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Morphometric Variations Exist Among Native Cattle of Bhutan

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ABSTRACT

For effective conservation and utilization of cattle gene pool consisting of native characterization is important. Therefore, the objective of the study was to assess some morphometric variations in Bhutanese native cattle breed. A total 101 adult animals were included belong to Mithun (5), Siri (bull = 14, cow = 14), Siri cow cross Mithun bull (bull = 20, cow = 20), first backcross hybrids (bull = 14, cow = 14). ANOVA was performed to test the level of significance among the populations. Bulls were superior to cows in body and head sizes and shapes. Among seven populations, Jatsha and Mithun were proportionately larger. On contrary, Thrabum (Siri cows) were comparatively smaller in body sizes and shapes ($p < 0.05$). Moreover, dendrogram suggest that the populations could be clustered into two main groups. Hence, this information will assist in developing conservation strategies for native cattle in Bhutan.

Keywords: Breeding; conservation, morphometric trait, performance

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INTRODUCTION

Native cattle play social and cultural roles and is ranked as the most valued animal in Bhutanese farming system (Dorji and Gyeltshen, 2012). Of late, farmers prefer to keep Jersey and their crosses. In addition, beginning of superior cattle (improved breed) sourcing to dairy group member has motivated the farmers to take up dairy farming. For example, raw materials for shed construction are provided to those dairy farmers receiving the animal from the government. On contrary, local cattle (Siri, *Bos indicus*) survival might be threatened.

The local cattle are adaptable and ability to survive and perform under poor conditions (Ndumu et al., 2008; Hadiuzzaman et al., 2010; Kayastha et al., 2011). Besides, the country's rough steep terrain and use of farm machineries is less possible thus, bull are used as draft animal. Mithun (*Bos frontalis*) has been used for crossing with Siri cow to produce hybrid vigour (Jatsha and Jatsham for male and female, respectively). Jatsha are sterile and are powerful animal than the Siri bull which is perfectly designed for draft purpose. Jatsham produces more milk than her dam and they are further backcrossed with Siri bull to produce Yangkum (female) and Yangku (male). Scientific research should be performed with respect

to body measures for its genetic potential in these populations. Therefore, the purpose of this study was to determine the morphometric variations among Bhutanese common cattle population. These will be essential while developing conservation strategy for Bhutanese native cattle. Moreover, the morphometric measurements could be used to estimate the body weight (Assan, [2013](#)).

MATERIALS AND METHODS

Population and sample sizes

We used four Bhutanese indigenous cattle breeds from the Shingkar block, Zhemgang district. Body measurements for seven populations include; Mithun bull (*Mencha* local name; $n = 5$), Siri bull (Thrapa, $n = 14$), Siri cow (Thrabum, $n = 14$), Siri cow cross Mithun bull progeny male (Jatsha, $n = 20$), Siri cow cross Mithun bull progeny female (Jatsham, $n = 20$), first backcross male hybrid from Jatsham and Siri bull (Yangku, $n = 14$) and first backcross female hybrid from Jatsham and Siri bull (Yangkum, $n = 14$) as indicated in Table 1. For each animal, body morphology variables were measured as per Yakubu *et al.* ([2010](#)), Tolenkhomba *et al.* ([2012](#)) and FAO ([2012](#)) method. Herder assistance provided during the experiment minimized cattle handling problems.

Table 1. Indigenous cattle breeds in Bhutan

Sl. No	Sire	Dam	F1 progeny male	F1 progeny female
1	Thrapa	Thrabum	Thrapa	Thrabum
2	Mithun	Thrabum	Jatsha	Jatsham
3	Thrapa	Jatsham	Yangku	Yangkum

Statistical analysis

Shapiro-Wilk test (Manikandan, [2010](#)) of SPSS 16 (2007) was used to test for data normality. On deviation from the null hypothesis, data were transformed to log₁₀ anchored at 1 (Osborne, [2010](#)). Hereafter, all the statistical analyses were involved with the transformed data (Manikandan, [2010](#)) and then transformed to original data on completion of analysis. A dendrogram was constructed based on hierarchical clustering method.

RESULTS AND DISCUSSION

Shapes of the head and body linear traits measured in Jatsha and Mithun were higher among seven populations (Table 2). For instance, wither height was the tallest with 128.50 cm (Jatsha), followed by 127.96 cm (Mithun). While the shortest wither height in Thrabum were significantly different from the rest ($p < 0.05$). Similarly, body length, horn length, head length, arm length, ear length, elbow length and tail length in Thrabum were the lowest among the populations (Table 2). Furthermore, Jatsha and Jatsham were significantly higher in body measures than their parent except for lengths of ear, arm and head ($p < 0.05$). Overall, it was observed that the progeny of Siri cross Mithun have produced proportionately larger body and head size.

The body length, wither height, ear length, tail length, neck circumference, pes length and head length of Siri cow was lower than Manipur local cow (Tolenkhomba *et al.*, [2012](#)). Even, lengths of tail and head and neck circumference of Jatsham and Yangkum were lower than the above investigators. On the other hand, body length, wither height, ear length, neck length, elbow length, pes length, thigh length and arm length of Jatsham and Yangkum were comparatively greater than local cows of Maipur (Tolenkhomba *et al.*, [2012](#)). Three local cow populations have body and ear length which was closer to Red Chittagong cows in Bag *et al.* ([2010](#)) study. But, the length of horn (10.82 cm) and length of tail (92.29 cm) of Red Chittagong cows (Bag *et al.*, [2010](#)) was shorter and longer, respectively than the Bhutanese local cows.

Table 2. Body measurements in Bhutanese native population (mean ± SE)

Parameters (cm)	Jatsham	Jatsha	Yangkum	Yangku	Thrabum	Thrapa	Mithun
Body length	107.07±0.92 ^a	113.04±0.82 ^b	105.32±1.34 ^a	108.31±1.30 ^a	100.24±0.80 ^c	105.54±1.24 ^a	118.56±0.88 ^b
Wither height	124.45±0.72 ^a	128.50±1.00 ^a	113.91±1.02 ^b	115.10±2.21 ^b	101.11±1.04 ^c	110.94±1.48 ^b	127.96±0.99 ^a
Ear length	16.22±0.46 ^{ab}	18.09±0.47 ^{ab}	16.44±0.94 ^{ab}	17.10±0.38 ^{ab}	14.95±0.28 ^a	15.51±0.35 ^a	21.10±0.73 ^b
Tail length	80.89±0.71 ^a	87.12±1.38 ^c	71.16±1.45 ^b	71.02±1.50 ^b	67.23±1.42 ^b	71.56±1.44 ^b	81.36±2.32 ^{ac}
Neck circumference	56.82±0.52 ^a	62.92±0.92 ^c	56.47±1.40 ^a	55.44±1.17 ^a	46.44±0.91 ^b	54.53±1.17 ^a	68.70±2.00 ^c
Neck length	36.81±1.22 ^a	39.20±1.43 ^a	31.43±0.71 ^b	31.65±0.97 ^b	27.69±0.52 ^{bc}	27.34±0.55 ^c	39.98±1.20 ^a
Arm length	33.81±0.78 ^a	36.74±0.82 ^{abc}	33.17±0.96 ^{ab}	34.43±0.97 ^{ab}	31.28±0.61 ^a	33.35±0.96 ^{ab}	40.48±1.63 ^c
Elbow length	40.55±0.81 ^a	42.15±0.81 ^a	31.66±1.12 ^b	31.12±1.48 ^b	29.04±0.74 ^b	29.81±0.97 ^b	42.62±1.46 ^a
Thigh length	35.15±0.63 ^a	48.91±0.97 ^b	40.81±1.11 ^c	40.98±1.58 ^c	42.58±0.84 ^c	48.94±1.07 ^b	43.98±1.34 ^{bc}
Pes length	36.22±0.72 ^{ab}	38.50±0.69 ^{ab}	32.74±0.95 ^a	35.39±0.99 ^{ab}	24.44±0.65 ^c	23.66±0.88 ^c	37.80±1.87 ^{ab}
Head length	33.67±0.61 ^a	36.59±0.95 ^{ab}	32.37±0.77 ^a	34.73±0.80 ^{ab}	30.93±0.71 ^a	32.64±0.63 ^a	40.10±1.30 ^b
Horn length	27.45±0.79 ^c	36.46±0.75 ^d	19.73±0.71 ^b	31.64±0.97 ^e	14.71±0.61 ^a	17.69±0.63 ^b	31.38±1.46 ^{cde}

^{a, b, c, d, e} superscript row, level of significance at $p < .05$. SE, standard error

Thrapa and Yangku ear length of about 16 cm was close to Red Chittagong’s bull (Bag *et al.*, 2010) study. Body length of Red Chittagong bull measured 130 cm which is relatively longer than Bhutanese native bulls. On the other hand, tail and horn lengths of Red Chittagong’s bull were comparatively shorter than present findings. Mithun bull’s length of body, head and horn and height of wither from our present study were lower than the Northeast Indian Mithun (Gupta *et al.*, 1996). Differences in recorded traits from the earlier investigator could be attributed to breed, environment and husbandry condition variations. Data general trends represented for sexual dimorphism in all three populations. Body traits were significantly greater in some morphometric variables for male bulls (Table 2). This is in support to Gupta *et al.*, (1996) and Bag *et al.*, (2010) study. There were few exception; Siri bull’s neck length and pes length were shorter than the cow’s but, there were no significance of difference ($p < 0.05$). Yangkum were superior to Yangku in neck circumference, elbow length and tail length.

We could also classify the seven populations into two main clusters; first cluster consisting of Yangkum, Yangku, Thrabum, Thrapa and Jatsham while Jatsha and Mithun forms another group. The dendrogram informs that the first backcross hybrids (Yangku and Yangkum) were morphometrically closer to Siri (Thrapa and Thrabum). Genetically, backcross hybrids are supposed to be about 75% closer to Siri. Furthermore, a bigger distance was observed between Mithun and Siri (Figure 1). We may appropriately restate that the Bhutanese native cattle populations are morphological different from the neighbouring Indian state cattle hence, they should be important for conservation for effective utilization of cattle resources.

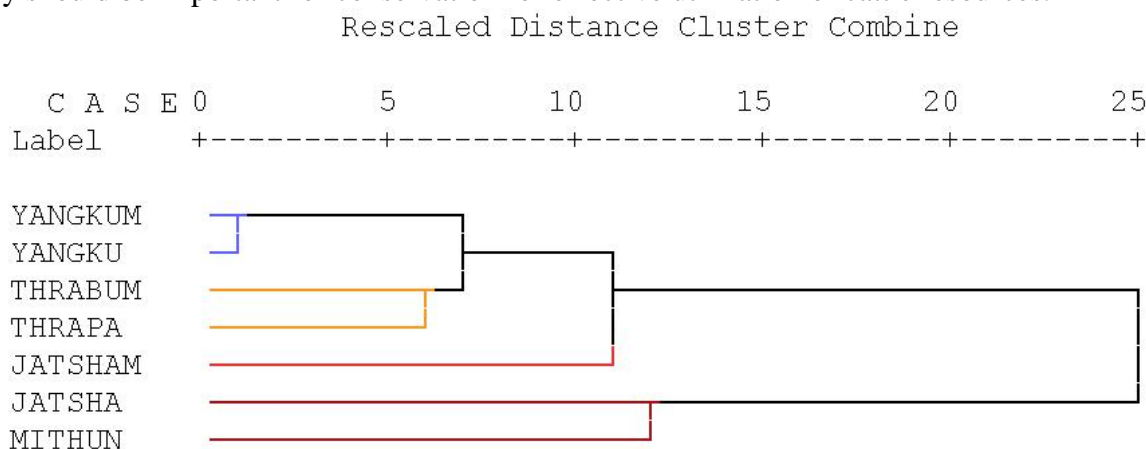


Figure 1. Dendrogram clustering among seven populations

CONCLUSION

Some physical body and head traits recorded for adult Bhutanese native cattle was alike to native cattle of Assam and Bangladesh but, variations exist which might be due to difference in breed, husbandry conditions and environment

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