



Effect of different altitudes on growth performance and nutrient utilization in mithun calves

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Received: 1 May 2013; Accepted: 28 August 2013

Key words: Altitude, Growth rate, Mithun, Nutrient utilization

Mithun (*Bos frontalis*) the cattle of mountain, probably originated more than 8000 years ago is considered to be domesticated from wild gaur (Simoons *et al.* 1984). The mithun and gaur were considered to be different species earlier; however, at present taxonomically mithuns and gaur are grouped into the same species *Bos frontalis*. Mithun refers to be the domesticated form (Wilson *et al.* 1993). This free-range bovine species has a limited geographical distribution and mainly found in the North-Eastern hilly region of India and in many locations of South-East Asia like Myanmar, Bhutan, China and Bangladesh. Mithuns are distributed on mid altitude hills from the Patkai in the North-East and Arkan and Chin hills of Myanmar through Chittangong tracts of Bangladesh and Lushai, Manipur and Naga hills in the South east. In India, it is mainly found in the tropical rainforest of the North Eastern hill states (Arunachal Pradesh, Nagaland, Manipur and Mizoram). Small numbers of mithuns are also found in Myanmar, China, Bangladesh and Bhutan. Mithuns are generally found at an altitude between 1,000–3,000m MSL and are quite adaptable in that range. They also play a vital role in the economy of its rearers as the scope of arable agriculture is limited in these areas because of steep topography, prolong and severe winter, shallow soil and lack of irrigation facilities. The mithun is reared primarily for meat and its ownership is considered to be the sign of prosperity and superiority of individual in the society. On important occasions, mithuns are sacrificed for communal feast. The value of mithun differs from one tribe to another tribe and from place to place. The challenge lies ahead to introduce mithun under different climatological condition as an efficient beef animal. Hence, before introducing of mithun at large scale in different places, it is necessary to understand its capability to adopt with different

climatological conditions. However, availability of scientific information on the adaptation capability of mithuns under different climates and altitudes till date is scanty. Considering all these above points, the present research work was carried out to determine the effect of altitude on growth performance and nutrient utilization in Mithun.

Animals and feeding: Mithun calves (6) each were selected irrespective of sex and strains at National Research Centre on Mithun, Jharnapani (300MSL) and at Porba farm which is situated at 2,100 MSL. The animals were kept in confined condition and were fed according to NRC (1989). Digestibility trials were conducted for 7 days during each season. Body weight of the animal was taken before feeding at fortnightly interval.

Analysis of feed and faeces samples: The proximate analysis of feeds and faeces samples was done according to the standard procedures of AOAC (1989). All the data are expressed as Mean $\pm$ SE. Variations in daily weight gain during different seasons and at different farms are analyzed using general linear model procedures of SPSS (1999).

Chemical composition and variation in the body weight: Mithuns kept for research work where fed with the available fodder at both the location where the availability of grass between June to November is abundant, but afterwards during December to May the lean season starts where availability of fodder becomes very difficult and mithuns struggle to find good quality and quantity of fodders. Since the study was conducted throughout the year, hence whatever fodder material was available, it was properly formulated according to NRC (1989). The formulated feed composition at both the farm as presented in Table 1 showed that the concentrate crude protein and fibre content was 21.97% and 21.43%; 10.37% and 9.73% respectively, for Medziphema and Porba Farm whereas the green grass contained 13.47% and 17.67%; 17.87% and 20.73% respectively. Variation in body weight and daily weight gain are presented in Table 2. Growth rates of 472.7 g/day to 470.55 g/day were obtained during the experimental period at Medziphema and Porba farms. A body weight gain of 371 and 305.67 g/day in male and female

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Table 1. Chemical composition (% DM) of the feed ingredients of the different digestibility trials conducted at Medziphema and Porba farm

Farm	Feed	DM %	OM %	TCHO %	CP %	EE %	CF %	NFE %	ASH %
Medziphema	Concentrate	88.97	90.17	63.73	21.97	4.37	10.37	53.4	9.8
	Green grass	23.9	86.57	70.47	13.47	2.5	17.87	52.6	13.4
	Concentrate	90.87	90.1	64.23	21.43	4.4	9.73	54.47	9.83
	Green grass	28.2	87.4	67.5	17.67	2.23	20.73	46.77	12.5

Table 2. Variation in body weight changes (kg) and daily weight gain (g/day) Medziphema and Porba farms

Particulars	Farms	
	Medziphema	Porba
Initial body weight (kg)	203.5 ± 5.7	146.0 ± 19.8
Final body weight (kg)	303.0 ± 8.3	251.6 ± 26.7
Body weight gain (g/day)	472.7 ± 0.04	470.55 ± 0.04

Table 3. Variation in nutrient intake at Medziphema and Porba farms

Particulars	Farms	
	Medziphema	Porba
DM intake (kg/day)	6.47 ± 0.35**	5.00 ± 0.21**
OM intake (kg/day)	5.78 ± 0.32**	4.44 ± 0.18**
CP intake (g/day)	1079.85 ± 73.05	1003.93 ± 52.80
CF intake (g/day)	1143.46 ± 111.99*	849.85 ± 43.53*
EE intake (g/day)	222.31 ± 16.96*	170.40 ± 8.98*
TCHO intake (kg/day)	4.62 ± 0.29**	3.27 ± 0.12**

** P<0.01 and * P<0.05.

mithun calves was reported by Pal *et al.* (2004). Body weight gains from 350 to 500 g/day were observed by Singh *et al.* (2003) in young mithun calves of (0 to 3 months). Similar body weight gains of 500g/day on Napier grass and 250–376 g/day on tree leaves along with concentrate feeding was reported in mithuns by Pal *et al.* (2000, 2001). A growth rate of 200–550 g/day was recorded in cattle and buffalo by Patnaik *et al.* (1987), Ranjhan *et al.* (1993), Sen *et al.* (1978). A weight gain between 352–548 (g/ day) was reported in mithuns by Prakash *et al.* (2005, 2008, 2008a).

Mithun calves in this present study clearly shows that their growth rate was similar in nature i.e 472.7 ± 0.04 (g/day) at Medziphema and 470.55 ± 0.04 (g/day) at Porba and it indicate that altitude does not have any significant affect on the growth rate.

Variation in Nutrient intake, digestibility, utilization by Mithun calves and nutritive value of ration: Variations in the nutrient intake at both the farms are presented in Table 3, which showed that the DM, OM and TCHO intake were significant (P<0.01), CF and EE intake were significant

Table 4. Variation in nutrient digestibility at Medziphema and Porba farms

Digestibility	Farms	
	Medziphema	Porba
DM	62.62 ± 1.71	58.76 ± 2.28
OM	64.41 ± 1.65	60.34 ± 2.23
CP	65.19 ± 1.72*	59.29 ± 1.73*
CF	59.67 ± 2.50*	51.82 ± 2.64*
EE	66.67 ± 3.30	65.40 ± 2.84
TCHO	64.80 ± 1.95*	57.15 ± 2.63*

* P<0.05.

(P<0.05) except the CP. Nutrient digestibility data (Table 4) suggested that there were significant difference in the digestibility of CP, CF and TCHO (P<0.05) between the farms as well as there were low digestibility at higher altitude.

However, the total digestible crude protein (P<0.01) and total digestible nutrients (P<0.05%) of the diet differed significantly between the farm (Table 5). Nutritive value of the diet in terms of digestible crude protein differ significantly (P<0.01) at both the farms i.e. 4.06 and 6.42% respectively. Total digestible nutrients (%) at both the farms differed

Table 5. Variation in plane of nutrition at Medziphema and Porba farms

Particulars	Farms	
	Medziphema	Porba
DM intake, kg/100 kg body weight	2.39 ± 0.08	2.37 ± 0.20
DM intake, g/kgW ^{0.75}	66.42 ± 1.69	55.14 ± 3.18
DCP, % of diet	4.06 ± 0.16**	6.42 ± 0.76**
DCP intake, g/100 kg body weight	260.60 ± 16.15	313.26 ± 34.08
DCP intake, g/kgW ^{0.75}	10.57 ± 0.69	11.49 ± 1.03
TDN, % of diet	62.22 ± 2.25*	54.57 ± 2.26*
TDN intake, kg/100 kg body weight	1.51 ± 0.10	1.46 ± 0.17
TDN intake, g/kgW ^{0.75}	61.17 ± 4.24	53.12 ± 4.97
ME intake, MCal/100 kg body weight	5.65 ± 0.41	5.34 ± 0.68

** P<0.01 and * P<0.05.

Table 6. Variation in feed conversion efficiency (kg nutrient intake/kg body weight gain) at Medziphema and Porba farms

Particulars	Farms	
	Medziphema	Porba
DM	12.08 ± 0.73	10.33 ± 0.67
TDN	7.54 ± 0.57*	5.61 ± 0.43*
DCP	1.31 ± 0.09	1.23 ± 0.09

* P<0.05.

significantly ($P<0.05$) i.e. 62.22 and 54.57% respectively. Adult mithuns, when fed with sole roughage diet, a nutritive value of 7.70% DCP and 59.16% TDN was reported by Pal and Bujarbaruah (2002). Pal *et al.* (2004) reported that when male and female mithun calves were fed on green forage based diet, the nutritive values were 7.53 and 7.44% DCP, and 70.35 and 68.03% TDN respectively.

Feed conversion efficiency (nutrient intake/kg body weight gain) presented in Table 6. Feed conversion efficiency (nutrient intake/kg body weight gain) did not differ significantly for DM and DCP intake however, a significant difference was obtained for TDN ($P<0.05$) showing that TDN was higher at Medziphema (7.54) than to Porba farm (5.61 ± 0.43). Similar values of FCE of DM, DCP and TDN i.e. 18.49, 1.16 and 13.03 respectively, were reported by Pal *et al.* (2004) when mithuns were fed with natural grass and rice bran. The values for FCE of DM, DCP and TDN varied from 12.81 - 15.04; 1.50 - 1.78 and 7.75 - 9.22, respectively in mithuns as reported by Dhali *et al.* (2003–2004).

The present study revealed that mithuns reared at lower altitude and at higher altitude does not differ significantly in terms of body weight gain and feed conversion efficiency of dry matter and digestible crude protein intake however, total digestible nutrients varied significantly at both the farms. It can be concluded that mithuns can be reared at even lower altitude of 300m MSL without any effect on the growth performance of the animals.

SUMMARY

A comparative study on effect of altitude on growth performance and nutrient utilization in mithun calves was carried out at National Research Centre on Mithun at Medziphema farm (300 MSL) and Porba farm (2100 MSL), to find its adaptability so that it can be reared a low altitude to compensate the high demand of mithun meat in the state. The mithuns of either sex were selected and fed in confined condition. Growth rate of 472.7 g/day and 470.55 g/day were obtained during the experimental period at Medziphema and Porba farms which were nonsignificant. DM, OM, EE, CF and TCHO intake were significantly different and CP intake does not differ significantly. However CP, CF and TCHO digestibility differed significantly at both the altitude. Dry

matter, digestible crude protein, total digestible nutrients and Metabolizable energy intake at both the altitude were non-significant. Feed conversion efficiency at both farms were same for DM and DCP intake; however, the values TDN intake differed significantly. Results on the body weight gain showed that there was no significant difference at both the farms which means that mithuns can be reared at low altitude without any difference in their growth rate and can be an alternative source for providing good quality meat.

ACKNOWLEDGEMENT

The author expresses his deep sense of gratitude to Director NRC on Mithun, Jharnapani for providing all the necessary facilities for carrying out the research work.

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