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***Research Article***

# COMPARATIVE BIOMETRICS AND PERFORMANCES OF THREE COLOUR VARIETIES OF BENGAL GOATS IN THEIR HOME TRACT

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**ABSTRACT: A study has been done in Nadia district, West Bengal, India during January, 2010 to December, 2013 with specific objective to know the comparative biometrics and performances of three colour varieties of Bengal goats in their home tract. The results have been revealed that male goats were significantly ($p \leq 0.05$) heavier than their female counterparts at all the age groups of three color varieties of Bengal goats studied *viz*., at birth and at 3, 6, 9, and 12 months of age and also in all types of birth *viz*., singlet, twins and triplets. Results indicated that the effect of types of birth on birth weight and weight at 3, 6, 9 and 12 months of age was also statistically significant ($p \leq 0.05$). The effect of coat color (black, brown and white) on birth weight and subsequent body weight at 3, 6, 9 and 12 months of age was significant ($p \leq 0.05$), the weight of White Bengal goat being heavier followed by Brown Bengal goat and then Black Bengal goat at different stages of life. All the body measurements, *viz*., body length, height at wither, chest girth, ear length, horn length and tail length in three color varieties of Bengal goats were increased with age in both the sexes. The body measurements traits studied were statistically significant ($p \leq 0.05$) between the male and female in all age groups of three color varieties of Bengal goats where males showed higher measurements than their female counterparts. All the body measurements traits were significantly ($p \leq 0.05$) different in all age groups among three color varieties of Bengal goats. White Bengal goats showed higher ($p \leq 0.05$) linear measurements in all the traits in all age groups studied followed by Brown Bengal and Black Bengal goats.**

**Keywords:** Biometrics, Performances, Bengal goats, Coat color varieties.

## INTRODUCTION

India is rich in goat population (16.7% of world share) and its genetic biodiversity (FAO 2010). There are 24 recognized breeds of goats in India (NBAGR 2015). On the other hand, the state of West Bengal has the 4th highest goat

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population of 1.15 crores in the country with 8.51% of the country's share (19th All India Livestock Census, 2012), but it has only one recognized breed, *viz.*, Bengal goat. Many reports are available on the characterization of Black Bengal goats. However, information about the other two color varieties of Bengal goats (Brown and White) under village conditions is not commonly found in the available literatures. Keeping in view of its importance a study is being proposed to know the comparative biometrics and performance of three colour varieties of Bengal goats in their home tract.

## MATERIALS AND METHODS

The present research work was done in Nadia district of West Bengal during January, 2010 to December, 2013. Nadia district lies between 22°52' 30" and 24°05'40" parallels of North latitudes and 22°08'10" and 88°48'15" meridians of East Longitudes. Considering the need for availability of data and accessibility of the area, two Gram Panchayats of the Nadia district, West Bengal, India were selected purposively for the present study. Five villages of each of the Gram Panchayats were considered. These were Basantapur, Dogachhia, Ghoragachha, Katabelia and Teligachha villages of Saguna Gram Panchayat and Mollabelia, Panpur, Kurumbelia, Nischintapur and Madhpur villages of Mollabelia Gram Panchayat. The study area is located in hot-humid zone having three distinct seasons, *viz.*, summer (March to June), monsoon (July to October) and winter (November to February). From each of the selected villages, 20 respondents were selected randomly. In this way 200 respondents selected from 10 villages of the two Gram Panchayats have been constituted the sample of the present study. For biometrical characterization, a total of seven hundred fifty Bengal goats of the three color varieties (250 Black, 250 Brown and 250 White) were selected irrespective to sex from 200 families from 10 villages of the two Gram Panchayats. All the animals under study were neck tagged to maintain individual identity. Separate data sheet for each animal was maintained for recording data. Bengal goats aged from birth to 12 months were used for morphometric characterization. The parameters were measured in five age groups of the three color varieties of Bengal goats as at birth, 3, 6, 9 and 12 months. In order to evaluate the goat morphometrically, body weight, body length, height at wither, chest girth, ear length, horn length and tail length of both males and females of three color varieties were measured. Birth weight of animal was recorded within 12 hours of kidding. Growth of individual kid was measured in terms of its body weight in the subsequent periods profiled *viz.*, 30 day weight, 90 day weight, 180 day weight, 270 day weight and 365 day weight as included in the present investigation, both males and females being recorded to examine the sex effect. The body weight was taken in the morning hours when no feed was offered to kids/goats or before the kids/goats were allowed for grazing. The oblique length between the shoulder point and pin bone constituted the body length. The distance between the ground and the level of wither was taken as height at wither of the animal. The circumference as measured surrounding the heart just behind the elbow constituted the heart girth of the animal. Ear length is measured from tip of the ear to base of ear. Horn length is measured from tip of the horn to base of horn. Tail length is measured

from tip of the tail to base of tail. The data collected for the study were compiled, tabulated and analyzed following the standard procedures (Snedecor and Cochran 1967).

## RESULTS AND DISCUSSION

### Body weight of three color varieties of Bengal goats

Body weights of male and female of three color varieties of Bengal goats at birth and at 3, 6, 9 and 12 months of age are presented in Table 1.

The results have been revealed that male goats were significantly ($p \leq 0.05$) heavier than their female counterparts at all the age groups of three color varieties of Bengal goats studied *viz*., at birth and at 3, 6, 9, and 12 months of age and also in all types of birth *viz*., singlet, twins and triplets. Heavier weight of male kids at birth might be due to the anabolic effect of male sex hormones during the prenatal development. This trend was continued during the later part of life. This may be due to aggressive behavior of males during feeding and suckling mother along with anabolic effect of male sex hormone. Similar observations were reported by Koratkar *et al*. (1998) in Osmanabadi goat, Husain *et al*. (1996) in goats of Bangladesh, Ghosh *et al*. (1994) in Bengal goats, and Nahardeka (1994) in Assam local goats and their crosses with Beetal.

Results indicated that the effect of types of birth on birth weight and weight at 3, 6, 9 and 12 months of age was also statistically significant ($p \leq 0.05$). The lighter weight of triplets and twins at birth may be due competition for favorable nutrients and space in the prenatal environment. Higher body weight in singlet at the later part of life may also be due to the availability of more nutrition for a single kid provided by its mother during suckling period. Similar variations due to 'type of birth–effect' were also reported by Malik and Kanaujia (1991) in Beetal goats, Ghosh *et al*. (1994) in Bengal goats, Koratkar *et al*. (1998) in Osmanabadi goat and Ghosh *et al*. (2001) in Black Bengal goats.

From the table it is revealed that the effect of coat color (black, brown and white) on birth weight and subsequent body weight at 3, 6, 9 and 12 months of age was significant ($p \leq 0.05$), the weight of White Bengal goat being heavier followed by Brown Bengal goat and then Black Bengal goat at different stages of life.

### Body measurements of three color varieties of Bengal goats

Body measurements, *viz*., body length, height at wither and chest girth, and ear length, horn length and tail length of three color varieties of Bengal goats at birth and at 3, 6, 9 and 12 months of age in male and female are presented in Table 2 and Table 3.

Analysis of the data revealed that all the body measurements, *viz*., body length, height at wither, chest girth, ear length, horn length and tail length in three color varieties of Bengal goats were increased with age in both the sexes. The body measurements traits studied were statistically significant ($p \leq 0.05$) between the male and female in all age groups of three color varieties of Bengal goats where males showed higher measurements than their female counterparts. It is expected from any such study. This result was supported by Gyaneshwari *et al*. (2007) on the basis of their work on Black Bengal goats.

Results indicated that all the body measurements traits were significantly ($p \leq 0.05$) different in all age groups among

**Table 1. Body weight of three colour varieties of Bengal goats (mean ± SE).**

| Body weight (kg) (Mean ± SE) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | | Birth | | | 3 Month | | | 6 Month | | | 9 Month | | | 12 Month | | |
| Birth type | | Singlet | Twins | Triplets | Singlet | Twins | Triplets | Singlet | Twins | Triplets | Singlet | Twins | Triplets | Singlet | Twins | Triplets |
| Sex | Male | 1.278± 0.014 | 1.187± 0.014 | 1.047± 0.012 | 4.02± 0.057 | 3.56± 0.044 | 3.45± 0.089 | 6.26± 0.052 | 5.68± 0.065 | 5.63± 0.082 | 10.21± 0.095 | 10.15± 0.102 | 10.07± 0.097 | 13.46± 0.048 | 13.34± 0.021 | 13.30± 0.019 |
| | Female | 1.209± 0.012 | 1.061± 0.016 | 0.964± 0.012 | 3.87± 0.049 | 3.43± 0.022 | 3.21± 0.084 | 6.02± 0.029 | 5.48± 0.080 | 5.39± 0.088 | 9.86± 0.098 | 9.87± 0.096 | 9.90± 0.083 | 13.04± 0.063 | 12.94± 0.018 | 13.01± 0.027 |
| Color | Black | 1.168± 0.009 | 1.056± 0.022 | 0.972± 0.015 | 3.55± 0.082 | 3.16± 0.036 | 3.14± 0.019 | 5.49± 0.025 | 5.46± 0.063 | 5.30± 0.020 | 9.59± 0.073 | 9.40± 0.056 | 9.38± 0.040 | 12.53± 0.052 | 12.41± 0.045 | 12.51± 0.024 |
| | Brown | 1.251± 0.156 | 1.152± 0.018 | 1.017± 0.018 | 4.12± 0.025 | 3.52± 0.027 | 3.32± 0.019 | 6.40± 0.028 | 5.45± 0.024 | 5.42± 0.014 | 10.01± 0.009 | 10.15± 0.043 | 10.13± 0.018 | 13.59± 0.019 | 13.46± 0.016 | 13.41± 0.056 |
| | White | 1.312± 0.0109 | 1.164± 0.021 | 1.029± 0.017 | 4.17± 0.021 | 3.81± 0.025 | 3.52± 0.058 | 6.54± 0.036 | 5.84± 0.031 | 5.81± 0.024 | 10.50± 0.045 | 10.48± 0.018 | 10.45± 0.016 | 13.63± 0.074 | 13.56± 0.079 | 13.55± 0.057 |
| Black | Male | 1.201± 0.009 | 1.111± 0.023 | 1.007± 0.019 | 3.71± 0.121 | 3.19± 0.056 | 3.20± 0.016 | 5.59± 0.014 | 5.55± 0.014 | 5.35± 0.012 | 9.91± 0.013 | 9.59± 0.056 | 9.45± 0.010 | 12.76± 0.011 | 12.60± 0.013 | 12.61± 0.008 |
| | Female | 1.136± 0.007 | 1.000± 0.028 | 0.936± 0.017 | 3.39± 0.092 | 3.12± 0.043 | 3.09± 0.022 | 5.38± 0.009 | 5.36± 0.013 | 5.24± 0.010 | 9.27± 0.012 | 9.22± 0.013 | 9.31± 0.012 | 12.31± 0.011 | 12.22± 0.010 | 12.41± 0.025 |
| Brown | Male | 1.289± 0.021 | 1.215± 0.011 | 1.058± 0.020 | 4.16± 0.034 | 3.60± 0.027 | 3.39± 0.016 | 6.51± 0.011 | 5.58± 0.015 | 5.52± 0.010 | 10.02± 0.014 | 10.21± 0.010 | 10.19± 0.010 | 13.67± 0.011 | 13.52± 0.010 | 13.50± 0.111 |
| | Female | 1.213± 0.016 | 1.089± 0.021 | 0.975± 0.023 | 4.09± 0.033 | 3.44± 0.028 | 3.25± 0.014 | 6.28± 0.017 | 5.32± 0.011 | 5.32± 0.010 | 9.99± 0.011 | 10.09± 0.012 | 10.07± 0.009 | 13.52± 0.010 | 13.39± 0.010 | 13.31± 0.026 |
| White | Male | 1.345± 0.014 | 1.234± 0.014 | 1.076± 0.020 | 4.20± 0.027 | 3.90± 0.015 | 3.76± 0.013 | 6.69± 0.020 | 5.90± 0.014 | 6.01± 0.012 | 10.69± 0.011 | 10.66± 0.018 | 10.58± 0.015 | 13.95± 0.012 | 13.91± 0.010 | 13.80± 0.050 |
| | Female | 1.278± 0.005 | 1.093± 0.023 | 0.981± 0.019 | 4.14± 0.031 | 3.72± 0.024 | 3.29± 0.040 | 6.39± 0.014 | 5.77± 0.019 | 5.60± 0.011 | 10.30± 0.010 | 10.31± 0.011 | 10.32± 0.016 | 13.31± 0.009 | 13.22± 0.009 | 13.31± 0.055 |

**Table 2. Body measurements (body length, height at wither and chest girth) of three colour varieties of Bengal goats (mean ± SE).**

| Parameters | | Body length (cm) | | | | | Height at wither (cm) | | | | | Chest girth (cm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | | Birth | 3 month | 6 month | 9 month | 12 month | Birth | 3 month | 6 month | 9 month | 12 month | Birth | 3 month | 6 month | 9 month | 12 month |
| Sex | Male | 19.24± 0.080 | 30.42± 0.041 | 38.73± 0.062 | 42.16± 0.077 | 45.57± 0.041 | 21.04± 0.041 | 34.80± 0.062 | 39.90± 0.077 | 42.94± 0.041 | 46.13± 0.062 | 23.05± 0.062 | 38.86± 0.077 | 46.83± 0.041 | 51.71± 0.062 | 55.04± 0.077 |
| | Female | 18.97± 0.135 | 29.31± 0.122 | 35.65± 0.076 | 38.72± 0.089 | 41.36± 0.122 | 20.86± 0.122 | 30.87± 0.076 | 35.86± 0.089 | 38.79± 0.122 | 43.65± 0.076 | 22.93± 0.076 | 35.04± 0.089 | 43.79± 0.122 | 47.76± 0.076 | 53.07± 0.089 |
| Color | Black | 19.05± 0.037 | 29.63± 0.124 | 36.88± 0.375 | 40.25± 0.387 | 43.27± 0.490 | 20.52± 0.029 | 32.42± 0.497 | 37.57± 0.467 | 40.47± 0.481 | 45.04± 0.255 | 22.72± 0.026 | 36.64± 0.432 | 45.08± 0.347 | 49.53± 0.444 | 53.87± 0.261 |
| | Brown | 19.09± 0.041 | 29.78± 0.130 | 37.15± 0.350 | 40.28± 0.388 | 43.45± 0.486 | 20.77± 0.040 | 32.68± 0.479 | 37.70± 0.476 | 40.66± 0.485 | 44.73± 0.261 | 22.92± 0.025 | 36.74± 0.440 | 45.23± 0.346 | 49.72± 0.467 | 53.88± 0.241 |
| | White | 19.18± 0.039 | 30.18± 0.136 | 37.55± 0.341 | 40.79± 0.411 | 43.67± 0.478 | 21.56± 0.033 | 33.41± 0.377 | 38.37± 0.450 | 41.46± 0.465 | 44.91± 0.436 | 23.34± 0.021 | 37.48± 0.443 | 45.62± 0.358 | 49.96± 0.452 | 54.42± 0.272 |
| Black | Male | 19.16± 0.046 | 30.15± 0.044 | 38.51± 0.029 | 41.93± 0.043 | 45.40± 0.047 | 20.58± 0.033 | 34.58± 0.046 | 39.60± 0.053 | 42.56± 0.047 | 45.72± 0.038 | 22.79± 0.034 | 38.52± 0.038 | 46.59± 0.044 | 51.46± 0.043 | 54.61± 0.046 |
| | Female | 18.94± 0.031 | 29.10± 0.041 | 35.25± 0.048 | 38.56± 0.046 | 41.14± 0.056 | 20.46± 0.039 | 30.26± 0.031 | 35.54± 0.057 | 38.38± 0.043 | 44.35± 0.411 | 22.64± 0.023 | 34.76± 0.020 | 43.57± 0.036 | 47.60± 0.035 | 53.13± 0.403 |
| Brown | Male | 19.22± 0.041 | 30.34± 0.026 | 38.66± 0.044 | 41.97± 0.042 | 45.57± 0.045 | 20.91± 0.036 | 34.77± 0.030 | 39.78± 0.13 | 42.77± 0.046 | 45.87± 0.036 | 22.98± 0.033 | 38.66± 0.027 | 46.74± 0.046 | 51.75± 0.037 | 54.92± 0.031 |
| | Female | 18.96± 0.039 | 29.23± 0.049 | 35.63± 0.040 | 38.59± 0.037 | 41.34± 0.024 | 20.62± 0.030 | 30.60± 0.035 | 35.63± 0.10 | 38.54± 0.042 | 43.60± 0.034 | 22.85± 0.023 | 34.83± 0.025 | 43.73± 0.032 | 47.68± 0.039 | 52.84± 0.052 |
| White | Male | 19.34± 0.024 | 30.77± 0.031 | 39.03± 0.036 | 42.58± 0.031 | 45.75± 0.047 | 21.64± 0.026 | 35.05± 0.037 | 40.33± 0.11 | 43.48± 0.035 | 46.81± 0.037 | 23.38± 0.027 | 39.41± 0.027 | 47.17± 0.033 | 51.92± 0.041 | 55.60± 0.046 |
| | Female | 19.03± 0.028 | 29.60± 0.036 | 36.06± 0.054 | 39.00± 0.034 | 41.60± 0.045 | 21.49± 0.051 | 31.77± 0.046 | 36.41± 0.11 | 39.43± 0.042 | 43.01± 0.035 | 23.30± 0.028 | 35.55± 0.046 | 44.06± 0.025 | 47.99± 0.042 | 53.24± 0.027 |

**Table 3. Body measurements (ear length, horn length and tail length) of three colour varieties of Bengal goats (mean ± SE).**

| Parameters | | Ear length (cm) | | | | | Horn length (cm) | | | | Tail length (cm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | | Birth | 3 month | 6 month | 9 month | 12 month | 3 month | 6 month | 9 month | 12 month | Birth | 3 month | 6 month | 9 month | 12 month |
| Sex | Male | 6.6± 0.022 | 9.63± 0.035 | 10.98± 0.038 | 11.93± 0.033 | 12.07± 0.040 | 1.12± 0.021 | 2.37± 0.020 | 3.65± 0.025 | 4.33± 0.052 | 4.44± 0.060 | 7.16± 0.037 | 8.73± 0.049 | 8.92± 0.052 | 9.90± 0.042 |
| | Female | 6.36± 0.017 | 9.52± 0.028 | 10.87± 0.036 | 11.83± 0.021 | 11.98± 0.028 | 1.01± 0.029 | 2.22± 0.024 | 3.52± 0.020 | 4.09± 0.046 | 4.21± 0.043 | 7.00± 0.042 | 7.91± 0.053 | 8.26± 0.041 | 9.23± 0.038 |
| Color | Black | 6.3± 0.060 | 9.38± 0.103 | 10.86± 0.022 | 11.81± 0.026 | 12.00± 0.023 | 1.02± 0.026 | 2.20± 0.033 | 3.38± 0.032 | 4.03± 0.032 | 4.23± 0.035 | 6.97± 0.046 | 8.30± 0.076 | 8.55± 0.079 | 9.51± 0.085 |
| | Brown | 6.4± 0.023 | 9.65± 0.033 | 10.92± 0.023 | 11.84± 0.025 | 11.98± 0.057 | 1.04± 0.023 | 2.24± 0.037 | 3.58± 0.024 | 4.21± 0.045 | 4.35± 0.044 | 7.05± 0.038 | 8.26± 0.118 | 8.60± 0.088 | 9.54± 0.075 |
| | White | 6.6± 0.015 | 9.69± 0.016 | 11.00± 0.027 | 11.99± 0.025 | 12.09± 0.028 | 1.14± 0.025 | 2.45± 0.033 | 3.79± 0.027 | 4.39± 0.042 | 4.40± 0.040 | 7.21± 0.036 | 8.40± 0.099 | 8.62± 0.073 | 9.66± 0.079 |
| Black | Male | 6.6± 0.014 | 9.53± 0.128 | 10.91± 0.026 | 11.88± 0.022 | 12.02± 0.034 | 1.07± 0.035 | 2.25± 0.047 | 3.45± 0.039 | 4.11± 0.036 | 4.30± 0.051 | 6.99± 0.071 | 8.62± 0.025 | 8.88± 0.030 | 9.86± 0.036 |
| | Female | 6.1± 0.011 | 9.23± 0.153 | 10.80± 0.026 | 11.74± 0.038 | 11.99± 0.031 | 0.97± 0.031 | 2.15± 0.044 | 3.31± 0.041 | 3.95± 0.039 | 4.16± 0.040 | 6.94± 0.061 | 7.98± 0.031 | 8.22± 0.045 | 9.16± 0.045 |
| Brown | Male | 6.59± 0.013 | 9.64± 0.061 | 10.98± 0.026 | 11.91± 0.026 | 12.07± 0.055 | 1.08± 0.032 | 2.32± 0.050 | 3.64± 0.034 | 4.34± 0.041 | 4.49± 0.051 | 7.15± 0.050 | 8.76± 0.021 | 8.96± 0.047 | 9.85± 0.022 |
| | Female | 6.40± 0.012 | 9.67± 0.029 | 10.86± 0.027 | 11.77± 0.031 | 11.89± 0.094 | 1.00± 0.028 | 2.17± 0.045 | 3.52± 0.024 | 4.08± 0.057 | 4.21± 0.035 | 6.96± 0.039 | 7.75± 0.040 | 8.24± 0.038 | 9.23± 0.040 |
| White | Male | 6.68± 0.015 | 9.72± 0.018 | 11.05± 0.044 | 12.01± 0.036 | 12.13± 0.044 | 1.22± 0.025 | 2.55± 0.045 | 3.87± 0.035 | 4.55± 0.031 | 4.53± 0.047 | 7.34± 0.031 | 8.82± 0.028 | 8.92± 0.032 | 10.00± 0.019 |
| | Female | 6.58± 0.010 | 9.65± 0.020 | 10.95± 0.026 | 11.97± 0.034 | 12.05± 0.032 | 1.06± 0.022 | 2.36± 0.025 | 3.72± 0.027 | 4.23± 0.027 | 4.26± 0.028 | 7.09± 0.034 | 7.99± 0.044 | 8.32± 0.035 | 9.32± 0.023 |

the three color varieties of Bengal goats. White Bengal goats showed higher ($p \leq 0.05$) linear measurements in all the traits in all age groups studied followed by Brown Bengal and Black Bengal goats.

## CONCLUSION

On the basis of results of current study, it can be concluded that the singlet was significantly ($p \leq 0.05$) heavier followed by twin and triplet at birth and also at subsequent ages (at 3 month, 6 month, 9 month and 12 months) in all the three color varieties of Bengal goats. So far coat color was considered, in general White Bengal goats were heavier at different age groups, followed by Brown and Black. Sex difference was also significant ($p \leq 0.05$); males were heavier than their female counterparts. Different body measurements were significantly varied ($p \leq 0.05$) in three color varieties of the breed.

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