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DIVERSITY IN MORPHOLOGY AND PIGMENTATION PATTERNS OF LOCAL PABNA CATTLE IN BANGLADESH

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ABSTRACT

The study was aimed to reveal the morphological features of local Pabna cattle at Bangladesh Livestock Research Institute (BLRI), Regional Station, Sirajganj and community levels. Data of various morphological features were collected from total 24 cattle from on-station and 8 cattle from community. It was observed that most of the morphological features were not varied between the studied cattle populations except body length, height at wither, pelvic length, tail dock circumference and mouth circumference (p <0.05). Pigmentation pattern revealed that light red was dominated for coat color in both cattle population while black color was most frequently observed in muzzle, eyelid, eyelash, horn, hoof, dew claw and tail switch. As most of the phenotypic observation and pigmentation patterns were unique between two existing Pabna cattle population, an open nucleus breeding system might be enhanced the desire dairy breed development from those cattle population regarding the uniformity of morphological features.

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INTRODUCTION

Indigenous cattle population of Bangladesh are mainly *indicus* type encompassing various cattle genetic resources like Non-descript, Red Chittagong, Pabna, North Bengal Grey, Madaripur, and Munshiganj cattle. Genetic attributes of indigenous cattle are environmental adaptation and tolerance to drought, heat, diseases and ability to utilize low-quality local forages (Bhuiyan et al., 2007; Mwai et al., 2015). The non-descript cattle constitutes about 85-90% of the indigenous cattle population in our country. Pabna type cattle are considered as notable milch type cattle and famous for larger body size and better milk production among all the indigenous cattle populations, and also characterized by prominent hump and large dewlap (Hoque et al, 1999). This variety was developed at Shahjadpur of Sirajganj district by breeding with indigenous cows with Hariana and Sahiwal bulls in early 1900s (Bett et al., 2013).

Phenotypic characterization contributes to the improvement of animal genetic resources in the context of country-level implementation (FAO, 2012). Although several studies had been carried out for local Pabna cattle in Bangladesh (Husain et al., 1984; Husain and Mostafa, 1985 and Khan et al., 1999), the in-depth information of phenotypic measurements and pigmentation patterns on Pabna cattle are scanty. Thus, this study was aimed to evaluate morphological characteristics of Pabna cattle at BLRI Regional Station, Sirajganj and also at farmers' community beside the river of Jamuna at Bera upazila of Pabna district in Bangladesh.

MATERIALS AND METHODS

Data of morphological measurements and pigmentation patterns of selected body parts were collected from 24 cattle (19 cows and 5 heifers) at BLRI Regional Station, Baghabari, Shahjadpur, Sirajganj using a pretested questionnaire including measuring tape and a recognized color chart (Aluminium Allied Centre, Kerala, India) for the white (01712), light red (02131), red (02412), black (03915) and the combination of red and black (reddish black or blackish red) colors during the period of August to September in 2017. The age of the purchased cows at BLRI regional station was between 31 months to 46 months of age (one or two permanent teeth) having at least one parity and milk production capability 5 to 6 liters per day. The heifers were between the age of 24 to 30 months showed at least one heat. The similar criteria were considered for data collection from 8 cows (35 to 40 months) of a community at Bera upazila of Pabna district during the measurement of morphometric features and pigmentation patterns. The gathered data were tabulated and analyzed following independent sample *t* test and one-way ANOVA with descriptive statistics using SPSS version 16 (SPSS Inc. Chicago, USA).

RESULTS AND DISCUSSION

The morphological characteristics of Pabna cattle (Figure 1) revealed that body length (p <0.01), height at wither (p <0.05), pelvic length (p <0.05), tail dock circumference (p <0.05) and mouth circumference (p <0.01) had significant variations between the cattle of BLRI Regional Station and farmer's community (Table 1). Most of the studied morphological traits related to body, head and udder characteristics (Table 1) were not varied statistically between cattle of BLRI Regional Station and farmer's community (p >0.05). However, the studied morphological features among the cattle of BLRI on-station were not varied statistically based on age differences (Table 2) except mouth circumference (p <0.01), and distance between fore and hind teats (p <0.05). Similar findings were observed in community except for body length (p <0.05) and rump length (p <0.05).

Table 1. Morphological measurements of local Pabna cattle between on station and community

Morphology	BLRI Regional Station (n=19)		Community (n=8)		P value
	Mean	SE	Mean	SE	
Body character					
Body length (cm)	112.42	0.65	111.38	1.53	0.005
Heart girth (cm)	151.05	1.72	147.00	2.40	0.200
Height at wither (cm)	118.11	1.67	111.00	1.28	0.015
Carpal circumference (cm)	14.53	0.26	14.44	0.55	0.868
Tarsal circumference (cm)	16.45	0.32	16.19	0.48	0.662
Pelvic length (cm)	37.53	0.56	35.25	0.77	0.031
Rump length (cm)	37.47	0.43	37.63	0.80	0.858
Tail length (cm)	83.26	1.45	78.38	2.47	0.087
Tail dock circumference (cm)	20.21	0.41	18.50	0.56	0.025
Head character					
Mouth circumference (cm)	39.03	0.35	37.31	0.39	0.009
Head length (cm)	46.84	0.47	46.38	0.71	0.589
Head width (cm)	19.21	0.36	19.63	0.18	0.480
Horn length (cm)	10.33	0.49	9.25	1.26	0.335
Horn circumference (cm)	11.81	0.39	10.43	0.55	0.062
Ear length (cm)	21.82	0.57	22.38	0.80	0.591
Ear width (cm)	12.94	0.21	12.44	0.42	0.239
Udder character					
Fore teat length (cm)	4.46	0.27	4.19	0.34	0.567
Fore teat circumference (cm)	7.02	0.29	6.33	0.34	0.183
Hind teat length (cm)	3.91	0.24	3.84	0.27	0.866
Hind teat circumference (cm)	6.46	0.24	6.10	0.28	0.391
Distance between fore and hind teat (cm)	3.28	0.32	3.40	0.29	0.823
Distance between teats (cm)	5.01	0.48	5.40	0.54	0.643

The study of Udo et al. (1990) found similar findings on Pabna cattle for height at wither (118.21 cm) and heart girth (147.56 cm) but much higher result for body length (164.39 cm) than the present observation for these cattle (112.42 cm). It might be the reason of difference between two measuring techniques. However, body length of Pabna cattle in this study was measured (shoulder point to pin bone) according to the instruction of phenotypic characterization of animal genetic resources (FAO, 2012).

The pigmentation frequency of different body parts showed that coat color of cattle had similarity for light red (79.17 and 62.50%) and red colors (20.83 and 37.50%) in both on-station and community, respectively (Figure 2). The same pattern observed for the color of reddish black (16.70%) in eyelid of the cattle at on-station than community. However, the color of muzzle, eyelid, eyelash, horn, hoof, dew claw and tail switch were almost unique for studied cows. Three types of colors identified for tail switch (Figure 3) in which black (62.50-79.20%) was dominated followed by reddish black (16.70-25%) and white (4.20-12.50%) in the studied cattle at on station and community.

Table 2. Morphological measurements of local Pabna cattle within on-station and community based on age variation

Morphology	BLRI Regional Station (Mean ± SE)		P value	Community (Mean ± SE)		P value
	≤3 years (n=7)	>3 years (n=12)		≤3 years (n=3)	>3 years (n=5)	
Body character						
Body length (cm)	111.88±1.08	112.75±0.84	0.526	112.00±2.31	105.80±1.16	0.035
Heart girth (cm)	148.00±1.76	152.83±2.43	0.183	142.67±4.67	149.60±2.24	0.177
Height at wither (cm)	118.86±4.30	117.67±1.14	0.742	111.33±0.33	110.80±2.13	0.858
Carpal circumference (cm)	14.36±0.18	14.63±0.40	0.630	13.50±0.29	15.00±0.77	0.205
Tarsal circumference (cm)	16.36±0.39	16.50±0.47	0.837	16.00±1.15	16.30±0.49	0.788
Pelvic length (cm)	36.57±0.43	38.00±0.59	0.200	34.67±1.20	35.60±1.08	0.599
Rump length (cm)	36.57±0.43	38.00±0.59	0.109	35.67±0.88	38.80±0.80	0.046
Tail length (cm)	85.14±2.28	82.17±1.87	0.336	78.00±4.62	78.60±3.26	0.917
Tail dock circumference (cm)	20.29±0.52	20.17±0.58	0.891	17.67±0.33	19.00±0.82	0.280
Head character						
Mouth circumference (cm)	37.86±0.56	39.71±0.33	0.007	37.50±0.76	37.20±0.49	0.739
Head length (cm)	45.86±0.74	47.42±0.56	0.109	46.33±0.33	46.40±1.17	0.968
Head width (cm)	19.00±0.53	19.33±0.50	0.671	19.67±0.33	19.60±0.24	0.875
Horn length (cm)	9.79±0.90	10.65±0.58	0.407	10.67±0.72	8.40±1.32	0.426
Horn circumference (cm)	11.00±0.65	12.28±0.45	0.115	11.50±1.04	9.80±0.51	0.148
Ear length (cm)	21.14±0.59	22.21±0.84	0.386	22.67±2.33	22.20±0.37	0.801
Ear width (cm)	12.71±0.42	13.08±0.24	0.418	11.83±0.73	12.80±0.49	0.294
Udder character						
Fore teat length (cm)	4.07±0.48	4.69±0.33	0.284	4.17±0.60	4.20±0.46	0.966
Fore teat circumference (cm)	6.64±0.45	7.23±0.39	0.346	5.53±0.29	6.80±0.37	0.058
Hind teat length (cm)	3.87±0.45	3.93±0.29	0.912	4.17±0.44	3.64±0.35	0.391
Hind teat circumference (cm)	6.29±0.40	6.56±0.31	0.594	5.93±0.64	6.20±0.30	0.679
Distance between fore and hind teat (cm)	4.10±0.59	2.80±0.32	0.048	2.73±0.23	3.80±0.34	0.069
Distance between teats (cm)	5.81±0.84	4.54±0.57	0.214	4.73±1.27	5.80±0.49	0.383

Bhuiyan et al. (2007) reported that coat color of Pabna cattle varied within red or grey or the mixture of both which were agreed with our findings. However, our results indicating that the frequency of light red color was dominated in studied Pabna cattle population in both on-station and community levels while black color was dominated in muzzle, eyelid, eyelash, horn, hoof, dew claw and tail switch. Thus, selective breeding in the open nucleus breeding herd considering the observed dominated pigmentation patters in different body parts could established a breed having desire phenotypic features in the next generations.

Figure 1. Pabna cattle in two rearing systems: (a) BLRI Regional Station (*ex situ*) and (b) Community (*in situ*)

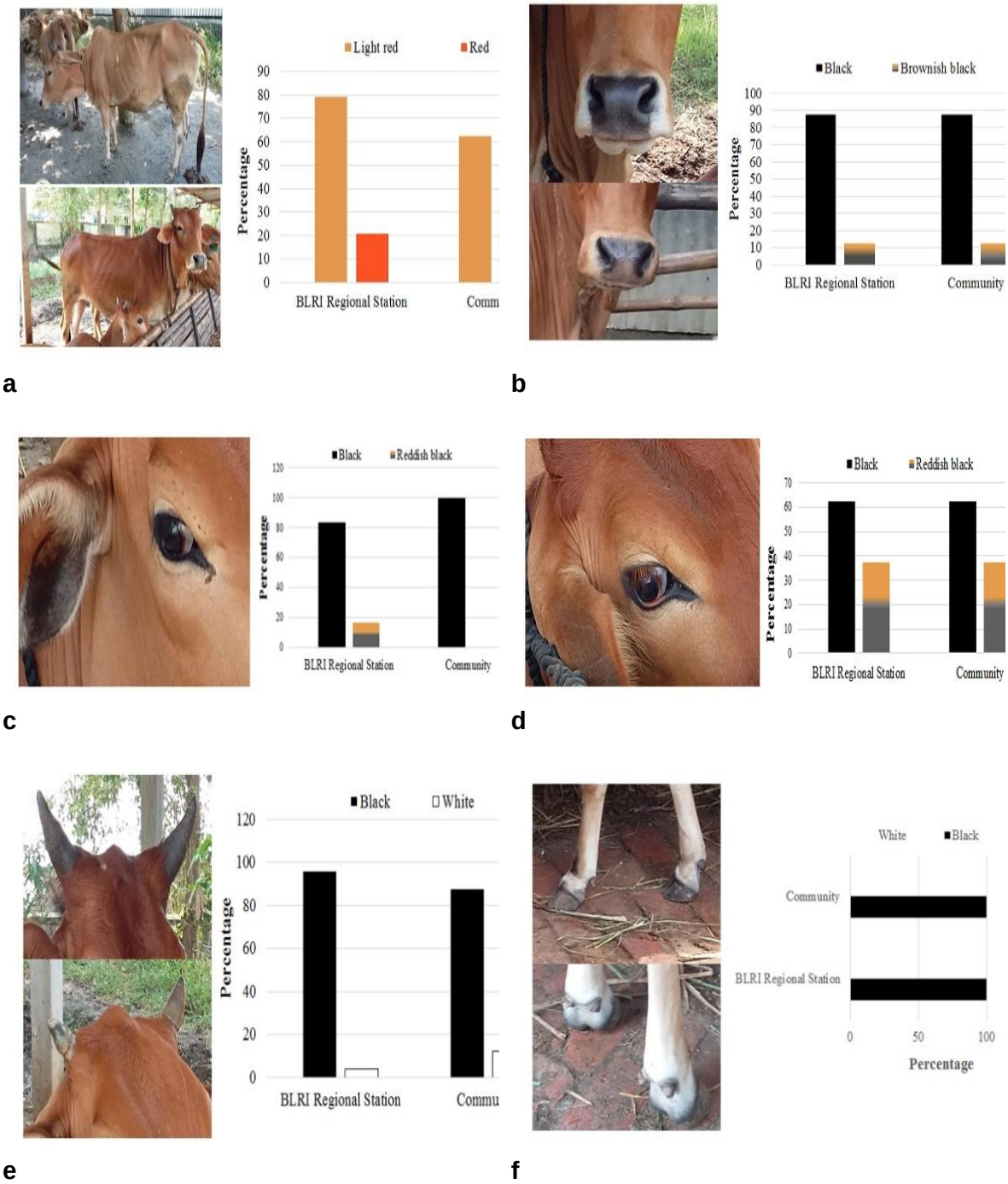

Figure 2. Diversity in phenotypic features of Pabna cattle in both on-station and community. (a) coat color: light red and red, (b) muzzle color: black and brownish black, (c) eyelid: black and reddish black, (d) eyelash: black and reddish black, (e) horn: black and white and (f) hoof and dwe claw: black

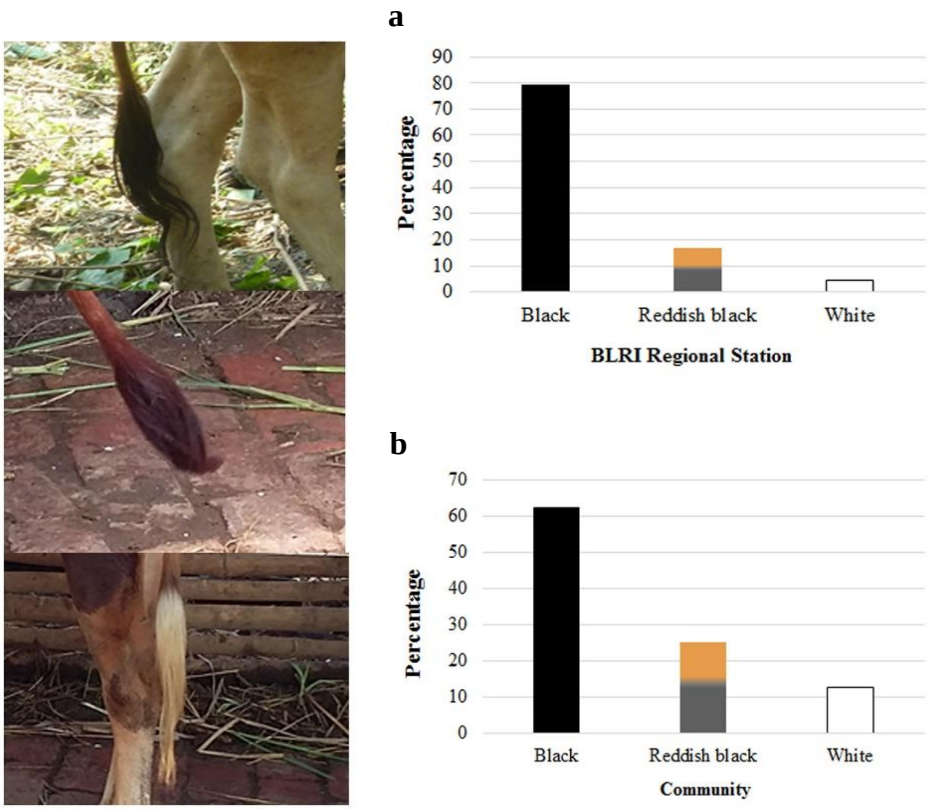

Figure 3. Diversity in tail switch color of both (a) on-station and (b) community encompassing black, reddish black and white colors

CONCLUSION

It is concluded that most of the studied observations on morphological characteristics were similar for the existing Pabna cattle population of BLRI Regional Station and community. Thus, genetic improvement of those Pabna cattle having similar features might be enhanced following selective breeding through open nucleus breeding system to develop desire dairy breeds in Bangladesh.

COMPETING INTEREST

No competing interests.

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