	88.96	33.27	18.10	13.83	2.86	4.78

Table 2. Comparative intake and digestibility of nutrients in Murrah and Bhadwari buffalo calves (Trial 1)

Particulars	Murrah	Bhadawari	't' value
Body weight (kg)	177.8±15.87	164.8±17.84	–
DMI (kg)	4.645±0.28	4.122±0.29	1.49
Pasture intake (kg/d)	2.081±0.35	2.051±0.26	0.52
Pasture intake % of DMI	44.82^{a}±2.47	49.78^{b}±2.31	1.94
DMI/100 kg b.wt	2.65±0.10	2.56±0.12	0.60
OMI/100 kg b.wt	2.39±0.16	2.31±0.11	0.64
Digestibility coefficient (%)			
DM	57.18±1.13	57.29±0.31	1.12
OM	59.79±1.06	60.74±1.09	1.15
CP	54.50±1.26	53.31±1.12	0.22
EE	61.79±1.57	61.53±1.21	0.58
NDF	51.01±0.97	53.57±0.67	2.19
ADF	49.12± 1.45	52.21±0.54	0.35
NFE	59.68±0.82	61.57±0.32	1.10
DOMI (kg/100 kg b.wt)	1.43± 0.21	1.16±0.32	0.72
DCP intake (g/d)	271 ± 0. 15	225±0. 20	0.76
DCP intake (g/100 kg b.wt)	155±0.22	113±0.31	0.12
N intake (g/kg DOMI)	31.76± 0.36	29.77±0.40	0.24
TDN intake kg/d	2.629±0.32	2.363±0.24	1.23
Nutritive value (%)			
DCP	5.85±0.22	5.53±0.65	0.28
TDN	56.56±0. 79	57.31±0. 32	1.23

Means bearing different superscript in a row differ significantly ($P<0.05$).

Table 3. Comparative growth performance, intake and digestibility of nutrients in Murrah and Bhadawari buffalo calves (Trial 2)

Particulars	Murrah	Bhadawari	't' value
Body weight (kg)	205±15.85	183±19.38	–
DMI (kg)	4.89±0.23	4.24±0.37	1.05
Pasture intake (kg/d)	1.612±0.12	1.703±0.14	0.52
Pasture intake (%of DMI)	32.92±2.96	40.00±2.34	1.94
DMI (kg)/100 kg b.wt	2.42±0.09	2.35±0.05	0.18
OMI (kg)/100 kg b.wt	2.154±0.12	2.095±0.16	0.16
Digestibility coefficient (%)			
DM	52.46±. 82	53.47±0.49	1.22
OM	55.53±0.56	56.36±0.45	1.28
CP	44.96±1.24	45.37±1.36	0.73
EE	54.38±2.60	56.16±1.68	0.14
NDF	43.63±0.70	45.39±0.37	1.75
ADF	42.58±0.69	43.03±1.08	1.37
NFE	55.10±1.12	56.89±1.16	1.36
DCP intake (g/d)	218±14.13	197±22.30	1.08
DCP intake (%BW)	106±4.83	108±2.24	1.12
N intake g/kg DOMI	36.91±1.12	36.93±1.06	1.17
TDN intake (kg/d)	2.56±0. 13	2.26±0.20	1.51
Nutritive value (%)			
DCP	4.44±0. 13	4.58±0. 48	0.47
TDN	52.24±0. 58	53.17±0. 47	1.04
Initial B.W. (kg)	166.33±15.0	153.33±18.7	–
Final B.W (kg)	217.5±16.72	194.0±19.9	–
Gain (kg)	51.17^{b}±3.72	40.67^{a}±1.87	2.52
Average daily gain (g/d)	568.5^{b}±41.3	451.70^{a}±20.8	2.52

Means bearing different superscript in a row differ significantly (P<0.05).

supplementation. Bargo *et al*. (2003) observed that concentrate supplementation decreased pasture intake and substitution rate was 0.55 kg/kg concentrate. Organic matter intake/100 kg body weight was also similar in both the breeds (Singh *et al*. 2004). NDF intake as percentage of body weight in both the breeds (1.34% to 1.5%) was similar to earlier report of Kolver and Muller (1998). DM, OM and CP digestibility were comparable in both the breeds and similar to earlier report of Gupta (1988). The digestibility of NDF and ADF were higher in Bhadawari buffaloes than Murrah buffaloes though not statistically significant and corroborated the earlier report of Das *et al.* (2007), however, better nutrient digestibility was recorded in Bhadawari buffaloes than Murrah buffaloes (Singh *et al.* 2004). DCP intake (g/100 kg body weight) in Murrah buffaloes was relatively higher than Bhadawari buffaloes and the values are in close association with the suggested values of Anonymous 1998. DCP intake (g/d) was higher (271 vs 225) in July in both the breeds as compared to September (218 vs 197), which might be due to decreased in protein content of pasture. N intake (g) per kg DOM intake was 31.76 in Murrah and 29.77 in Bhadawari buffaloes indicated that for efficient utilization of energy by the rumen microbes and its optimum growth, the N intake was sufficient. TDN intake was similar in both the breeds and sufficient for achieving a live weight gain of 500 g daily (Anonymous 1998). Nutritive value in terms of DCP and TDN content were comparable in both the breeds. Total weight gain after 3 months of grazing was significantly (P<0.05) higher in Murrah than Bhadawari buffaloes (Table 3). Similarly daily live weight gain was also higher in Murrah Buffaloes (569 g/d) than Bhadawari buffalo (452 g/d) calves however, comparable growth performance was recorded earlier in both the breeds fed milk from their mother using traditional calf on foot up to 3 months of age (Das *et al.* 2007). The growth rate recorded in current study in Murrah buffalo calves was comparable to that reported by Tahir *et al.* (1989) who noted a 520 g growth rate per day but higher than that recorded by Afzal *et al.* (2009) in buffaloes on open grazing.

Thus it can be concluded that nutrient utilization was similar although the pasture intake by Bhadawari buffalo is higher than Murrah under grazing with supplementation however, daily live weight gain was higher in Murrah buffaloes than Bhadawari buffalo calves.

REFERENCES

Afzal M, Anwar M, Mirza M A and Andrabi S M. 2009. Comparison of growth rate of male buffalo calves under open grazing and small feeding system. *Pakistan Journal of Nutrition* **8**: 187–88.

Anonymous 1998. *Nutrient Requirement of Livestock and Poultry*. Indian Council of Agricultural Research, New Delhi.

AOAC.1990. *Official Methods of Analysis*. 14th edn. Association of Analytical Chemists. Washington D C.

Bargo F, Muller L D, Kolver E S and Delahoy J E. 2003. Invited Review: Production and Digestion of supplemented dairy or pasture. *Journal of Dairy Science* **86**: 1–42.

Das M M, Singh S and Mojumdar A B. 2007. Comparative nutrient utilization and growth performance of Bhadawari and Murrah buffalo calves under traditional rearing system. *Range Management and Agroforestry* **28**: 218.

Goering H K and Van Soest P J. 1970. *Forage Fiber Analysis. Agricultural HandBook No. 379*, Agricultural Research Services, USDA, Washington, D.C.

Gupta B N. 1988. Buffalo as an efficient converter of course roughages. *Buffalo Production and Health*. ICAR, New Delhi. Pp.120–29.

Karim S A, Santra A and Singh V K.2004. *Lamb Feeding for Mutton Production*. Central Sheep and Wool Research Institute, Avikanager, India.

Kolver E S and Muller L D. 1998. Performance and nutrient intake of high producing Holstein cows consuming pasture or a total mixed ration. *Journal of Dairy Science* **1**: 1403–11.

Kurar C K and Mudgal V D. 1980. Maintenance requirement of Murrah buffaloes in early stage of lactation. *Indian Journal of Dairy Science* **33**: 443–49.

Raghuvanshi S K S, Prasad R, Triphathi M K, Mishra A S, Chaturvedi O H, Misra A K, Saraswat B L and Jacjmola R C. 2007. Effect of complete feed blocks or grazing and supplementation of lambs on performance, nutrient utilization,

rumen fermentation and rumen microbial enzyme. *Animal* **1**: 221–26.

Ranjhan S K. 1994. *Animal Nutrition in the Tropics*.4 th edn, pp.41–45.Vikash Publishing House Ltd., New Delhi.

Ranjhan S K and N N Pathak. 1979. *Management and Feeding of Buffaloes*. 1st edn. Vikas Publication House Pvt. Ltd., New Delhi.

Shem M N, Karnani A M, Mmtengeti E J and Stsyina R. 2001. Performance of grazing dairy cattle in semiarid area of western Tanzania and the marginal productivity of *Leuceana lencocephala* leaf meal supplement. *Agroforesty System Research* **52**: 73–82.

Shinde A K, Karim S A, Sankhyan S K and Bhatta R.1998. Seasonal charges in Biomass growth and quality and its utilization by sheep on semi-arid cenchrus ciliaris Pasture of India. *Small Ruminants Research* **30**: 29–35.

Snedecor G W and W G Cochran. 1989. *Statistical Methods*. 7th edn. Oxford and I.B.H publishing Co., Kolkata.

Singh S, Kundu S S, Misra A K and Sachan, C B. 2004. Nutritional Studies on Bhadawari Buffalo. *Buffalo Production Under Different Climatic Regions.* (Eds) Kundu S S, Misra A K and Pathak P K. International Book Distributing Co, Lucknow.

Tahir M S, Rehman S and Javed S. 1989. Economics of felinity of male buffalo calves fed on Sudan Sorghum hybrid. *Pakistan Veterinary Journal*. **9**: 146–47.

Tripathi M K, Mishra A K and Karim S A. 2001.Soil estimates (pH, N and OM), biomass yield and chemical composition of vegetation of comminuting range land in semi-arid region of Rajasthan. *India Journal of Animal Sciences* **71**: 285–86.