



Physical and Morphometric Characterisation of Badri Cattle

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ABSTRACT

Badri cattle is the only registered cattle breed of Uttarakhand. In the present study, an effort was made to characterize Badri cattle of the Kumaon and Garhwal region on the basis of physical and morphometric traits. The body length (BL), height at withers (HAW), heart girth (HG), paunch girth (PG), ear length (EL), face length (FL) and tail length (TL) of males from the Kumaon region were found to be 102.00±0.91, 103.25±1.12, 140.80±0.62, 145.64±1.71, 20.83±0.42, 37.82±0.45 and 73.40±0.34 cms, respectively. Similarly, the males from the Garhwal region had BL, HAW, HG, PG, EL and FL of 107.76±2.91, 106.80±3.59, 141.02±2.1, 146.28±2.22, 19.04±0.47, 37.78±0.80 and 77.42±2.16 cms, respectively. The study concludes that Badri cattle is a small sized cattle breed and the cows from both the Kumaon and Garhwal regions of Uttarakhand state had significantly lower morphometric characteristic estimates than the males.

HIGHLIGHTS

- Badri cows from both Kumaon and Garhwal region were having significantly lower estimates of morphometric characteristics than the males.
- The body length (BL), height at withers (HAW), heart girth (HG), paunch girth (PG) and tail length (TL) varied significantly with the sex of animals.
- The population of Badri cattle in plainer areas of breeding tract is declining owing to crossbreeding with Jersey and Red Sindhi breeds.

Keywords: Badri cattle, Kumaon, Garhwal, morphometric characteristics

Uttarakhand is rich in livestock biodiversity. Badri is the only genetically characterised (Dar *et al.*, 2020) breed of cattle of Uttarakhand state. The people of Uttarakhand are mainly depending upon agriculture for their livelihood. Majority of the cattle population in Uttarakhand comprises of indigenous breed i.e. Badri. Badri is found in hilly districts of Uttarakhand. There is a need to conserve genetic diversity in the AnGR which is possible through exploring, identifying and registering new breeds. As per the Hall and Brandley (1995) the taxonomically distinct

breeds are likely to have special gene combination and adaptation different from others. FAO (1984) defines characterization as morphological and genetic attributes of an animal species or breed, which has a unique genetic identity and the environment to which species or breed

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populations are adapted or known to be partially or not adapted at all. For characterization of breeds of livestock, morphological traits are of prime importance as they give an idea of body conformation which varies from breed to breed. Morphological markers make use of phenotypic traits like height at withers, body length, chest girth, orientation of ears for characterization of animal genetic resources. Badri cattle are reared mainly for bullock power, milk and manure. Milk of Badri cattle is healthy, nutritious and is A2 in nature (Dar *et al.*, 2018). Blood biochemical parameters of Badri cattle have seasonal variations (Dar *et al.*, 2019) and milk composition varies with altitude of place where animals are reared (Pathak *et al.*, 2021). The Badri cattle performs lesser in production and better in reproduction traits (Rahman *et al.*, 2021). Limited literature is available on Badri cattle of Uttarakhand state (Dar *et al.*, 2018). Thus an attempt has been made to characterize Badri cattle of Kumaon and Garhwal region in the present study.

MATERIALS AND METHODS

Under phenotypic characterization, data on geographical distribution, morphological traits, production potential and management practices in their typical production environment was collected. The native breeding tract of Badri cattle lies in the hilly districts of Uttarakhand state. The breeding tract lies in the agroclimatic zone-I and comprises of mountainous (86%) with a dense forest cover (65%). Uttarakhand lies in west Himalayan Biogeography zone and lies between Latitude of 28°43' N to 31°27' N and Longitude of 77°34' E to 81°02' E. The average temperature during the winter season ranges from sub-zero to about 15 degrees Celsius. Uttarakhand has diverse climatic conditions with subtropical conditions in valleys and temperate conditions in the higher slopes. At higher altitudes, temperature drops below zero in winter months and in plain areas like Pantnagar temperature during summers rises above 40°C. The region in which study was conducted has rugged mountainous terrain, altitude ranges from 300 m to above 7000 m and the climate varies accordingly. Uttarakhand has 13 districts and two major divisions viz. Kumaon and Garhwal. Sampling was done from both the divisions; in Kumaon division, Almora, Bageshwar, Champawat and Nainital districts were covered while in Garhwal Division districts namely Chamoli, Pauri Garhwal, Rudrapur, Tehri and

Uttarkashi were included. For phenotypic characterization, at least 2 blocks from each district were taken to study as many animals as possible.

Physical and Morphological traits

Physical and morphometric data on males and females of different age were recorded. All the hilly districts from Kumaon and Garhwal region were covered and two blocks from each district were selected randomly. In the selected blocks, sampling was done in 5 villages on an average. For morphological characterization, care was taken to collect the data on random animals belonging to true-to-type Badri cattle, as identified on the basis of their external appearance, homogeneity and typical morphological characteristics. Data was collected from animals belonging to each sex, as well as different age-groups (Table 1) 150 farmers from each division of the selected district were interviewed for production and reproduction traits.

The different Physical and morphometric traits recorded were:

Physical characteristics

Data was recorded for coat colour, muzzle colour, eye lid colour, hoof colour, tail switch colour, horn colour and shape, horn orientation, ear orientation, udder shape, udder size, teat shape and milk vein size.

Biometrical characteristics

The different biometrical characteristics including body length, chest girth, paunch girth, face length, tail length and ear length were measured on the individual animals with the help of scale and measuring tape. Data collected was classified according to location, sex of the animal and analysed statistically by the least squares analysis of variance technique. Duncans Multi Range test (DMRT) was used.

RESULTS AND DISCUSSION

The breeding tract of Badri cattle extends to hilly districts of Uttarakhand. It is found in both the two divisions of Uttarakhand *i.e.*, Kumaon and Garhwal. In Kumaon region it is distributed in Almora, Bageshwar, Champawat, Nainital and Pithoragarh districts. In Udham Singh Nagar,

Table 1: The number of animals from different districts used for morphometric characters

Division		Age group					Total
		0-3M	3-6M	6-12M	1-3Y	Adult (>3Y)	
Garhwal	Male	7	19	15	26	14	81
Kumaon		10	12	8	14	20	64
Garhwal	Female	12	13	15	45	100	185
Kumaon		20	18	21	35	120	214

the GBPUAT, Pantnagar has maintained a herd of Badri cattle at University farm, Baeni. In Garhwal region it is found in Chamoli, Pauri Garhwal, Rudraprayag, Tehri and Uttarkashi districts. These districts exist at varying heights which ranges from 210-7817 m above mean sea level. The villages in these districts are scattered at the varying heights. The topography in hilly districts is characterized by hilly terrain, deep valleys, high peaks, swift streams and rivulets, rapid soil erosion, frequent landslides and widely scattered habitation. Badri cattle is mainly maintained by people living in higher altitudes where it is most economical. The population of Badri cattle is about 16 lakhs. The population of Badri cattle in plainer areas of these districts is declining owing to crossbreeding with Jersey and Red Sindhi breeds.

Production system

In the surveyed area, Badri cattle was mainly maintained on semi intensive system of management though farmers feed some stored grass and cereal grains early in the morning. The small and marginal farmers keep small number of Badri cattle about 1-4. Very small number of farmers keeps herd size of 10-20 animals. These farmers mainly keep Badri cattle for milk production for household consumption and drought power for ploughing of fields. People let their animals to graze in nearby forests or community grazing land for 4-8 hours in winter and 8-10 hours during summers. The manure obtained is applied to soil for increasing fertility.

Husbandry practices

Breeding

Natural service was mainly practiced in Badri cattle of the surveyed area. Usually male and females graze together which leads to pasture mating. People in higher altitudes usually prefer natural mating as they use Badri for milk

and draught purpose. The frozen semen of Badri cattle is not available, so artificial insemination is mostly avoided. The people living in lower areas of the breeding tract districts have started using jersey semen in Badri cattle which has lead to dilution of this breed in these areas. So the data collected in present study was mostly focused to those areas where artificial insemination is avoided to get pure Badri cattle.

Housing

The housing type in Badri cattle is closed type in all the season unlike other most parts of country where open housing system is mostly practiced. Majority of the animal houses were part of residence. Farmers live in upper storey of the home while lower portion is kept for keeping animals. In Chamoli and Bageshwar district mostly animal houses were made separately and were not the part of residence. Majority of the animal houses were of pucca type. Animals are kept in animal sheds during night and odd hours. The farmers let their animals for grazing in the nearby forest or community grasslands during day time.

Feeding

The majority of the farmers let their animals for grazing in both winter and summer season. However they supplement the lactating animals with locally available cereal grains, cultivated crop residues and local grasses. There were a lower percentage of farmers that keep their animals in sheds throughout day and night. In stall feeding practices animals are given freshly cut fodders and grasses 2-3 times a day. Apart from fodders, crop residues and concentrates are supplemented in stall feeding practices.

Physical traits

Badri cattle is a small sized cattle with an average adult

body weight of about 200-250 kg. Both the Kumaon and Garhwal region was surveyed. It was found that the body of Badri was compact and cylindrical with tight skin. The legs were slender and strong with strongly built hooves that enable them to walk on uneven and hilly terrain. The hump was prominent but smaller in size. The neck of Badri was slender and short. Dewlap was also smaller in size.

Badri cattle is found in different coat colours ranging from white, black, brown, red, grey, reddish brown and others (Table 2). In both Kumaon and Garhwal region, surveyed Badri cattle was found under three major colours viz., black, brown and grey. The black, brown and grey coloured Badri cattle in Kumaon region were found to be 35, 30 and 20%, respectively whereas in Garhwal region the same colours were found to be 40, 15 and 30%, respectively.

Muzzle colour of Badri cattle in majority of cases was found to be black. The black coloured muzzle in Kumaon and Garhwal was found to be 76 and 85.5%, respectively whereas the brownish black colour of muzzle was found to be 24 and 14.5%, respectively.

Eyelid colour of Badri cattle was observed to be black

colour in majority of cases followed by brown and white, respectively. Black eyelids were found to be 60 and 68% followed by brown; 24 and 20.5%; and black; 16 and 11.5%, respectively in Badri cattle of Kumaon and Garhwal region.

Switch of tail was reaching upto fetlock joint and in some cases was touching to ground. The switch of tail was mostly black in colour in both the regions of state.

Majority of animals were having black coloured hooves with occurrence of 72 and 80 % in Kumaon and Garwal region whereas rest animals were having brownish black colour.

Ears are smaller and oriented at horizontal position. Both the sexes of Badri cattle have horns. Horns were curved and blackish in colour. The horns are bent towards face and contain pointed tips. Badri cattle were found to be moderate in temperament.

Udder characteristics

The udder was mainly trough type in majority of cases, 72 and 80% in Badri cattle of Kumaon and Garhwal region.

Table 2: Colour diversity and in Badri cattle of Kumaon and Garhwal region

	Number of animals		
	Kumaon	Garhwal	Overall
Black	97 (35)	106 (40)	203 (37.5)
Brown	83 (30)	40 (15)	123 (22.5)
Whitish grey/grey	56 (20)	80 (30)	136 (25)
Pure White	19 (7)	18 (7)	37 (7)
Red/ Reddish brown	13 (5)	11 (4)	24 (4.5)
Other colours	8 (3)	11 (4)	19 (3.5)

Values in parenthesis indicate percentage.

Table 3: Least squares means of morphometric traits (cms) in Badri cattle from Kumaon and Garhwal division

Kumaon division										
Age group	Sex	Number	Heart Girth	Paunch Girth	Body Length	Height at withers	Ear Length	Tail Length	Face Length	
Adult	Male	20	140.80±0.62	145.64±1.71	102.00±0.91	103.25±1.12	20.83±0.42	73.40±0.34	37.82±0.45	
Adult	Female	120	133.80±0.58	139.68±0.58	100.97±0.70	102.58±0.54	18.63±0.23	77.05±0.54	38.83±0.23	
Garhwal division										
Adult	Male	14	141.02±2.15	146.28±2.22	107.76±2.91	106.80±3.59	19.04±0.47	77.42±2.16	37.78±0.80	
Adult	Female	100	134.72±0.87	140.35±0.85	101.48±1.15	102.55±1.00	18.77±0.27	71.77±0.63	37.19±0.28	

In rest of the cows, udder was pendulous with occurrence of 15 and 18 % while others were having bowl type udder. The fore and hind quarters of udder were small and medium sized, respectively. The teat shape was cylindrical (70 and 78 %) and funnel type (30 and 32%) in Badri cattle of Kumaon and Garhwal region, respectively. Milk vein was not prominent as Badri is low yielder of milk.

Morphometric characteristics

In the present study, the major morphometric traits like heart girth, paunch girth, body length, height at withers, ear length, face length and tail length were studied for characterization of Badri cattle; the main animal genetic resource of Uttarakhand. These morphological traits were visualized and measured directly from animal body (Table 3). For measurement of these traits, adult animals above 3 years of age were included. Animals from different districts belonging to two major geographical regions, Kumaon and Garhwal were covered.

The body length (BL), height at withers (HAW), heart girth (HG), paunch girth (PG), ear length (EL), face length (FL) and tail length (TL) of males from Kumaon region were found to be 102.00 ± 0.91 , 103.25 ± 1.12 , 140.80 ± 0.62 , 145.64 ± 1.71 , 20.83 ± 0.42 , 37.82 ± 0.45 and 73.40 ± 0.34 cms respectively. Similarly the males from Garhwal region were having BL, HAW, HG, PG, EL and FL of 107.76 ± 2.91 , 106.80 ± 3.59 , 141.02 ± 2.1 , 146.28 ± 2.22 , 19.04 ± 0.47 , 37.78 ± 0.80 and 77.42 ± 2.16 cms. The females from the Kumaon were having BL, HAW, HG, PG, EL, FL and TL of 100.97 ± 0.70 , 102.58 ± 0.54 , 133.80 ± 0.58 , 139.68 ± 0.58 , 18.63 ± 0.23 , 38.83 ± 0.23 and 77.05 ± 0.54 cms. The females of Garhwal region were having BL, HAW, HG, PG, EL and FL of 101.48 ± 1.15 , 102.55 ± 1.00 , 134.72 ± 0.87 , 140.35 ± 0.85 , 18.77 ± 0.27 , 37.19 ± 0.28 and 71.77 ± 0.63 cms respectively.

From the observations, it was observed that the body length, height at withers (HAW), heart girth (HG), paunch girth (PG) and tail length (TL) varied significantly with the sex of animals (male and female) whereas no significant difference was observed region wise. The observations revealed that Badri cattle has higher estimates of morphometric than the hill cattle of Garhwal, Pithoragrah and Kumaon region of Uttarakhand (Patoo *et al.*, 2016; Pundir *et al.*, 2014; Kumar and Gaur, 2016). However comparable results were found with that of hill cattle

from Uttarakhand hills (Pundir *et al.*, 2013). It was found that Badri cattle has higher estimates of morphometric characteristics than some of the native cattle breeds/populations including Kosali cattle (Jain *et al.*, 2018); Malnad Gidda (Singh *et al.*, 2008), Punganur (Ekambaram *et al.*, 2014), non-descript cattle of Ratnagiri (Khirari *et al.*, 2014), Ponwar (Guar, 2003), Manipur cattle (Kayastha *et al.*, 2011, Tolenkhome *et al.*, 2012). The morphometric characteristics of Badri cattle was found to be lower than that of Zobawng, local cattle, from Mizoram state (Saidur and Girin, 2015), and Bachur cattle (109 and 116cm; Chandran *et al.*, 2014) breeds of India.

CONCLUSION

The present study concluded that the Badri cattle is a small sized cattle with low productive capacity, reared by small and marginal farmers who keep small number of animals.

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