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Original Article

The Growth Performance of Black Bengal goat in Village Condition of Bangladesh

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Keywords

Black Bengal goat, sex, type of birth, parity of dam, season

A B S T R A C T

The study was conducted about the growth performance of Black Bengal goat in village condition at Savar Upazila under the Dhaka District from June/2017 to April/2018. Least-squares means for body weights at birth, 3, 6, 9 and 12 months of ages were 1.10, 5.02, 8.41, 10.41 and 12.42 kg respectively. Sex has highly significant ($p < 0.01$) effect on the body weight at 3 months (5.22 ± 0.04 and 4.77 ± 0.04 kg), 6 months of ages (8.74 ± 0.04 and 7.96 ± 0.04 kg) and sex has significant ($p < 0.05$) effect on the body weight at 9 months (10.66 ± 0.09 and 10.10 ± 0.10 kg) and 12 months (12.88 ± 0.06 and 11.82 ± 0.07 kg) respectively male and female. Type of birth has highly significant ($p < 0.01$) effect on body weight at birth, 3, 6, 9 and 12 months. Parity has highly significant ($p < 0.01$) body weight at 3 months (4.95 ± 0.05, 5.04 ± 0.04 and 5.08 ± 0.05 kg) and 12 months (12.21 ± 0.67, 12.39 ± 0.08 and 12.67 ± 0.07 kg) and significant ($p < 0.05$) effect at birth weight (0.94 ± 0.01, 0.95 ± 0.01 and 0.97 ± 0.01 kg) and 6 months body weight (8.29 ± 0.06, 8.37 ± 0.05 and 8.54 ± 0.05 kg) respectively at 1st, 2nd and 3rd parity. Season has a highly significant ($P < 0.01$) effect in birth weight (0.91 ± 0.01, 0.99 ± 0.01 and 0.97 ± 0.01 kg), 3 months (4.87 ± 0.04, 5.22 ± 0.04 and 4.89 ± 0.06 kg), 12 months (12.21 ± 0.06, 12.65 ± 0.07 and 12.30 ± 0.10 kg) and season has significant effect ($P < 0.05$) at 6 months body weights (8.20 ± 0.04, 8.63 ± 0.05 and 8.23 ± 0.07 kg) respectively in winter, summer and rainy season. It can be concluded that male type of sex, single type kid, third parity of dam and summer season was better.

Introduction

In developing country like Bangladesh the production of goat meat is the primary objective. The domestic goat (*Capra hircus*) is an important livestock species in Bangladesh as well as other developing countries (MacHugh and Bradley, 2001). In the early times in human civilization goats have completed in economic, agricultural, cultural and even religious events. At the dawn of the Neolithic period in Fertile Cresent goats the first herbivores which were domesticated by human 10,000 years ago (Joshi *et al*., 2004). Goat population has increased 2.9% which is of a greater rate than sheep (1.8%) and cattle-buffalo (0.5%) (Peters, 1999). In the goat industry the production of milk, meat and cheeses extended 66% worldwide during last 20 years compared to only 9% for cattle (Dubeuf and Boyazoglu, 2009). Bangladesh and other developing countries, the domestic goat plays a vital role and it supplies a good source of meat, milk, fiber and skin. It is well recognized as "the goat is the poor man's cow" (Morand-Fehr and Boyazoglu, 1999). Goats have become very important in rural economy and nutrition throughout the country which is considered at present as the most promising livestock species for commercial meat production. The goat is important for its adaptability, early sexual maturity fertility, prolificacy, delicious meat, short generation interval, high market demand and excellent skin quality. At present, goats are widespread and found in all place of the world more or less. Statistics show that the total number of goats (live animals) Bangladesh was 262.67 lakh (DLS, Livestock economy at a glance 2018-19). Bangladesh has only one goat breed of its own, known as the Black Bengal goat which is a famous goat breed in the world. It plays a very significant position as an animal genetic resource in the predominantly agro-based farming system of Bangladesh. More than 90% of goat population in Bangladesh comprised the Black Bengal goats, the rest are Jamunapari and their crosses (Amin *et al.*, 2001; Husain, 1993). About 26.2

million goat, 24.23 million cattle, 1.48 million buffalo, 3.53 million sheep are available in Bangladesh. Contribution of livestock in GDP 1.47% and GDP growth rate of livestock 3.47%, share of livestock in agricultural GDP 13.46%, involved in employment directly 20% and partly 50% (BBS, 2018-19). Most of the goats are reared in Bangladesh under semi-intensive system. The average number of goats per household 2.31 which are mostly reared by small, landless and medium farmers (Faruque, 2010). Over growth of human population and that's why pressure on land use, goats are keeping a vital role in smallholder production systems in areas with high possibility (Bett *et al*., 2007). The demand of goat products is increasing with their production potentialities as a result more livestock producers are rising goats in developing countries (Sahlu and Goetsch, 2005; Husain *et al*., 1998). In developing countries goats contributes mainly socio-economically by ensuring food and fiber supply and providing employment for poor rural families, especially for women and children (Sahlu and Goetsch, 2005; Lebbi, 2004; Sahlu *et al.*, 2004; Rahman *et al*., 1998). Economic importance of the breeding objectives are body weight and growth rate that demand special attention in order to improve meat production. For improvement of the growth performance is the one way which select the best animals and the productivity of goat is essential for higher growth rate for optimal meat yield (Albuquerque and Meyer, 2001). A component in achieving this goal is to improve goat genetically in the areas of quantity, quality and efficiency. Genetic improvement can be achieved by selection (Falconer, 1989). The profitability should be increased by production of goat meat. In Black Bengal goats, there was a positive correlation between birth weight and rate of growth, age at maturity and mature body weight with length, height and heart girth which influence the future productive and reproductive performance of the animal (Sarkar *et al*., 2008; Kawsar *et al*., 2006; Husain *et al*., 1995; Banerjee, 1989; Prasad *et al*., 1981).

The objectives of the research are given below:

1. To determine the growth performance of Black Bengal goat in village condition.
2. To find out the effects of different factors on body weights at different ages.

Materials and Methods

Study area and data collection

The goat's farmers for data collection was selected three villages under Savar Upazilla of Dhaka district. Data were collected the period from May/2017 to April/2018. Data were collected by the researcher himself from the selected goat farmers. Information on growth performance of Black Bengal goat were collected throughout the previous questionnaire with direct visit to the farmer house.

Animals and management

This study provided information on housing, feeds and feeding management, mating system and healthcare management of Black Bengal goats. Most of the farmers reared goats in extensive system. Moreover some farmers keeps their goat besides their living room or under the space of their bed. Generally, farmers provided bedding materials (e.g. rice straw, rice bran and dry tree leaves) at winter season. The goats are generally allowed to graze in naturally available pasture land around the village at day time. Tree leaves and green grass from cultivated land is supplied to goat during the rainy season. Wheat bran and rice bran are also used in daily basis. Animals in advanced stage of pregnancy, farmers generally take it close observation for kidding and proper care of kids during and after birth. The bucks were allowed to mate naturally. The bio-security is not strictly maintained by farmer to reduce the incidence of diseases. Farmers mostly faced diseases are Peste des Petits Ruminants (PPR), fever, cough diarrhea, naval infection etc.

Parameters studied

In order to growth performance of Black Bengal goats the following parameters were considered:

Growth pattern in different ages of Black Bengal goat

Body weight of Black Bengal goat was taken at birth, 3 months, 6 months, 9 months and 12 months. Generally birth weight of kids was recorded 12 hours of kidding using digital balance and only those kids who remained alive were included in the analysis.

Effect of sex on the body weight of kids

Sex of the kid was grouped into male and female. It is the gender identifying character. Effect of sex plays a vital role in growth performance of their body weight.

Effect of type of birth on growth performance of kids

Type of birth means kidding size. It is also known as litter size which may be single, twins or triplets. Type of birth was grouped into single, twins and triplets. This factor was considered during data collection because type of birth affect the growth performance.

Effect of parity of dam on the body weight of kids

Parity of dam means the number of times a female has given birth. When animals gives birth 1st time then it is called first parity, when it gives birth 2nd time then it is called second parity, when it gives birth 3rd time then it is called third parity.

Effect of season on growth performance of kids

Season of births also affect the growth performance in different ages. The year was divided into three seasons; winter (from November to February), summer (from March to June) and rainy (from July to October).

Statistical analysis

In this study the effect of different factors such as age, sex, type of birth, parity of dam and season were investigated on growth performance of Black Bengal goats in village condition. For Statistical analyses considering different factors, significance of fixed effects (non-genetic factors) was tested by least squares analyses of variance using the general linear model (GLM) procedure of the statistical analysis system (SAS, 1998) according to the following model:

$Y_{ijklm} = \mu + S_i + M_j + R_k + T_l + E_{ijklm}$

Where:

Y_{ijklm}: the dependent variable (individual animal record for the trait).

μ: the overall mean.

S_i: the fixed effect of i^{th} sex of kid.

M_j: the fixed effect of j^{th} type of birth.

R_k: the effect of k^{th} parity of dam.

T_l: the effect of l^{th} season of birth.

E_{ijklm}: the residual error.

Results and discussion

Effect of different ages of Black Bengal goat on growth performance

Average body weights (kg) at different ages of Black Bengal goat are presented in Table 1. Least squares means for body weights at birth, 3, 6, 9 and 12 month of age were 1.10, 5.02, 8.41, 10.41 and 12.42 kg, respectively. The highest coefficient of variation (CV) was observed for body weight at birth age (36.26%) and the lowest CV was for 12 month body weight (3.93%). The CV for 12 month weight was much lower than those for the other stages, probably because of the smaller effects of environment on 12- month weight on the other stages.

Table 1. Body weights (kg) at different ages of Black Bengal goat.

Body weight (kg)	No. of record	Minimum value	Maximum value	Least-squares means	CV (%)
Birth	223	0.72	1.25	1.10	36.26
3-month	168	4.10	5.85	5.02	6.63
6-month	147	7.10	9.50	8.41	4.02
9-month	132	8.70	11.70	10.41	7.56
12-month	119	10.30	13.60	12.42	3.93

CV: coefficient of variation.

Birth weight of kids is regarded as contributory factors for improving growth performance. The average body weight at birth in the present study is comparable with those results that's conducted by (Mia *et al*., 2013; Hossain *et al*., 2004; Akhter *et al*., 2000; Husain *et al*., 1997; Husain *et al*., 1996) in Black Bengal goats. Birth weights of kids obtained in our study are lower than those results which are studied by (Singh and Singh, 1998; Mia, 1992; Verma *et al*., 1991) for the same breed but higher than results which is observed by Ali *et al*., (1973). The average body weight at 3 month of age in the present study is comparable to those results which are studied by (Akhter *et al*., 2000). Husain *et al*., (1996) and Akhter *et al*., (2000) also conducted the lower values for 3 month age of Black Bengal goat body than present study. The average body weight at 6 month of age in the present study is comparable to those results which are studied by (Akhter *et al*., 2000; Singh, 1997; Husain *et al*., 1996; Mia, 1992; Kanaujia and Pander, 1988; Patnaik and Nayak, 1988) analyzed the lower value for 6 months body weight than present study. The mean body weight at 9 month of age in our study is comparable to those results which are reported by (Singh, 1997; Husain *et al*., 1996; Mia, 1992). The average body weight at 12 month of age in the present study is comparable to those results which are conducted by (Mia *et al*., 2013; Singh, 1997) in which reported the average body weight at 12 month was 14.47 kg which is higher than our present 12.42 kg study. Body weight at 12 month of age seems to be higher than those results that was reported by (Mia, 1992; Husain *et al*., 1996). This could be due to the better management conditions that prevailed under the semi-intensive system of rearing. Differences in body weight studied by different authors could be due to the management and environmental variation in different studies.

Effect of sex on the body weights of kids

The average body weight of Black Bengal goat in male at birth, 3, 6, 9 and 12 months of age were 0.98 ± 0.01, 5.22 ± 0.04, 8.74 ± 0.04, 10.66 ± 0.09 and 12.88 ± 0.06 kg respectively. The average body weight of Black Bengal goat in female at birth, 3, 6, 9 and 12 months of age were 0.88 ± 0.01, 4.77 ± 0.04, 7.96 ± 0.04, 10.10 ± 0.10 and 11.82 ± 0.07 kg respectively which are presented in Table 2.

Table 2. Effect of sex on the body weights (kg) of kids in different periods.

Factor	Body weight, kg (LSM±SE)				
	Birth	3-month	6-month	9-month	12-month
Sex					
Male	0.98^{a} ± 0.01	5.22^{a} ± 0.04	8.74^{a} ± 0.04	10.66^{a} ± 0.09	12.88^{a} ± 0.06
Female	0.88^{a} ± 0.01	4.77^{b} ± 0.04	7.96^{b} ± 0.04	10.10^{b} ± 0.10	11.82^{b} ± 0.07
Level of significance	NS	**	**	*	*

Means with different superscripts within each column differed significantly *, ($p < 0.05$); **, ($p < 0.01$). NS: non-significant, LSM: Least-squares means, SE: Standard error.

The male kids were heavier than females from birth to 12-month of ages. Both male and female were significant at all ages under our present study, except body weight (0.98 ± 0.01 and 0.88 ± 0.01 kg) in birth age. Sex has highly significant ($p < 0.01$) effect in the body weight of male and female in 3 months (5.22 ± 0.04 and 4.77 ± 0.04 kg) and 6 months (8.74 ± 0.04 and 7.96 ± 0.04 kg) of ages. In this period growth performance in male and female kids is better than other periods due to mother milk which is very nutritious. Farmers also take extra care which is another reason for their better growth performance. On the other hand sex has significant ($p < 0.05$) effect in the male and female body weight (10.66 ± 0.09 and 10.10 ± 0.10 kg) at 9 months and (12.88 ± 0.06 and 11.82 ± 0.07 kg) 12 months of ages. So, sex has an appreciable effect on growth after weaning until mature age of the goat. Our result is in agreement with the reports of (Paul *et al.*, 2014; Afzal *et al.*, 2004; Portolano *et al.*, 2002; Akhter *et al*., 2000; Husain *et al*., 1996). The superiority of males over females for body weight highest in birth weight but lowest in 9 months body weight. The level of superiority of male kids recorded in this study is comparable to those results which is conducted for goat breeds (Hermiz *et al*., 1997). Average birth weights of Black Bengal kids were 1.03 and 0.93 kg respectively for male and female in Bangladesh (Amin, 2000) which are similar in our study (0.98 and 0.88 kg) for male and female respectively. (Paul, 2008) observed that the body weight of bucks at birth, 3 months and 6 months of age were (1.08 ± 0.06, 5.22 ± 0.33 and 8.95 ± 0.34 kg) respectively which are strongly support the results of the present study. He also observed that the body weight at 9 and 12 months were (12.05 ± 0.47 and 14.20 ± 0.41 kg) respectively which is higher than our present study.

In this study the average body weight of male and female at 3 month (5.22 ± 0.04 and 4.77 ± 0.04 kg) and 12 month (12.88 ± 0.06 and 11.82 ± 0.07 kg) respectively of age which are strongly supports the results of Hasanat *et al*., (2003) who reported that the body weight of male and female Black Bengal goats at 3 months (5.08 ± 0.32 and 13.19 ± 0.27 kg) and 12 months were (4.48 ± 0.18 and 12.47 ± 0.09 kg) respectively. Alam, (2006) reported that the body weight of Black Bengal male and female goat at 9 months and 12 months of age were (10.91 and 13.22 kg) and (10.32 and 12.18 kg) which strongly support the results of the present study. Higher body weights of males compared to females at all the ages might be due to aggressive behavior of males during feeding and suckling and male sex hormone, which

has an anabolic effect. Singh, (1997) reported significant effect of sex on body weights at 3, 6, 9 and 12 months of ages. Thiruvenkadan *et al.*, (2009) reported significant effect of sex on body weights at 3, 6, 9 and 12 months of ages. Relatively higher birth weight of male kid has also been studied by many authors (Amin *et al.*, 2001). The progressive increases in the body weight of male vise-a-versa the females after puberty suggests that the genetic and hormonal differences that exist between the male and female animals are being manifested after that stage. In this study, males were significantly heavier and grew faster from weaning to onward. These effects have been attributed to hormonal differences between sexes and their resultant effects on growth. Our results agreed with the reports of (Otuma and Osakwe, 2008; Paul *et al*., 2014) on live weights of different tropical goats.

Effect of type of birth on growth performance of kids

The effect of type of birth has highly significant ($P < 0.01$) in the body weight at birth, 3, 6 and 12 months of ages. Single (0.99 ± 0.01 kg) and twins (0.93 ± 0.01 kg) kids were heavier body weight at birth than the triplet (0.87 ± 0.01 kg). The growth performance was highly observed birth to 3 months body weight in single born kid, twins born kids and triplet born kids (0.99 ± 0.01, 0.93 ± 0.01, 0.87 ± 0.01 and 5.19 ± 0.06, 5.04 ± 0.04, 4.87 ± 0.06 kg) respectively (Table 3).

Table 3. Effect of type of birth on the body weights (kg) of kids in different periods.

Factor	Body weight, kg (LSM±SE)				
	Birth	3-month	6-month	9-month	12-month
Type of birth					
Single	0.99^{a} ± 0.01	5.19^{a} ± 0.06	8.66^{a} ± 0.06	10.78^{a} ± 0.12	12.84^{a} ± 0.09
Twins	0.93^{a} ± 0.01	5.04^{a} ± 0.04	8.43^{b} ± 0.04	10.39^{b} ± 0.08	12.42^{b} ± 0.06
Triplets	0.87^{b} ± 0.01	4.87^{b} ± 0.06	8.14^{c} ± 0.06	10.12^{bc} ± 0.12	11.99^{c} ± 0.10
Level of significance	**	**	**	**	**

Means with different superscripts within each column differed significantly **, ($p < 0.01$), LSM: Least-squares means, SE: Standard error.

In this period growth rate was high due to kids get milk from their mother. Body weight in the 6, 9 and 12 months due to single, twins and triplets born has statistically significant different among them (Table 3). The lower birth weight with increasing litter size has also been observed by (Al-Shorepy *et al*., 2002; Mia and Bhuiyan, 1997). This difference is probably due to the environment where a higher availability of nutrients to the single kid, lack of competition as well as more space may facilitate growth. The space and available nutrient shared by more than one kid may be responsible for the reduced birth weight with increasing litter size. Paul *et al.*, (2014), Kuthu *et al*., (2013), Mia *et al.*,(2013), Rashidi *et al.*, (2008), Habib *et al*., (2001) and Kumar *et al.*,(2005) noticed that birth weight of single born kids was highest followed by twins and triplets which are strongly supports in our present study. Single born kids maintained their highest weight followed by twins and triplets for all the period. These results agree with results reported by (Akhter *et al*., 2000). Husain *et al*., (1996) observed that the body weight of Black Bengal goat single, twins and triplets at birth weight (1.03 ± 0.02, 0.98 ± 0.02 and 0.92 ± 0.03 kg) and 3 months (5.5 ± 0.19, 4.9 ± 0.17 and 4.2 ± 0.92 kg) respectively which support the present study are strongly. They also reported that body weight at 6, 9 and 12 months single and twins were (9.3 ± 0.32, 8.8 ± 0.28; 11.5 ± 0.43, 11.1 ± 0.37; 13.8 ± 0.27, and 12.9 ± 0.29 kg) respectively which are also strongly support the present study. In case of triplets at 6 months body weight (7.1 ± 0.49 kg) which is lower than our present study.

The results of the present study single, twins and triplets in the birth weight (0.99 ± 0.01, 0.93 ± 0.01 and 0.87 ± 0.01 kg) and 3 months of the body weight (5.19 ± 0.06, 5.04 ± 0.04 and 4.87 ± 0.06 kg) respectively which are strongly support with the result of Mia *et al.*, 2013 in which showed body weight of Black Bengal goat single, twins and triplets at birth (1.11 ± 0.06, 1.09 ± 0.05 and 1.25 ± 0.05 kg) and 3 months body weight (5.48 ± 0.51, 5.20 ± 0.43 and 4.43 ± 1.53 kg). In case of single, twins and triplets at 12 months age of goat's body weight were (15.54 ± 0.88, 13.57 ± 0.72 and 12.86 ± 1.64 kg) respectively which are higher than the present study. Negative linear relationship of growth of kids with litter size at birth is probably due to a difference in birth weight and availability of mother's milk to their kids during early stage of life. We observed that body weight in single, twins and triplets were at birth and 3 months about same growth rate.

Effect of parity of dam on the body weight of kids

The parity of dam of Black Bengal goat body weight at birth, 3 months, 6 months, 9 and 12 months of age were found first parity (0.94±0.01, 4.95±0.05, 8.29±0.06, 10.27±0.13 and 12.21±0.67 kg); second parity (0.95±0.01, 5.04±0.04, 8.37±0.05, 10.35±0.11 and 12.39±0.08 kg) and third parity (0.97±0.01, 5.08±0.05, 8.54±0.05, 10.64±0.10 and 12.67±0.07 kg) respectively in which is presented in Table 4. Parity of dam has highly significant ($p < 0.01$) effect in the body weight at 3 months and 12 months age of Black Bengal goat. On the other hand significant ($P < 0.05$) effect of parity of dam at birth weight and 6 months of age. There was non-significant effect in the body weight 9 months (10.27 ± 0.13, 10.35 ± 0.11 and 10.64 ± 0.10 kg).

Table 4. Effect of parity of dam on the body weights (kg) of kids in different periods.

Factor	Body weight, kg (LSM±SE)				
	Birth	3-month	6-month	9-month	12-month
Parity of dam					
First	0.94^{b} ± 0.01	4.95^{b} ± 0.05	8.29^{b} ± 0.06	10.27^{a} ± 0.13	12.21^{c} ± 0.67
Second	0.95^{ab} ± 0.01	5.04^{ab} ± 0.04	8.37^{b} ± 0.05	10.35^{a} ± 0.11	12.39^{b} ± 0.08
Third	0.97^{a} ± 0.01	5.08^{a} ± 0.05	8.54^{a} ± 0.05	10.64^{a} ± 0.10	12.67^{a} ± 0.07
Level of significance	*	**	*	NS	**

Means with different superscripts within each column differed significantly *, ($p<0.05$); **, ($p<0.01$). NS: non-significant, LSM: Least-squares means, SE: Standard error.

In the birth weight first parity (0.94 ± 0.01 kg) and second parity (0.95 ± 0.01 kg) were statistically similar significant difference. In the same way body weight in the second parity (0.95 ± 0.01 kg) and third parity (0.97 ± 0.01 kg) were statistically similar significant difference. On the other hand body weight first parity (0.94 ± 0.01 kg) and third parity (0.97 ± 0.01 kg) has different significant difference. Body weight at 3 months, first parity (4.95 ± 0.05 kg) and second

parity (5.04 ± 0.04 kg) were statistically significant difference. In the same way at 3 months body weight second parity (5.04 ± 0.04 kg) and third parity (5.08 ± 0.05 kg) were statistically similar significant difference. On the other hand body weight 3 months first parity (4.95 ± 0.05 kg) and third parity (5.08 ± 0.05 kg) were statistically different significant difference. The growth rate was highest observed at birth to 3 month age of Black Bengal goat. After 3 month body weight growth rate decrease. At 9 months age of Black Bengal goat body weight at first parity (10.27 ± 0.13 kg), second parity (10.35 ± 0.11 kg) and third parity (10.64 ± 0.10 kg) more or less similar. At 12 month age highest body weight observed (12.67kg) at third parity and lowest at first parity (12.21 kg). At 6 months age body weight at first parity (8.29 ± 0.06 kg) and second parity (8.37 ± 0.05 kg) were statistically similar significant difference. But in the third parity (8.54 ± 0.05 kg) has statistically different significant difference with the first parity (8.29 ± 0.06 kg) and second parity (8.37 ± 0.05 kg). In the 9 months body weight first parity (10.27 ± 0.13 kg), second parity (10.35 ± 0.11 kg) and third parity (10.64 ± 0.10 kg) were statistically similar significant difference. In the 12 months body weight first parity (12.21 ± 0.67 kg), second parity (12.39 ± 0.08 kg) and third parity (12.67 ± 0.07 kg) were statistically significant different among them. Birth weight increased with the progress of parity. Significantly higher birth weight was observed at third parity (0.97 ± 0.01 kg) and birth weights were lowest at first parity (0.94 ± 0.01 kg). (Paul *et al.,* 2014, Thiruvenkadan *et al.,* 2009, Baiden, 2007, Chowdhury *et al.,* 2002 and Husain *et al.,*1996) also noticed that body weight third parity > second parity > first parity which are strongly support in our study. Paul *et al.,* (2014) observed that body weight in first parity, second parity and third parity at birth weight three different region Nucleus Breeding Flock (NBF) at BAU (0.99 ± 0.05, 1.15 ± 0.06 and 1.25 ± 0.06 kg); Dimla (0.83 ± 0.03,0.98 ± 0.03 and 1.12 ± 0.05 kg) which are similar with present study. Husain *et al*., (1996) observed that the first parity, second parity and third parity body weight of birth (0.94 ± 0.04, 0.98 ± 0.03 and 1.00 ± 0.03 kg); 6 months (8.1 ± 0.32, 8.6 ± 0.32 and 8.6 ± 0.36 kg); 9 months (10.5 ± 0.39, 10.7 ± 0.42 and 10.9 ± 0.46 kg) and 12 months (12.6 ± 0.26, 12.5 ± 0.25 and 13.1 ± 0.33 kg) which are strongly support present study. Mia *et al.,* (2013) observed that birth weight only significant but 3 months, 6 months, 9 months and 12 months were non-significant where in our present study at 9 months body weight was non-significant. Mia *et al.,* (2013) observed that the body weight at first parity, second parity and third parity of 3 months (4.67 ± 0.5, 5.64 ± 0.62 and 5.69 ± 0.68 kg); 6 months (7.74 ± 0.74, 8.50 ± 0.90 and 8.09 ± 0.01 kg) and 9 months (10.98 ± 0.83, 10.99 ± 1.03 and 10.22 ± 1.30 kg) which are similar with present study. Bharathidhasan *et al*., (2009) reported that the body weight first parity and second parity were (1.88 ± 0.06 and 6.61 ± 0.35 kg) and (2.04 ± 0.08 and 7.25 ± 0.50 kg) respectively at the age of birth and 3 months which are higher than our present study. Because most of the farmers are poor and they are not use commercial pellet feed. The mothering ability and milk production increases with parity of the dam. The effect of parity of the dam on kids is thus imparted as a maternal influence whose direct influence is limited to the nursing period.

Effect of season on growth performance of kids

Body weight of Black Bengal goat at birth, 3 months, 6 months, 9 months and 12 months of age were in winter (0.91 ± 0.01, 4.87 ± 0.04, 8.20 ± 0.04, 10.30 ± 0.09 and 12.21 ± 0.06 kg); summer (0.99 ± 0.01, 5.22 ± 0.04, 8.63 ± 0.05, 10.56 ± 0.10 and 12.65 ± 0.07 kg) and rainy (0.97 ± 0.01, 4.89 ± 0.06, 8.23 ± 0.07, 10.31 ± 0.13 and 12.30 ± 0.10 kg) respectively which are presented in Table 5.

Table 5. Effect of season on the body weights (kg) of kids in different periods.

Factor	Body weight, kg (LSM±SE)				
	Birth	**3-month**	**6-month**	**9-month**	**12-month**
Season					
Winter	0.91^{b}± 0.01	4.87^{b}± 0.04	8.20^{b}± 0.04	10.30^{a}± 0.09	12.21^{b}± 0.06
Summer	0.99^{a}± 0.01	5.22^{a}± 0.04	8.63^{a}± 0.05	10.56^{a}± 0.10	12.65^{a}± 0.07
Rainy	0.97^{a}± 0.01	4.89^{b}± 0.06	8.23^{b}± 0.07	10.31^{a}± 0.13	12.30^{b}± 0.10
Level of significance	**	**	*	NS	**

Means with different superscripts within each column differed significantly *, ($p<0.05$); **, ($p<0.01$). NS: non-significant, LSM: Least-squares means, SE: Standard error.

Season has highly significant ($P < 0.01$) influence in body weight at birth weight, 3 months and 12 months of ages. But body weight at 9 months has no-significant effect at different season. At 6 months body weights (8.20 ± 0.04, 8.63 ± 0.05 and 8.23 ± 0.07 kg) respectively in winter, summer and rainy season has significant ($P < 0.05$) effect. At 6 months age, body weight in summer season (8.63 ± 0.05 kg) has statistically different with the winter season (8.20 ± 0.04 kg) and rainy season (8.23 ± 0.07 kg). But body weight in winter season (8.20 ± 0.04 kg) and rainy season (8.23 ± 0.07 kg) were statistically similar. At 12 months age, body weight in summer season (12.65 ± 0.07 kg) has statistically different with the winter season (12.21 ± 0.06 kg) and rainy season (12.30 ± 0.10 kg).

Kids in summer season were heavier at birth to 12 month of age than their counterparts the winter and rainy season. In summer season growth performance was higher than rainy and winter season in different ages of Black Bengal goat. The growth rate of Black Bengal goat in winter, summer and rainy season at birth (0.91 ± 0.01, 0.99 ± 0.01 and 0.97 ± 0.01 kg) and 3 months (4.87 ± 0.04, 5.22 ± 0.04 and 4.89 ± 0.06 kg) respectively which was highest in our study. Growth rate more or less similar until 6 months body weight and then gradually decrease. In summer season growth performance was better than other season because of suitable environment, available of green grass and leaves. In rainy season growth rate decrease than summer season because in rainy season rains fall which hamper Black Bengal goat to go outside. In rainy season most of the time goats are confined. In this time mostly supply confined feed which are not sufficient for their requirement. In winter season lack of sufficient green grass and leaves hamper their body growth. Diseases prevalence rate also high in this period. Mia *et al.,* (2013) observed body weight in winter season and summer season at 3 months (5.54 ± 0.62 and 5.08 ± 0.63 kg), 6 months (8.49 ± 0.72 and 8.05 ± 0.80 kg) and 9 months (10.72 ± 0.81 and 11.31 ± 0.91 kg) which are similar with present study. The effect of the season may be explained partly by the climatic conditions, however, the feeding practices at

different seasons for dams and offspring were similar. Effect of season on kid live weights have been reported in several breeds by (Hermiz *et al*., 1997; Warmington and Kirton, 1990). Reported by (Singh and Singh, 1998; Husain *et al*., 1996) a non-significant effect of the season of birth on body weights at different stages of growth. On the other hand in our study stated that season has non-significant effect at the age of 9 months. (Singh, 1997) observed significant effect of season of birth on body weights at 3 and 6 month of age, whereas non-significant effect was noted at 9 and 12 months of age which is similar with the study except 12 months. Husain *et al.*,(1996) reported that the body weight at birth (0.97 ± 0.02, 1.01 ± 0.02 and 0.96 ± 0.02 kg), 3months (4.9 ± 0.15, 4.9 ± 0.35 and 4.7 ± 0.22 kg), 6 months (8.5 ± 0.36, 8.5 ± 0.55 and 8.1 ± 0.39 kg), 9 months (10.5 ± 0.67, 11.4 ± 0.64 and 10.2 ± 0.02 kg) and 12 months (12.9 ± 0.31, 12.8 ± 0.02 and 12.7 ± 0.02 kg) in winter season, summer season and rainy season respectively which are more or less similar with our study. On the other hand Husain *et al.*, (1996) found that body weight in all ages summer season > winter season > rainy season except 12 months. Al-Shorepy *et al*., (2002) observed non-significant effect of the season of birth on birth weight, but a significant effect on weaning weight was observed in Emirati goat where in our study has significant at birth. Faruque *et al.*, (2010) reported that season has no significant effect at birth but in our study season has a significant ($P < 0.01$) effect at birth. Paul *at el.*, (2014) reported that the season of birth has a significant ($p < 0.05$) effect on birth weight where in our present study season has significant ($P < 0.01$) effect at birth. Seasonal influence on birth weight operates through its effect on the dam's uterine environment, mostly in late gestation. Season of birth also plays an important role in growth performance indirectly, through its influence on the dam's nutrition and hence the amount of milk becomes available to the un-weaned kids. In summer season plenty of green grass and huge amount of jackfruits leaves and others variety leaves are available here and there. In the post-weaning period its influence is related to its effect on the quality and quantity of pasture available to the weaned kids. The lower body weights of winter season born kids emphasized the need to provide supplementary feed and adequate management for these kids because that time shortage of green leaves and lacking of others feed.

Conclusions

Co-efficient of variation at birth weight of Black Bengal goat is highest. Moreover Birth to 3 months growth rate is highest. Type of birth especially single born kids is heavier than twins and triplet. It can be concluded that male sex, single type of birth, third parity of dam and summer season should be better to the growth performance of Black Bengal goat that would be profitable for goat rearing in village condition.

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