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Research Article

PHENOTYPIC CHARACTERIZATION OF DIFFERENT COLOUR VARIANTS OF ENDANGERED SIRI CATTLE IN WEST BENGAL AND SIKKIM

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The present investigation was carried out on Siri cattle in its natural ecology with a focus on breed description to facilitate selection for better performance as well as conservation of the breed. It is revealed from the study that the majority of Siri cattle were black with white patches (64.73%) followed by black (15.8%), brown with white patches (9.89%) and brown (9.56%). The average morphometric measurements in male and female Siri cattle were 138.98 ± 0.22 and 122.29 ± 0.14 cm for withers height, 176.82 ± 0.46 and 154.36 ± 0.51 cm for heart girth, 138.40 ± 0.79 and 103.95 ± 0.63 cm for body length, 43.83 ± 0.17 and 38.32 ± 1.40 cm for face length, 47.38±0.20 and 31.17 ± 0.12 cm for neck length, 80.47 ± 0.14 and 69.66 ± 0.09 cm for neck girth, 19.62 ± 0.13 and 19.05 ± 0.97 cm for ear length respectively. Average age at first calving, average calving interval, average lactation length, average daily milk yield and peak milk yield per day were 51.51±0.81 months, 474.69±4.70 days, 239.00±2.04 days, 2.13±0.05kg and 3.08±0.05kg, respectively. Overall testicular circumference was 28.03±0.13 cm in male. In female teat length was 3.66±0.06 cm. Statistical analysis of data revealed that there was no significant variation in body conformation, physical characters, reproductive and productive performances among the four groups of colour variant Siri cattle.

Key words: Siri cattle, Physical characteristics, Productive performance, Reproductive Performances

The Indian sub-continent is a rich reservoir of livestock genetic resources. This is evident from the availability of most of the species of farm animals and an unusually large number of genetic variants in each species. The only indigenous descriptive cattle breed in West Bengal and Sikkim is Siri and the population size of this breed

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was reported as 5479 and 11254 respectively as per 19th livestock census of Government of India (2012). Siri cattle being developed through natural selection have high adaptation to wide range of hilly terrain (altitudes 150-2500m) in Himalaya with wide variation of temperature (17°C to 30°C in summer and 5°C to 20°C in winter) and rainfall of 3894 mm during May to September. The animal carries a thick hair coat which protects them from heavy rains and severe cold all around the year (Sharma *et al.,* 2008). Siri cattle play a pivotal role in subsistence farming system of these areas as a source of milk and milk products, draft power and manure. Siri breeders are communities in remote areas where farmers are food insecure and live under extreme poverty. Terrace type cultivation is practiced in these areas where rice, maize, ginger, soybeans, millets, pulse and mustard are cultivated as major crops. This Siri cattle breed is widely distributed from Bhutan, the real home of this breed to the various parts of Sikkim and also in the district of Darjeeling and Jalpaiguri of West Bengal (Nivsarkar *et al.,* 2000).

Economic potential cannot be measured by looking simply at performance. Rare or endangered breeds are often highly adapted and their performance should be measured comparatively within their own environmental conditions. They should not be compared with other breeds in improved or modified conditions or under intensive management. Furthermore, they should be examined with respect to the products for which they were selected and valued in the conditions under which they evolved. The comparative lower productivity of the indigenous cattle is compensated by their lower feed consumption and higher disease resistance power. Hence the need for conservation of germplasm of indigenous breed has become a part of genetic security (Elizabeth, 1999).

There is perceptible increase in a limited number of specialized breeds, while several indigenous livestock have suffered decline and degeneration over the years (Anonymous, 2007). Population of Siri cattle breed has also been declining over the last few years due to intensive crossbreeding with Jersey and Holstein semen through artificial insemination. Attempt to improve the productivity of this cattle breed shall directly contribute to increased rural livelihood and poverty alleviation. Only few studies were conducted regarding the physical characteristics, particularly the colour patterns and their relevance to productive as well as reproductive parameters of Siri cattle.

A study was therefore undertaken to characterize the precious germplasm of Siri cattle in its natural ecology with a focus on breed description to facilitate selection for better performance as well as conservation of the breed.

MATERIALS AND METHODS

Present study was conducted in hilly areas of Kalchini and Malbazar block in

Jalpaiguri district and Kalimpong–I and Kalimpong–II block in Darjeeling district of West Bengal and Ravong block of South Sikkim district in Sikkim, India. Zones were selected in such a way that there was no chance of natural mixing of animal or natural migration of animal from one zone to another zone. Data were collected from above stated five blocks during the period from 2012 to 2014. Total 930 Siri cattle were studied for colour pattern of different body parts (coat colour, colour of muzzle, horn, hoof and switch) from different location of mentioned five blocks. A total of one hundred and sixty (160) numbers of adult Siri cattle comprising twenty numbers each of male and female animals of five to eight years of age were randomly selected from each four distinct coat colour variant groups of the study area to assess the physical, reproductive and productive characters of this breed. They were grouped according to the coat colours as black (Group-I), brown (Group-II), black with white patches (Group-III) and brown with white patches (Group-IV).

The survey study was carried out following the guidelines of National Bureau of Animal Genetics Resources (NBAGR, Karnal) for evaluation of breed under filed condition. Accordingly a standard questionnaire was presented to the farmers or Siri cattle owners on random basis and then the questions were described in details for collection of relevant data. The body measurement of the male and female animal like the heart girth, body length, height at wither, face length, face width, ear length, horn length, tail length, testicular length and circumference (in bulls) were measured by using measuring tape and Vernier caliper.

The statistical methods used in the present study included percentage analysis, calculation of arithmetic mean and standard error. Chi-square test was done to determine differences in percent frequency of physical characteristics traits. One way analysis of variance was done to determine differences among the means using software computer programme of SPSS 16.0®.

RESULTS

Colour pattern: The research finding of the present study revealed that the majority of Siri cattle were black with white patches (64.73%) followed by black (15.82%), brown with white patches (9.89%) and brown (9.56%) (Table 1).

Siri cattle was found to have a thick long hair with a specialty of tuft of long coarse hair in the base of horn, areas between horn and the upper portion of hump region. The muzzle colour was black in all animals under study.

Eyelids colour of all the black and black with white patches coat coloured animals were found to be black, whereas eyelids colour of all the brown and brown with white patches coat coloured animals were brown. The colour of hoof of all the black and black with white patches coat coloured

Table 1. Colour pattern of different body parts of Siri cattle

Attributes	Siri Cattle (N=930)			
	Black colour	Brown colour	Black with white patches colour	Brown with white patches colour
Population	15.82%	9.56%	64.73%	9.89%
Muzzle colour	Black(100%)	Black(100%)	Black(100%)	Black(100%)
Eyelid colour	Black(100%)	Brown(100%)	Black(100%)	Brown(100%)
Hoof colour	Blackish grey (100%)	Brownish grey (100%)	Blackish grey (100%)	Brownish grey (100%)
Tail switch colour	Blackish (100%) Blackish (69%)	Brownish (31%) Brownish (5.14%)	Whitish (9.71%) Blackish (85.15%) Brownish (5.84%)	Whitish (54.87%)

animals were found to be blackish grey and all the brown and brown with white patches coat coloured animals were brownish grey in colour. Tail switch colour of the all black coat coloured animal was found to be black whereas in brown coat coloured animals, the tail switch were brownish (31%) and blackish (69%) in colour. But the tail switches of the black with white patches coat colour animals were of three types i.e. blackish (85.15%), brownish (5.14%) and whitish (9.71%). On the other hand, the tail switches of the brown with white patches coat coloured animals were of two types i.e. whitish (54.87%) and brownish (45.13%).

Productive and reproductive parameters: The productive and reproductive performances of Siri cattle were estimated and presented in Table 2.

Table 2. Coat colour wise Productive and Reproductive performances of Siri cattle

Characters	Black colour (N=20)	Brown colour (N=20)	Black with white patches colour(N=20)	Brown with white patches colour(N=20)	Overall
Age at first calving(months)	51.55±1.61	50.50±1.61	50.75±1.65	53.25±1.63	51.51±0.81
Calving interval (days)	472.50±10.35	478.25±8.99	476.75±9.55	471.25±9.36	474.69±4.70
Gestation length (days)	288.00±1.13	287.75±1.04	288.25±1.04	287.80±1.18	287.95±0.54
Daily milk yield (kg)	2.15±0.12	2.10±0.11	2.20±0.11	2.10±0.11	2.13±0.05
Peak milk yield (kg)	3.10±0.10	3.05±0.10	3.15±0.10	3.05±0.10	3.08±0.05
Lactation period (days)	241.75±4.73	240.0±3.40	237.50±3.83	237.00±4.49	239.00±2.04

Table 3. Coat colour wise different morphometric parameters of Siri cattle

	Black colour (N=40)		Brown colour (N=40)		Black with white patches colour (N=40)		Brown with white patches colour (N=40)		Overall (N=160)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Heart girth (cm)	176.25±0.92	155.05±1.01	177.50±0.84	154.75±1.11	177.10±0.87	154.00±1.02	176.45±1.10	153.65±1.04	176.82±0.46	154.36±0.51
Body length (cm)	138.35±1.29	105.05±1.48	140.10±1.26	104.75±1.47	139.50±1.31	102.90±1.02	135.65±2.18	103.10±1.02	138.40±0.79	103.95±0.63
Body weight (kg)	393.00±9.12	233.55±6.27	407.65±7.47	232.15±6.76	404.10±7.71	225.50±5.24	390.80±10.6	224.85±5.31	398.89±4.40	229.01±2.94
Wither height (cm)	138.40±0.46	122.20±0.29	139.15±0.46	122.20±0.27	139.10±0.49	122.25±0.27	139.25±0.41	122.50±0.31	138.98±0.22	122.29±0.14
Tail length, without switch (cm)	84.90±1.48	66.20±0.67	85.05±1.17	67.75±0.61	87.15±1.50	67.55±0.65	86.95±1.57	67.25±0.60	86.01±0.71	67.18±0.32
Switch length (cm)	43.15±0.44	38.05±0.60	43.65±0.48	38.70±0.50	43.35±.039	38.75±0.51	43.15±0.38	38.25±0.54	43.32±0.21	38.43±0.26
Horn length (cm)	20.65±1.00	18.90±0.99	19.00±0.90	19.30±1.13	20.25±0.75	18.55±0.99	20.10±3.66	19.25±1.04	20.00±0.43	19.00±0.51
Ear length (cm)	19.50±0.25	19.10±0.21	19.45±0.24	19.00±0.97	19.75±0.27	18.95±0.99	19.80±0.27	19.15±0.23	19.62±0.13	19.05±0.97
Face length (cm)	43.70±0.34	38.25±0.33	46.60±0.3	38.45±0.29	43.95±0.35	38.30±1.41	44.10±0.36	38.30±1.45	43.83±0.17	38.32±1.40
Neck length (cm)	47.15±0.39	31.10±0.23	47.40±0.42	31.10±0.23	47.65±0.42	31.20±0.25	47.35±0.40	31.30±0.25	47.38±0.20	31.17±0.12
Neck girth (cm)	80.45±0.29	69.65±0.20	80.50±0.24	69.50±0.22	80.55±0.29	69.65±0.19	80.40±0.30	69.85±0.16	80.47±0.14	69.66±0.09
Width of fore head (cm)	18.45±0.21	18.20±0.23	18.55±0.21	18.00±0.24	18.60±0.19	18.00±0.21	18.65±0.20	18.30±0.20	18.56±0.10	18.12±0.11
Distance between base of horn (cm)	17.75±0.16	17.55±0.15	17.80±0.17	17.60±0.15	17.75±0.17	17.55±0.13	17.90±0.16	17.45±0.13	17.80±0.08	17.53±0.07
Dewlap height (cm)	13.75±0.34	9.45±0.29	13.95±0.56	11.05±0.95	13.55±1.57	9.95±0.28	13.65±0.34	9.55±0.28	13.70±0.20	10.00±0.27
Testicular circumference (cm)	28.12±0.25	--	27.82±0.27	--	28.30±0.28	--	27.87±0.25	--	28.03±0.13	--
Left testicular length (cm)	11.75±0.16	--	11.62±0.13	--	11.67±0.14	--	11.67±0.13	--	11.68±0.07	--
Right testicular length (cm)	12.45±0.19	--	12.30±0.15	--	12.37±0.17	--	12.32±0.17	--	12.36±0.08	--
Naval flap size (cm)	2.05±0.11	--	2.12±0.10	--	2.17±0.11	--	2.12±0.10	--	2.11±0.05	--
Teat length (cm)	--	3.68±0.13	--	3.60±0.11	--	3.66±0.13	--	3.68±0.10	--	3.66±0.06

Fig. 1. Male Siri cattle (black with white patches)

Fig. 2. Female Siri cattle (brown with white patches)

Present study revealed that there was no significant variation among groups of different coat colour variants ($P<0.05$) of Siri cattle. Average age at first calving and average calving interval were 51.51 ± 0.81 months and 474.69 ± 4.70 days, respectively. The average lactation length was 239.00 ± 2.04 days. The average daily milk yield and peak milk yield per day were 2.13 ± 0.05 kg and 3.08 ± 0.05 kg, respectively.

Physical morphometric parameters: Different morphometric parameters of male and female Siri cattle were presented in Table 3. Higher estimate of different morphometric traits were observed in males as compared to females in this study. The average values recorded in present study were of withers height (138.98 ± 0.22; 122.29 ± 0.14 cm), heart girth (176.82 ± 0.46; 154.36 ± 0.51 cm), body length (138.40 ± 0.79; 103.95 ± 0.63 cm), face length (43.83 ± 0.17; 38.32 ± 1.40 cm), neck length (47.38 ± 0.20; 31.17 ± 0.12 cm), neck girth (80.47 ± 0.14; 69.66 ± 0.09 cm), ear length (19.62 ± 0.13; 19.05 ± 0.97 cm) and horn length (20.00 ± 0.43; 19.00 ± 0.51 cm) in male and female Siri cattle respectively. Average dewlap height was 13.70±0.20 cm in male and 10.00 ± 0.27 cm in female. Average testicular circumference and naval flap size recorded in male was 28.03 ± 0.13 cm and 2.11 ± 0.05 cm respectively The average teat length of Siri cattle was recorded as 3.66 ± 0.06 cm.

DISCUSSION

The present finding of different coat colour patterns and muzzle colour of Siri cattle were in accordance with the findings of Tantia *et al*. (1996); Nivsarkar *et al*. (2000) and Pundir *et al*. (2016). In the present study it was evident that all the brown and brown with white patches coat coloured animals had prominent brown eyelids that was in contrary to the result of Tantia *et al*. (1996), Nivsarkar *et al*. (2000) and Pundir *et al*. (2016) who reported only black eyelids colour in all animals of Siri cattle. The present finding of switch colour also differed from the finding of Nivsarkar *et al.* (2000) who reported black and white switch colour and Pundir *et al. (*2016) who reported black, brown and grey switch colour. Two types of hoof colour for Siri catle were observed in this study whereas only black hoof colour was observed by Nivsarkar *et al.* (2000).

Average age at first calving (51.51 ± 0.81 months) and average calving interval (474.69 ± 4.70 days) recorded under field condition in the present study were in accordance with the findings of Tantia *et al.* (1996); Nivsarkar *et al*. (2000); Pundir *et al.* (2016) and Phanchung *et al.* (1996). The average lactation length (239.00±2.04 days)

was in accordance with the findings of the above workers. The average milk yield of Siri cattle in the present study was found to be 2.5 kg per day which was in corroboration with the finding of Phanchung *et al.* (1996) while the range of average milk yield per day was 2 to 6.5 kg (Pundir *et al*., 2016), 2 to 6 kg (Nivsarkar *et al*., 2000) and 3 to 4 kg (Tantia *et al*., 1996).

The estimates of different morphometric measurements of Siri cattle obtained in this present investigation were comparable with the earlier reports of Pundir *et al.* (2016) and Nivsarkar *et al*. (2000).

Present study also revealed that the hump is placed slightly towards cervicothoraxic region which is covered with long tuft of hair. Hump is medium in size in male and small in female. The horn is directed outward upward and forward, and medium to small in size in both male and female. Naval flap in male is very small in size and it is almost absent in some animals. Udder is small in size and bowl shaped and teats are cylindrical in shape with rounded tips. Milk vein is not prominent. These observations of Siri cattle found in the present study were also in agreement with the findings of Tantia *et al*. (1996); Nivsarkar *et al*. (2000); Pundir *et al.* (2016) and Phanchung *et al.* (1996) except the teat length and size which was recorded as 5 to 12 cm in length and funnel shaped as reported by Pundir *et al.* (2016). It was reported that the horns are directed outward forward and upward.

There is no significant variation in body conformation, physical characters, reproductive and productive performances among the four groups of animal according to the coat colours which indicates uniformity among the Siri cattle under present study and may be due to genetic uniformity among the animal of different coat colour.

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