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Characterization of Black Bengal goat

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Abstract

Characterization of Black Bengal bucks and does was performed in this study. A total of 50 goats of different aged were studied. The experiment was performed in Black Bengal bucks and does at 1st day and at 3, 6, 9 and 12 months of age for measuring different parameters such as body length, heart girth, wither height, hip height, fore and hind leg length, head length and width, head length and width, ear length and ear breath, scrotal length and scrotal circumference. In a single parameter as body weight of Black Bengal bucks and does at 1st day and at 3, 6, 9 and 12 months of age were found to be 1.08±0.06, 5.22±0.33, 8.95±0.34, 12.05±0.47 and 14.20±0.20; and 1.01±0.23, 3.93±0.19, 7.41±0.27, 9.53±0.38 and 12.40±0.41 kg respectively. Whereas all the finding where gradually increased for all parameters according to their specific age periods. Body weight has a strong positive relationship with heart girth, body length, height at wither, scrotal length and scrotal circumference in Black Bengal goat. All the parameters studied found comparatively higher in bucks than does.

Keywords: Black Bengal goat, Characterization, Body parts, Analysis

Introduction

Bangladesh has only one goat breed of its own, known as the Black Bengal goat. It is estimated that more than 90% of goat population in Bangladesh comprised the Black Bengal goats, the remainder being Jamnapari and their crosses (Husain, 1993). There are wide variations in color, body size and weights of goats found in different locations. Black Bengal goats have different coat color variation i.e. black, brown, and white and any combination of those colors at any proportion (Nozawa and Katsumata (1984).

During selection of goat, attention should be given on the age, growth rate, body weight, heart girth, body length, height at wither and soundness of sexual organ.

Body length and heart girth may be used as good reliable predictors to assess live weight according to Bhattacharya *et al.* (1984) and Islam *et al.* (1991) reported that heart girth in males is a good predictor of live weight in Bengal goats. There was a correlation of body weight with length, height and heart girth in Black Bengal goats (Prasad *et al.,* 1981). Correlation of body weight with heart girth was highest and that was followed by length and height, respectively. Scrotal circumference has great value as indicator of genetic trait, puberty and total spermatozoa production (Ott, 1986). Determination of scrotal length and circumference is an important aspect of breeding soundness examination (BSE).

It is known that there are several important quantitative traits for goat. Among these birth weight and body weight of goats are considered as important. There is a positive correlation between birth weight and rate of growth, age at maturity and mature body weight which influence the future productive and reproductive performance of the animal (Banerjee, 1989). Husain *et al.* (1995) demonstrated that poor pre-weaning kid survivability could be improved by increasing birth weight of kids and milk yield of dam. In spite of promises of Black Bengal goat amongst the world goat genetic resource, the systematic information on genetic and phenotypic parameters in Black Bengal goat is very limited. No substantial work has yet been done on the morphological characterization and genetic evaluation of goat. It seems essential to identify and quantify the parameters by which Black Bengal goats can be described distinctively from others. The present work, therefore, was undertaken to study some basic morphological information of Black Bengal goats, relationship of body weight with heart girth, body length and height at wither and estimate heritability of growth traits.

Materials and Methods

Location of the experiment

The present experiment was conducted at the Artificial Insemination (AI) Center under the Department of Animal Breeding and Genetics, Bangladesh Agricultural University (BAU), Mymensingh.

Animals and their management

Two groups which contain twenty five of bucks and does of Black Bengal goats each (aged from 1 to 12 months) were used for morphological characterization and were under study were neck banded to maintain individual identity with separate data sheet for each animal. The goats were fed with Napier and/or German grass twice daily as per requirement. The feed was supplemented with concentrates (crude protein content: 120g/kg DM and energy content: 10.4 MJ ME/kg DM) in the morning and again in the afternoon at the rate of 100gm/ goat. Clean and safe water was made available at all time. The flock was maintained under semi-intensive system. The house was provided with necessary arrangement for feeding and watering with provision of sufficient access to fresh air and their movement freely. The bio-security was maintained as per routine procedure to maintain the farm to reduce the incidence of diseases. All goats were vaccinated against *Paste des Petits Ruminants* (PPR). Regular deworming was done with broad spectrum anthelmintic. Regular dipping with Nigotox^{R} (Trichlorfon, Dimethyl 2, 2, 2 trichloro-1-hydroxyethyl phosphonate USP 10 gm) was also performed in every month.

Body weight

Birth weight of animal was recorded within 12 hours of kidding. The body weight was recorded in the morning before the animals were fed.

Body measurements

In order to characterize and evaluate the Black Bengal goat, the following morphological characteristics were measured:

Body length, Heart girth, Height at wither, Hip Height, Fore and hind leg length, Head length and width, Ear length and breadth, Tail length, Scrotal length, Scrotal circumference. All measurements were taken by measuring tape.

Statistical Analysis

Mean and Standard errors (SE) for different traits were estimated with the help of statistical analysis system computer software (SAS, 1998) and correlation was performed using statistical package for social science 11.5 (SPSS 11.5) SPSS Inc. 1999, Microsoft Corporation, 1998) windows package.

Results and Discussion

Body weight

The body weight of bucks and does at 1st day and at 3, 6, 9 and 12 months of age are presented in Table 1 and 2. In all cases bucks' body weight are higher than does. Rahman (2007) reported that the body weight of male goats at birth and 9 months of age were 1.21 and 12.76 kg, respectively which strongly support the results of the present study. He also reported that the body weight at 3 and 6 months were 4.26 and 7.68 kg which are lower than the present study. Alam (2006) studied body weight of Black Bengal male and female, and reported that female goats were lighter (1.07 and 12.18 kg) than male goats (1.18 and 13.22 kg) at the age of birth and 12 months which strongly supported the present study. The live weights of male and female in this study were lower than the weights reported by Singh *et al.* (1987) which were 14.93 and 14.35 kg at 12 months of age. Mia *et al* (1993), Verma *et al.* (1991) studied birth weight of Bengal goats and their findings were 1.35 and 1.45 kg respectively. These results are slightly higher than the findings of the present study. Kanaujia and Pander (1988), Kumar and Singh (1983), Acharya (1982) reported that birth weight of Black Bengal goats were 1.13, 1.21 and 1.31 kg respectively. These results are almost similar to the findings of present study. The relationship of body weight with body length, heart girth, wither height, scrotal length and scrotal circumference for bucks are presented in Table 3 and 4 respectivly. In bucks, the body weight had highly significant correlation ($P<0.01$) with body length (0.954), heart girth (0.864), wither weight (0.937), scrotal length (0.950) and scrotal circumference (0.953) in Table 3. In does the body weight of female has highly significant correlation ($P<0.01$) with body length (0.973), hearth girth (0.847) and wither height (0.944). The findings of the present study strongly supports the results of Rahman (2007) who reported the almost similar correlation between body weight and heart girth (0.937), body weight and body length (0.939) as well as body weight and height at wither (0.934).

Table 1. Measurement of different body traits at varying age in Black Bengal buck

Age (month)	n	Body weight (kg) (Mean ±SE)	Body length (cm) (Mean ±SE)	Heart girth (cm) (Mean ±SE)	Wither height (cm) (Mean ±SE)	Hip height (cm) (Mean ±SE)	Fore leg length (cm) (Mean ±SE)	Hind leg length (cm) (Mean ±SE)	Head length (cm) (Mean ±SE)	Head Width (cm) (Mean ±SE)
1st day	13	1.08±0.06^{e}	19.69±0.69 ^{e}	24.38±0.87 ^{e}	22.62±0.96^{e}	23.31d±1.93 ^{e}	14.62±0.38 ^{e}	16.38±0.49^{d}	8.31±0.28^{c}	6.42±0.25 ^{bc}
3	13	5.22±0.33^{d}	31.23±0.63^{d}	39.42±0.89^{d}	35.04±0.86^{d}	37.85±0.95^{c}	20.42±0.44 ^{bc}	24.00±0.65^{c}	12.15±0.25^{b}	8.48±0.30^{b}
6	16	8.95±0.34^{c}	39.06±0.69^{c}	47.78±0.64^{c}	40.63±0.93^{c}	43.00±1.12^{b}	22.69±0.34^{b}	25.59±0.42^{bc}	14.83±0.87^{a}	11.50±0.37^{a}
9	6	12.05±0.47^{b}	42.83±0.31^{b}	52.00±1.03^{b}	43.42±0.37^{b}	44.42±0.58^{b}	24.33±0.17^{ab}	26.75±0.57^{b}	15.06±0.55^{a}	11.59±0.40^{a}
12	5	14.20±0.20^{a}	46.50±0.77^{a}	55.70±0.20^{a}	46.90±0.33^{a}	47.90±0.33^{a}	26.00±0.27^{a}	28.60±0.19^{a}	15.10±0.56^{a}	11.60±0.24^{a}

Table 1. Contd.

Age (month)	n	Ear length (cm) (Mean ±SE)	Ear breath (cm) (Mean ±SE)	Tail length (cm) (Mean ±SE)	Scrotal length (cm) (Mean ±SE)	Scrotal circumference (cm) (Mean ±SE)
1st day	13	6.69±0.30^{c}	3.56±0.17^{b}	5.31±0.28^{c}	1.81±0.11^{d}	4.73±0.32^{d}
3	13	9.73±0.28^{b}	4.92±0.18^{ab}	7.42±0.24^{b}	4.79±0.36^{c}	11.68±0.68^{c}
6	16	11.00±0.26^{a}	5.42±0.20^{a}	8.69±0.27^{ab}	7.81±0.20^{b}	16.78±0.30^{b}
9	6	12.03±0.25^{a}	5.63±0.13^{a}	8.83±0.31^{ab}	8.75±0.44^{a}	18.08±0.20^{a}
12	5	12.20±0.37^{a}	5.70±0.20^{a}	9.80±0.20^{a}	9.80±0.37^{a}	19.60±0.24^{a}

Means with different superscripts differed significantly within the column (P<0.05)
n = Number of observations

Body length

The body length of Black Bengal bucks and does are presented in Table 1 and 2. Body length significantly (p<0.05) differed in different age groups. In this study it was also observed that body lengths of bucks at different age groups are always higher than does. Hasanat *et al.* (2003) reported that the average body length of Black Bengal buck and doe were 47.07 and 44.99 cm at 12 months of age which strongly supports the present result. The average body length of the present study at 6, 9 and 12 months of age is lower than the findings of Alam (2006) who reported that the body length of Black Bengal bucks and does were (62.83, 67.18, 60.69 cm) and (58.77, 62.85, 66.95 cm) respectively at the same age groups. Hasanat *et al.* (2003) also reported that sex had significant influence (P<0.01) on body length. These results are very closer to that obtained in the present study but contradict with the results of Singh *et al.* (1987). It was observed that body lengths in male has highly significant correlation (P<0.01) with body weight (0.954), heart girth (0.784), wither height (0.890), scrotal length (0.931) and scrotal circumference (0.927) in Table 3. The relationship of body length with body weight, heart girth and wither height for does are presented in Table 4. From Table 4, it was observed that body length has highly significant correlation (P<0.01) with body weight (0.973), heart girth (0.848) and wither height (0.945). The findings of the present study supports the results of Rahman (2007) who found positive correlation between body weight and body length (0.939), heart girth (0.98) and wither height (0.969). The result of the present study was found to be higher than the findings of Khan *et al.* (1992) who found positive correlation between body weight and body length (0.64).

Hearth girth

In the present study, it was found that age has a significant effect (P<0.05) on hearth girth (Table 1 and 2). In this study, it was also found that hearth girth of bucks was higher than does at different age groups. The findings in this study at 12 months of age are similar with Hasanat (2003) who reported that the average hearth girth of bucks and does were 55.42 and 52.93 cm, respectively. Singh *et al.* (1987) observed the chest circumference in both male and female Black Bengal goats at 12 months of age to be 56.92 and 56.66 cm, respectively. The hearth girth reported by Singh *et al.* (1987) for male was almost similar but that of female was lower in comparison to present study. In another study, Rahman (2007) reported that heart girth of Black Bengal bucks at 1st day and at 6, 9 and 12 months of age were (26.35, 51.10, 54.26 and 59.08 cm), respectively, which is higher than the present experiment. This variation might be due to difference in variety, nutrition, genetic constitution and other managemental procedure.

Table 2. Measurement of different body traits at varying age in Black Bengal does

Age (months)	n	Body weight (kg) (Mean ±SE)	Body length (cm) (Mean ±SE)	Heart girth (cm) (Mean ±SE)	Wither height (cm) (Mean ±SE)	Hip height (cm) (Mean ±SE)	Fore leg length (cm) (Mean ±SE)	Hind leg length (cm) (Mean ±SE)
1st day	9	1.01 ± 0.23^{e}	19.11 ±1.22^{e}	22.28±1.16^{e}	21.44±1.0^{e}	23.00±1.05^{e}	13.33±0.53^{c}	15.67±0.76^{d}
3	10	3.93± 0.19^{d}	29.60 ±0.96^{d}	35.95±0.79^{d}	31.75±0.71^{d}	34.80±0.87^{d}	18.85±0.72^{bc}	22.80±0.57^{c}
6	12	7.41± 0.27^{c}	36.00±0.65^{c}	44.50±0.85^{c}	36.58±0.72^{c}	39.17±0.81^{c}	20.83±0.34^{b}	23.58±0.43^{b}
9	10	9.53± 0.38^{b}	39.60±0.60^{b}	48.10±0.80^{b}	39.40±0.75^{b}	42.00±0.54^{b}	22.20±0.36^{b}	25.15±0.26^{ab}
12	10	12.40± 0.41^{a}	42.15±0.55^{a}	53.40±0.83^{a}	43.10±0.74^{a}	46.50±0.93^{a}	24.10±0.43^{a}	26.60±0.54^{a}

Table 2. Contd.

Age (months)	n	Head length (cm) (Mean ±SE)	Head Width (cm) (Mean ±SE)	Ear length (cm) (Mean ±SE)	Ear breath (cm) (Mean ±SE)	Tail length (cm) (Mean ±SE)
1st day	9	8.50± 0.17^{c}	6.44± 0.36^{b}	6.22±0.31^{c}	3.26±0.20^{c}	4.17±0.37^{d}
3	10	12.15± 0.39^{b}	8.20± 0.35^{ab}	9.42± 0.32^{b}	4.85±0.11^{bc}	6.70±0.20^{c}
6	12	12.83± 0.35^{b}	8.50± 0.28^{a}	10.88± 0.15^{ab}	5.21± 0.13^{b}	7.88±0.15^{c}
9	10	14.05± 0.46^{a}	9.50± 0.22^{a}	11.65±0.21^{a}	5.23±0.11^{b}	8.25±0.20^{b}
12	10	15.10± 0.37^{a}	10.55± 0.28^{a}	11.90±0.29^{a}	5.40± 0.12^{a}	9.15±0.18^{a}

Means with different superscripts differed significantly within the column (P <0.05)
n = Number of observations

Heart girth of bucks have highly significant correlation (P<0.01) with body weight (0.864), body length (0.784), wither height (0.927), scrotal length (0.875) and scrotal circumference (0.923) in Table 3. It was observed from Table 4 that hearth girth of does has highly significant correlation (P<0.01) with body weight (0.84), body length (0.945) and heart girth (0.927). The result of the present study was found to be lower than the findings of Rahman (2007) who found positive correlation between body weight and heart girth (0.937). The findings of the present study also supports the result obtained by Tandon (1966) who reported significant association between chest girth and body weight in Beetal goats.

Table 3. Relationship of body weight with body length, hearth girth, wither height, scrotal length and scrotal circumference in Black Bengal buck

	Body weight	Body length	Heart girth	Wither height	Scrotal length
Body weight	-	-	-	-	-
Body length	0.954**	-	-	-	-
Heart girth	0.864**	0.784**	-	-	-
Wither height	0.937**	0.890**	0.927**	-	-
Scrotal length	0.950**	0.931**	0.875**	0.925**	-
Scrotal circumference	0.953**	0.927**	0.923**	0.938**	0.959**

** P<0.01

Table 4. Relationship of body weight with body length, hearth girth and wither height in Black Bengal does

	Body weight	Body length	Heart girth
Body weight	-	-	-
Body length	0.973**	-	-
Heart girth	0.847**	0.848**	-
Wither height	0.944**	0.945**	0.927**

** P<0.01

Wither height and Hip Height

In the present study it was observed that wither height and hip height significantly (P<0.05) differed with different age groups (Table 1 and 2). The higher wither height and hip height was attained by male than female at different age groups. Rahman (2006) reported that wither height of Black Bengal bucks at 6, 9 and 12 months of age were (39.95, 43.73 and 47.92 cm), respectively which strongly support the results of the present study. This research also reported that the wither height at 1st day and 3 months of age were 26.30 and 28.45 cm, respectively which are higher than the present study. Bhattacharya *et al.* (1984) reported wither height was 46.5 cm in Black Bengal goats which agrees with the result of this study. Majid *et al.* (1999) reported that the hip height of Black Bengal bucks and does at 6-12 months of age were 46.45 and 45.01 which strongly supports the present study. It was observed that wither height has highly significant correlation (P<0.01) with body weight (0.937), body length (0.890), hearth girth (0.927), scrotal length (0.890) and scrotal circumference (0.923) (Table 3). The wither height was highly significant correlation (P<0.01) with body weight (0.944), body length (0.945) and heart girth (0.927) (Table 4). The findings of the present study supports the results of Rahman (2007), Noran and Mukherjee (1997) and Singh *et al*. (1981) who reported that increase in height at wither reflected significantly (P<0.001) on the increase of body weight of the bucks.

Fore leg and hind leg length

From Table 1 and 2, it was also observed that the fore and hind leg lengths of bucks was always higher than the does. Rahman (2007) reported that the fore and hind leg lengths of Black Bengal bucks at 1st day, 6 and 9 months of age were (15.95, 23.67, 24.82 cm) and (17.90, 25.55, 27.29 cm), respectively which support the present study. This research also found that the fore and hind leg lengths at 3 months of age were 18.22 and 20.19 cm respectively which are lower than the present study. Alam (2006) reported that the fore leg and hind leg length of male and female at 6, 9 and 12 months of age were slightly higher than the results of present study. In this study the average fore leg lengths for buck and does at 12 months of age were 26.00 and 24.10 cm, respectively which supports the results of Hasanat *et al.* (2003) who reported the average hind leg lengths of male and female were 25.91 and 25.04 cm respectively.

Head length and width

It can be seen from Table 1 and 2, the head lengths and widths were significantly (P<0.05) different in different age groups on the other hand it was also observed that bucks possessed higher head lengths and breath than does at 6 and 9 months of age. Rahman (2007) reported that the head lengths and width of Black Bengal bucks at 1st day and at 3, 6, 9 and 12 months of age were (8.6, 12.05, 14.40, 15.39 and 16.67 cm) and (7.00, 7.85, 11.45, 11.70 and 12.33 cm), respectively which support the present study. Hasanat (2003) reported that the head length of male and female at 12 months of age were 15.53 and 15.49 cm which are very close to the results of the present study. Rahman (2007) found the lower the head width of Black Bengal male and female at 12 months of age than the present study.

Ear length and Ear breathe

From the Table 1 and 2, it was observed that the ear length and breaths of bucks and does did not differ significantly (P>0.05). Similar results were also reported by Rahman (2007) and Alam (2006). Hasanat *et al.* (2003) reported the average ear length and breadth of Black Bengal bucks and does at 12 months of age were (12.87, 5.54) and (12.75, 5.43) cm, respectively which are in close agreement with the results of this study.

Scrotal length and circumference

The scrotal length and circumference at 12 months of age was significantly (P<0.05) higher than that of other age groups (Table 1). Rahman (2007) reported that the scrotal circumference of Black Bengal bucks at 1st day and at 3, 6, 9 and 12 months of age were (4.85, 10.35, 15.42, 18.05 and 19.72 cm) which strongly support the results of the present study. Samsuddin *et al.* (2000) reported that the mean scrotal circumference of Black Bengal buck at puberty ranged from 14.0 to 16.0 cm which strongly supports the

results of the present study. The scrotal length has highly significant correlation (P<0.01) with body weight (0.950), body length (0.931), heart girth (0.875), wither height (0.925) and scrotal circumference (0.959) (Table 3). It was also observed that scrotal circumference has highly significant correlation (P<0.01) with body weight (0.953), body length (0.927), heart girth (0.923), wither height (0.938) and scrotal length (0.959).

It would be worthwhile to investigate the genetic characterization of Black Bengal goat, blood protein polymorphism and base sequence of DNA and a country wide study is required to recommend the characterization of Black Bengal goats.

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