MORPHOMETRIC CHARACTERISTICS OF RED CHITTAGONG CATTLE IN A NUCLEUS HERD

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Abstract

The present study was undertaken measuring a total of 78 animals of Red Chittagong Cattle (RCC) of different ages and sexes maintained under a USDA funded RCC project at Bangladesh agricultural University (BAU) Dairy Farm, Mymensingh. The experiment was conducted to estimate different body measurements of RCC at different age groups. A total of 12 different age groups at 6 months interval were considered for estimation. The age groups were 1-6, 7-12, 13-18, 19-24, 25-30, 31-36, 37-42, 43-48, 49-54, 55-60, 61-66 and 66+ months. Different body measurements were wither height, hip height, body length, chest diameter, chest width, hip width, thurl width and rump length. As expected, it was found that all measurements significantly increased (P<0.01) with the advancement of age. All the estimates reached in maximum level at the highest age class (66+ months) in this study except chest width and rump length (61-66 and 43-48 months class, respectively). It also observed that all the estimates were gradually increased with age, but the rate of increment varied for different measurements for different age groups. The results also revealed to conclude no definite ages at which the estimates reached a maximum level due to lack of animals of more than 66 months of age to composite further age groups.

Key words: Morphometric characteristics, RCC, Nucleus herd

Introduction

Most of the indigenous cattle in Bangladesh are of indicus type and are kept by the 80% of the rural people of the country. Depending upon the climate, soil type and availability of fodder, different types or variety of cattle genetic resources are available in different parts of the country like Non descript Deshi, Red Chittagong, Pabna, North Bengal Grey, Madaripur, Hilly and Munshigong (Bhuiyan *et al.,* 2005). But Red Chittagong Cattle (RCC) is one of the promising varieties of cattle genetic resource of Bangladesh. They attribute good qualities like good adaptability to traditional husbandry practices, subsistence on poor quality feeds and fodders, regularity in breeding and better resistance capabilities to withstand environmental stress and tropical diseases (Bhuiyan *et al.,* 2005). The bullocks of this breed are active, useful for light ploughing and carting and are remarkable for their speed and stamina. RCC possess some distinguishable features in their appearance and body characteristics. They are noble and handsome looking animals. Their power of draught and

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spirit of endurance are appreciable. The head of the RCC are somewhat erect with moderately long face. Well carried on short and stout neck rising over the withers into a medium and noticeable hump which is short in female and large in male while erect inclined vertically for both. Horns are medium and stumpy, tapering to a blunt point. Ears are moderately long and alert and slightly dropping. They possess medium and flesh dewlap which are fairly depth and broad between the fore arms. Clean leg but not so massive, well apart firmly and squarely set under the body. They are humped, especially male are big humped up to 6-8".

The morphometric measurement is conducted for the assessment of carcass quantity as well as to characterize breeds of animals. Live weight is an important trait in cattle farming. Weighing is not always feasible and therefore live weight is often estimated from easily accessible morphometric data (Coopman *et al*., 2009). Conformation is an indicator of carcass composition (Laville *et al*., 1995). Laville *et al*. (1996) studied the relationships among morphological traits and bovine carcass composition traits in order to select carcass measurements to derive equations for predicting muscle weight, percentage of muscle and muscle to bone ratio. The study on morphometric measurement is very scanty for the indigenous cattle of Bangladesh; however Namikawa *et al*. (1984); Habib *et al*. (2003); Al-Amin (2004); Hossain *et al*. (2006); Bhuiyan *et al*. (2007) and Bag *et al*. (2010) studied some morphometric characters for indigenous cattle of Bangladesh. Considering the aforesaid identification, the present research work was aimed to determine the morphometric characteristics of RCC reared in a nucleus herd at Bangladesh Agricultural University (BAU).

Materials and Methods

The study was conducted under a USDA funded Red Chittagong Cattle Project at BAU, Mymensingh. The morphological measurements were taken from 78 animals including different ages and sexes (Table 1) and were recorded for this study.

The feeding and management systems at the nucleus herd were almost similar because stall feeding was practiced throughout the year. Straw treated with urea and /molasses was the basal bulk diet supplied *ad lib* where green fodder were supplied very limited amount. Concentrate feeds such as oil cake, wheat bran, rice polish, corn, salt and vitamin-mineral premix mixture were also supplied @ 600 g/d/lactating cows, 500 g/d/pregnant cow, 400 g/d/dry and heifer and 250 g/d/calf. Animals were dewormed and vaccinated regularly according to prevailing diseases and parasites.

The present study covered different morphological characters which included wither height, hip height, body length, chest diameter, chest width, hip width, thurl width and rump length of animals of different ages and sexes at the nucleus herd. The description of those measurements is given in Table 2.

Table 1. Distribution of data set for measuring morphometric characters

Age class (month)	Male	Female	Total
1-6	4	6	10
7-12	3	4	7
13-18	3	6	9
19-24	1	3	4
25-30	1	3	4
31-36	0	5	5
37-42	0	4	4
43-48	0	4	4
49-54	0	5	5
55-60	0	8	8
61-66	0	7	7
66+	0	11	11
Total	12	66	78

Table 2. Description of different morphometric measurements of RCC

Trait	Description
Wither height	Vertical distance between the fetlock and the point of wither.
Hip height	Vertical distance between the fetlock and the point of hip bone.
Body length	Distance between points of shoulder to pin bone.
Chest diameter	It was the diameter surrounding the heart girth of the animal.
Chest width	Chest width was measured as the broadest portion of the chest.
Hip width	Distance between two hip bones of the animal.
Thurl width	Distance between pin bone to hip bone.
Rump length	Distance between parts of base of tail to hip bone

The animals were of different ages and there were both parents (male and female) and progeny groups. Therefore, there were sufficient unbalances in the data material. In other words, the numbers of observations were different from class to class. So, the statistical design of the study was non- orthogonal factorial in nature. For analyzing the data materials both simple descriptive statistics as well as Completely Randomized Design (CRD) with unequal sample sizes were used. For comparing means of the different sub-classes, least significant difference (LSD) test was applied using SPSS 11.5 computer program.

The mathematical equation followed for this analysis was as follows:

$$Y_{ijK} = \mu + S_i + A_j + e_{ijK}$$

Where Y_{ijK} = morphometric measurement of ith sex of jth age class of Kth animal.

μ = Population mean

S_i = Fixed effect of ith sex (1 = male and 2 = female)

A_j = Fixed effect of jth age class (j =1, 2, 3, ………….., 12)

e_{ijk} = Random residual error

Results and Discussion

Least squares means along with their standard errors of different mophometric measurements of the said traits of RCC at different ages were estimated (Table 3) and discussed below.

Table 3. Morphometric measurements of RCC for different age classes with level of significance

Age class (Month)	Measurement (cm)[1] (Mean ± SE)							
	WH	HH	BL	CD	CW	HW	TW	RL
1-6	72.29±.31	73.76±0.37	68.70±0.42	81.49±0.36	18.15±0.35	15.66±0.36	21.56±0.45	20.65±0.43
7-12	81.48±0.40	81.57±0.42	73.66±0.44	96.54±0.20	18.59±0.40	17.55±0.40	23.60±0.44	21.62±0.38
13-18	86.49±0.40	89.64±0.25	78.90±0.32	124.91±0.28	19.17±0.25	20.25±0.45	23.99±0.30	24.07±0.38
19-24	92.47±0.32	92.60±0.44	89.38±0.30	125.23±0.28	20.61±0.25	22.36±0.43	25.06±0.51	26.62±0.31
25-30	94.89±0.34	96.48±0.49	92.99±0.34	126.29±0.38	23.65±0.48	24.93±0.45	26.44±0.44	27.85±0.44
31-36	98.65±0.31	98.62±0.31	97.25±0.28	126.48±0.33	25.23±0.35	26.31±0.41	27.33±0.37	31.07±0.33
37-42	103.61±0.48	99.98±0.71	98.67±0.37	127.35±0.29	25.86±0.29	27.07±0.33	29.60±0.53	32.50±0.43
43-48	107.41±0.19	103.66±0.47	100.08±0.72	128.91±0.42	26.23±0.33	26.57±0.38	30.29±0.49	37.07±0.51
49-54	108.43±0.23	104.70±0.70	106.06±0.57	132.49±0.43	26.26±0.32	29.58±0.60	33.30±0.40	34.19±0.60
55-60	108.57±0.29	107.23±0.46	108.26±0.31	135.51±0.20	28.01±0.58	28.81±0.51	35.71±0.22	36.47±0.69
61-66	111.05±0.26	108.36±0.25	108.48±0.24	136.13±0.26	29.20±0.61	29.34±0.42	36.60±0.55	36.94±0.47
66+	112.21±0.56	109.82±0.49	110.60±0.45	137.22±0.48	28.82±0.45	30.69±0.50	37.95±0.48	33.26±0.49
Level of Sig.	**	**	**	**	**	**	**	**

[1]WH-wither height; HH-hip height; BL-body length; CD-chest diameter; CW-chest width; HW-hip width; TW-thurl width; RL-rump length; ** = Significance at P<0.01

Wither height

The result of wither height found in this study for age group of 43-48 months was closely agreed by Bag *et al.*, (2010); Hossain *et al.* (2006) and Habib *et al.* (2003) in their studies for body height (105.86 ± 5.25, 105.94 ± 2.17 and 107.71 ± 0.93 cm, respectively) in adult female of RCC. Bhuiyan *et al.* (2005) measured height at wither of adult RCC female and found 107.71 cm which also strongly supported the results of this study. The results of the present study were found to be lower than the results of Bhuiyan *et al.* (2007) for Pabna cows and Gaur *et al.* (2003) for Indian Ponwar cows who reported that the average wither height

of adult cows were 118.21 ± 3.25 and 109.0 ± 0.4 cm, respectively. Al-Amin (2004) however reported lower (93.91 ± 1.13 cm) estimate of wither height for North Bengal Grey cows. In this study, the wither height at 24 months of age was strongly supported by the result of Namikawa *et al.* (1984) who reported 100.32 ± 2.79 cm for Bangladeshi native cattle. In another study by Singh *et al.*, (2002) reported wither height for Indian Deoni cattle as 86.45 ± 1.87, 98.51 ± 3.46, 107.94 ± 2.32, 112.50 ± 2.23, 122.06 ± 2.39 and 122.22 ± 1.23 cm, respectively for the age groups of 4-6, 10-12, 13-18, 19-24, >24 and adult cows which were greater values than that of this study. Fig. 1 showed a gradual increasing trend (P<0.01) of measurements with progressing age.

Hip height

The hip heights of RCC at different ages are depicted in Table 3. Namikawa *et al.* (1994) measured hip height of Bangladeshi native cattle at more than two years old and found 103.37 ± 6.47 cm which agreed strongly by the result of this study. In contrast, Vinoo *et al.* (2003) reported hip height of Ongole cattle of India as 147.47 cm at 60 months of age. Statistical analyses of these measurements also revealed that the hip height of RCC was significantly increased (P<0.01) with advancement of age (Fig. 1).
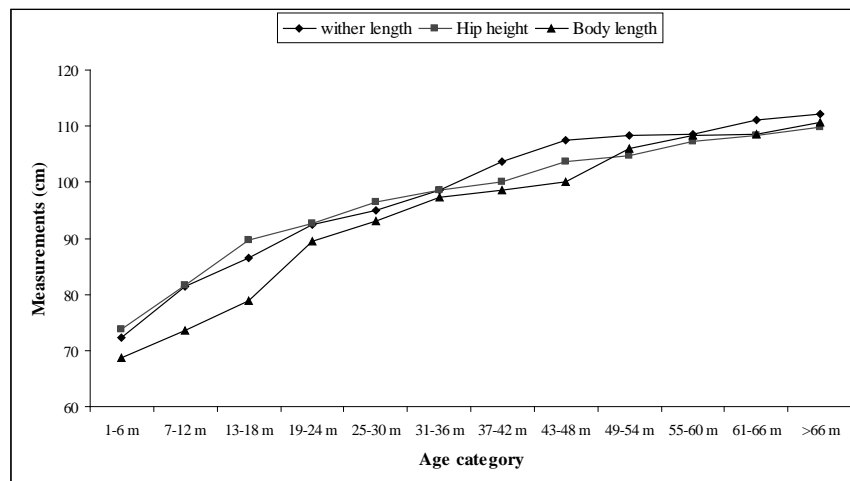

Fig. 1. Trends of body measurements according to age

Body length

The average body length of this study at 60 months of age was lower than the findings of Vnioo *et al.* (2003) who reported 144.11 cm for Ongole cattle at that age. The result was consistent for the age of 54 months by the results found by Al-Amin (2004) for North Bengal Grey cows (105.16 ± 1.21 cm), Hossain *et al.* (2006) for RCC (107.13 ± 2.17 cm) and Bag *et al.* (2010) for RCC (106.89 ± 3.58 cm). The result of this study were not in accordance with the results found by Habib *et al.* (2003) for RCC (114.38 ± 1.56 cm) and Bhuiyan *et al.* (2007) for Pabna cows (164.39 ± 2.36 cm). Singh *et al.* (2002) in their published literature reported body length for Indian Deoni cattle as 78.45 ± 1.86, 93.30 ± 2.34, 101.56 ± 1.50,

103.52 ± 2.59, 116.43 ± 2.06 and 120.11 ± 2.16 cm, respectively for the age groups of 4-6, 10-12, 13-18, 19-24, >24 and adult cows which were much higher values than the corresponding values found by this study. A significant (P<0.01) increasing trend with progressing age was found in this study for body length of RCC (Fig. 1).

Chest diameter

Bag *et al.*, (2010), Hossain *et al.* (2006) and Habib *et al.* (2003) reported heart girth of adult RCC female cows to be 136.88 ± 6.18, 136.90 ± 2.22 and 139.85 ± 1.63 cm, respectively which were closely in agreement by the result found in this study for the age of 66+ months (Table 3). Al-Amin (2004) reported 126.95 ± 1.53 cm heart girth for North Bengal Grey cattle which was smaller than this study; however Bhuiyan *et al.* (2007) found relatively larger heart girth (147.56 ± 1.70 cm) for Pabna cows in their studies. Namikawa *et al.* (1984) measured chest diameter of Bangladeshi native cattle at more than two years old to be 50.79 ± 2.45 cm which was much smaller than this study at this age. In another study by Singh *et al.*, (2002) reported chest girth for Indian Deoni cattle as 94.56 ± 3.85, 114.53 ± 3.31, 124.97 ± 2.73, 129.73 ± 5.31, 144.83 ± 2.81 and 151.82 ± 1.92 cm, respectively for the age groups of 4-6, 10-12, 13-18, 19-24, >24 and adult cows which partially agreed in particular ages by this study.

The analysis of variance showed a significant (P<0.01) increasing trend of chest diameter with advancement of age (Fig. 2).
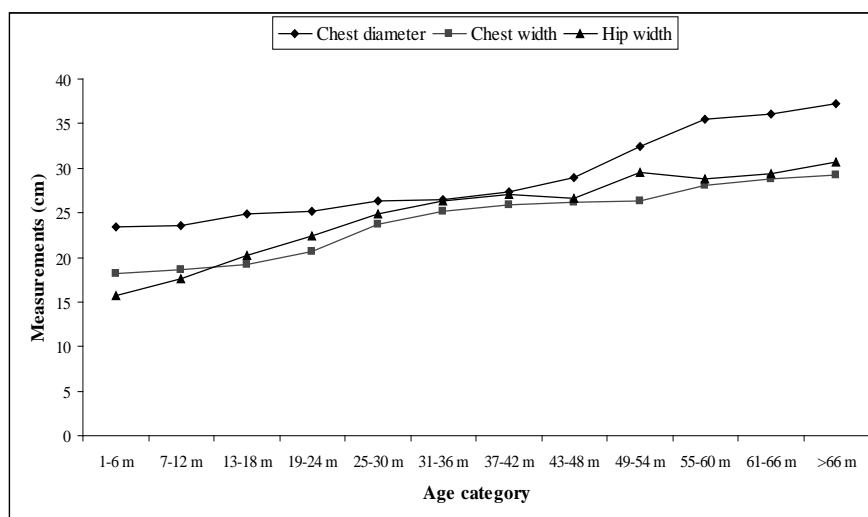

Fig. 2. Trends of body measurements according to age

Chest width

The chest widths at different ages are given in Table 3. Namikawa *et al.* (1984) measured chest width of Bangladeshi cattle and found to be 23.67 ± 3.07 cm at more than 2 years of age which strictly agreed by this study. Fig. 2 tended to increase (P<0.01) the chest width gradually and reached peak up to 61-66 months of age and declined slightly after that age.

Hip width

The hip widths of RCC at different ages are depicted in Table 3. Namikawa *et al.* (1984) reported hip width of Bangladeshi cattle to be 33.21 ± 2.05 cm at more than 2 years age which was not in agreement with this study. Statistical analysis of these measurements revealed that the hip width of RCC was significantly (P<0.01) increased with advancement of age (Fig. 2).

Thurl width

The measurements of thurl width of the said age classes are given in Table 3. Namikawa *et al.* (1984) found thrul width of Bangladeshi native cattle to be 30.07 ± 2.06 cm at more than 2 years age which agreed with the measurement of 43-48 months age group cows found in this study. Statistical analysis of these measurements showed significant (P<0.01) increase with advancement of age (Fig. 3).
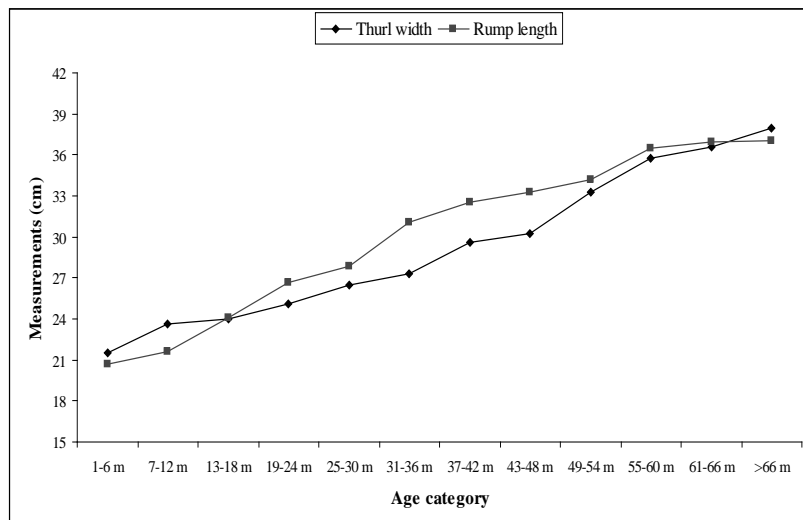

Fig. 3. Trends of body measurements according to age

Rump length

The rump lengths of RCC found from the animals of different ages are shown in Table 3. Namikawa *et al.* (1984) measured rump length of Bangladeshi native cattle at more than two years old and reported it to be 29.26 ± 6.12 cm which was closely in agreement with this study for the measurement of age group 25-30 months. Rump length increased significantly (P<0.01) with progressing age (Fig. 3).

Conclusion

From the results and discussion above, it was clear that all morphological measurements of RCC significantly increased (P<0.01) with the advancement of age. The growth of all

measurements, studied were linear up to final ages studied except chest width and rump length. However, the growth of chest width and rump length increased linearly up to 66 months of age and decreased thereafter. Although morphometric measurements in adult RCC compared to other indigenous cattle of Bangladesh and India were somewhat alike but variations existed might be due to differences of genetic make up of growth traits of different breeds or types and different feeding and management systems the animals are pertained to.

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