THE GROWTH PERFORMANCE OF BLACK BENGAL GOAT IN VILLAGE CONDITION

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CERTIFICATE

*This is to certify that thesis entitled, "**THE GROWTH PERFORMANCE OF BLACK BENGAL GOAT IN VILLAGE CONDITION**" submitted to the Faculty of Animal Science & Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (MS) in ANIMAL BREEDING AND GENETICS**, embodies the result of a piece of bona fide research work carried out by **M. M. SHAMSUDDIN TABREZE**, Registration No. **12-05007** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that such help or source of information, as has been availed of during the course of this investigation, has duly been acknowledged.

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DEDICATED TO

Associate Professor Dr. Lam Lea Asad

And

My beloved parents

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The author

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ABSTRACT

Black Bengal goat is the heritage, pride and one of the potential genetic resources of Bangladesh. The study was conducted about the growth performance of Black Bengal goat in village condition at Savar Upazila under the Dhaka District from May/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 of Black Bengal goat has highly significant ($p<0.01$) effect on the body weight at 3 months (5.22±0.04 and 4.77±0.04 kg) and 6 months of ages (8.74±0.04 and 7.96±0.04 kg) respectively for male and female. Moreover, 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. Male was heavier body weight than female in all the ages. Type of birth has highly significant ($p<0.01$) effect on body weight at birth, 3, 6, 9 and 12 months. Single type (0.99±0.01kg) birth of kid weight was higher than twins (0.93±0.01 kg) and triplets (0.87±0.01 kg). First, second and third parity of dam 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 of all ages. Body weight is higher in third parity than first and second parity in all ages. 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) of ages respectively in winter, summer and rainy season. In winter, summer and rainy 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. The growth performance better in summer season than rainy and winter season was observed in all ages. Thus it can be concluded that male type of sex, single type kid, third parity of dam and summer season was better.

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LIST OF ABBREVIATIONS AND SYMBOLS

%	= Percentage
>	= Greater than
<	= Less than
±	= Plus minus
AI	= Artificial insemination
AICRP	= All India Co-ordinated Research Project
BAU	= Bangladesh Agricultural University
BBG	= Black Bengal Goat
BLRI	= Bangladesh Livestock Research Institute
BW	= Birth weight
CIRG	= Central Institute for Research on Goats
CHG	= Central Highland Goats
CV	= Coefficient of variation.
DLS	= Department of Livestock Services
et al.	= Associate
FAO	= Food and Agricultural Organization
GDP	= Gross Domestic Product
gm	= Gram
GLM	= General linear model
MW	= Month Weight
NBF	= Nucleus Breeding Flock
Ibs	= Pound
Kg	= Kilogram
LSD	= Least Squares Means
MFTSP	= Microfinance and Technical Support Project
mL	= Milliliter
n	= Number of observation
NS	= Non-significant

PKSF = Palli Karma Sahayak Foundation

PPR = Peste des Petits Ruminants

SAS = Statistical Analysis

SAU = Sher-e- Bangla Agricultural University

SAURES = Sher-e Bangla Agricultural University Research System

SE = Standard Error

WADG = West African Dwarf goat

WW = Weaning Weight

YW =Yearling weight

CHAPTER 1
INTRODUCTION

In the 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 country (MacHugh and Bradley, 2001). The quality of meat production should be the farmost important criteria of domestication of goat (Huq, 1988). 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; Pringle, 1998 and Porter, 1996). Goats are found in different locations with variety in color (i.e. black, brown, and white and any combination of those colors at any proportion), body size and weights (Nozawa and Katsumata, 1984). 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. Most of the rural landless and farmers own 1-5 goats. Goats contribute 41% of the total income in some areas of the farm (Husain, 1993). The goat is important for its adaptability, early sexual maturity fertility, prolificacy, delicious meat, short generation interval, high market demand and excellent skin quality. The breed is early maturing with first kidding occurring at about 12 months. Their skin is of superior quality for leather goods and is of great demand both in domestic and foreign markets. Grazing on fallow lands, crop field dividers, and embankment are the only means of feeding the animals. They are best users of grasses, shrubs and various tree leaves, which have little alternative use. They can be reared easily without or with a little amount of supplement feed. In Bangladesh most goats are kept by women and children; consequently the

production cost is minimum. (Amin *et al*., 2001; Islam, 2001; Son, 1999*;* Husain *et al*., 1998; Devendra and Burns, 1983). In the world about 200 different goat breeds present. Asia itself possess about 466.28 million out of 703.39 million which is almost 66.3% of total population (FAO, 1997). At present goats are wide spread and found in all place of the world more or less. A statistics show that the total number of goats (live animals) in 2013 was 975.8 million (FAOSTAT, 2015). Increasing the number of goats is observed since 1990. The number of goats increase per year has been between 1 to 4 % and the total number of goats in the world has increased with 166 % from 1990 (589.2 million) to 2013 and at the same time, per year the number of cattle has increased by 5% and sheep has decreased by 10 % (Aziz, 2010). Now the fourth largest livestock groups in the world is goat (677 millions) (Morand-Fehr and Boyazoglu, 1999). 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. It is measured that 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 26.1 million goat, 24.08 million cattle, 1.48 million buffalo, 3.46 million sheep are available in Bangladesh. Contribution of livestock in GDP 1.54% and GDP growth rate of livestock 3.40%, share of livestock in agricultural GDP 13.62%, involved in employment directly 20% and partly 45%. Milk demand 150.29 lakh metric ton (250 ml/day/head), production 94.06 lakh metric ton and availability (158.19 ml/day /head) but deficiency 56.23 metric ton. On the other hand meat demand 72.14 lakh metric ton (120 gm/day/head), production 72.60 lakh metric ton, availability (122.10 gm/day/head) but deficiency 0.46 lakh metric ton (BBS, Livestock Economy at a glance 2017-18).

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). Goat farming in rural areas 75.8% are contributed by Small, landless and marginal farmers and 24.2% are contributed by medium and large farmers (Huque, 2008). 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).

Goat meat is the most expensive meat and the most acceptable to people of all castes, creeds, and religions in Bangladesh. The demand of goat meat is increasing because of its nutritional quality and taste. In comparison with beef, kid meat contains the equal amount of protein, but a lower fat % (50-60%) and comparison with broiler meat it also contains 40% less saturated fatty acids (Addrizzo, 1992). 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). Goat meat is used for human consumption about 284 million and goat skin annually that helps to earn foreign exchange amounting to Taka 1800 million annually from producing about 84 million pounds leather (FAO, 2002). The intestine of goat is used to make "catgut", which is still in use as material for internal human sutures. Goat husbandry is becoming an attractive activity mainly among the poor women and it is really suited for them because poor people who have not ability to buy and rear large ruminants (Choudhury *et al*., 2012). 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).

Bangladesh has been carried out very little work on the assessment of growth rates of Black Bengal goats. It was estimated that weight of dam affects the weight gain of the kids first month less than during the second and third month of life (Romagesa Vila, 1981). Economic importance of the breeding objectives are body weight and growth rate that demand special attention in order to improve meat production. Improving the growth performance is the one way which is to select the best animals and the productivity of goat is essential for higher growth rate for optimal meat yield (Albuquerque and Meyer, 2001; O'Shea, 1983*)*. 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 (Husain *et al.,* 1995; Banerjee, 1989; Prasad *et al*., 1981).

The benefits of farmers in Bangladesh through goat keeping were described by Hossain *et.al*. (2005): Increased cash income and savings, greater investment in children's education, more expenditure on healthcare, clothes and other consumables, better

access to land, improved knowledge regarding goat keeping, efficient use of underutilized family labour, improved social status as income increased, increased community participation and awareness, access to microfinance has become possible. Goats are valued for their contribution in the national economy of Bangladesh due to: meat for human consumption from castrated male ('khasi') in particular, skin for earning foreign currency irrespective of type of goat, increase of income and poverty alleviation for small holders, employment generation in rural areas and cash income for empowerment of women. There are five goat development farms under government control in different parts of the country (Dhaka, Sylhet, Rajshahi, Chuadanga and Jhenaidah). Goat production is one of the important divisions at Bangladesh Livestock Research Institute (BLRI) also, different Agricultural Universities, Science and technology Universities are also involved with research activities. The goal of a livestock system including goats is to produce a quantity of quality products with maximum efficiency. 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 and especially kids are produce at a marketable age. The technical assistance can be provided to the goat producers by organizing the rural goat keepers through community based goat production system. Considering the above point in view the study was undertaken with the following objectives:

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.

CHAPTER 2

REVIEW OF LITERATURE

Substantial research works have been carried out in different countries of the world related to the growth performance of Black Bengal goat in village condition. In Bangladesh this kind of works have also been done in different area. But Kalma, Adorshagram and Anarkoli in Savar upazila there are no research work about growth performance of Black Bengal goats. However the related findings of research work carried out in Bangladesh and abroad area reviewed in this chapter.

2.1 Growth pattern in different ages of Black Bengal goat

Adult body weight is an important and economic factor which influences the growth and production pattern of any goat enterprise and has more influence mainly on the growth behavior of kids (McGregor, 1984). A number of experiments have been carried out in this regard which are summarized as follows:

Routa *et al.* (2018) carried out an experiment in the Jamunapari goats were introduced to the study area (CIRG) from their natural habitat, the Chakarnagar area of Etawah district of Uttar Pradesh, which is situated 150 km from the Central Institute for Research on Goats (CIRG) in Mathura, India, 1982 to 2012.The study area has semiarid climate and an average annual rainfall of about 375mm which is scattered during the months of June to September. The result of the experiment observed that the highest coefficient of variation (CV) was observed for body weight at 9 month of age (25.4%) and the lowest CV was (21.3%) at birth weight.

Jalil *et al.* (2016) observed that the productive and reproductive performances of Black Bengal Goat (BBG) under farming condition. Data were collected from Bangladesh Livestock Research Institute (BLRI) goat research farm during 2006 to June 2013. They revealed that the mean of body weight at birth 3, 6, 9 and 12 months were 1.31, 5.65, 9.63, 14.20 and 17.70 kg, respectively.

Paul *et al.* (2014) conducted at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two

other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the average birth weight of kid in NBF, Modhupur and Dimla were 1.09±0.27, 1.09±0.25, and 1.10±0.27 kg, respectively.

Mia *et al.* (2013) conducted at nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. The result of the experiment revealed that, the highest coefficient of variation (CV) was observed for body weight at 3 month of age (27.46%) and the lowest CV was for 12 month body weight (13.32%).

Halim *et al.* (2011) investigated at the reproductive and productive performances of Black Bengal goats reared by moderate and ultra-poor households at three different districts of Bangladesh during March, 2008 to June 2009. In the first stage, 3 districts were selected purposively from MFTSP areas under PKSF. Subsequently two villages were selected from an Upazila under each district. The selected villages were Domrakandi and Betbaria under Faridpur Sadar Upazilla; Gutia Dakkhin Para and Madhya Para under Uzirpur Upazila of Barishal and Uttar Chowtul and Sayedpara of Habiganj sadar upazila. The result of the experiment revealed that the average weaning weight for herds of all sizes was found to be 4.82±0.525 kg, the difference was statistically significant among groups ($P<0.05$). The weaning weights of kids at 3 months of age observed in herd size-1, 2 and 3 were 5.20, 4.92 and 4.33 kg, respectively. In this study, it was found that the weaning weight was higher in herd size-1 and herd size-2 than herd size-3. The weaning weight of Black Bengal goats was 6.56 kg for intensive and semi-intensive condition.

Paul *et al*. (2011) observed at the Artificial Insemination (AI) Center under the Department of Animal Breeding and Genetics, Bangladesh Agricultural University (BAU), Mymensingh to study Characterization of Black Bengal goat. In that study they revealed that the buck body growth rate rapidly increased 6 month (8.95 kg) to 9 month (12.05 kg) but then slowly increased 9 month (12.05 kg) to 12 month (14.20 kg).

Similarly does body growth rate rapidly increased 3 month (3.93 kg) to 6 month (7.41 kg) but then slowly increased 6 month (9.53 kg) to 12 month (12.40 kg).

Faruque *et al*. (2010) found at the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Saver and Dhaka. Ninety elite pre-pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi-intensive management to compare performance. In the study they observed that the birth weight was highest ($P<0.10$) in intensive rearing system (1.49+0.13 kg) and lowest (1.28+0.11 kg) in semi-intensive rearing system.

Hassan *et al.* (2010) revealed that which goats were ear-tagged and maintained under semi-intensive conditions from July 2007 to June 2009. Ninety-six does and eight bucks were housed in slatted floor permanent house raised above the ground. Buck was kept separate from does to avoid unplanned mating. In the study they observed that the mean body weight at birth, 3 month, 6 month, 9 month and 12 month were1.6, 7.9,12.2,16.8 and 21.4 kg respectively.

Ahuya *et al*. (2009) stated that the smallholder farmers participating in the Food and Agricultural Research Management in Africa (FARM-Africa) goat improvement project in the Meru Central and South districts, which are located 250km to the East of Nairobi on the slopes of Mt. Kenya. The goats were reared under zero-grazing system. In that study they reported that the highest coefficient of variation (CV) was observed for body weight at the age of weaning weight (23.69%) and the lowest CV was for birth weight (21%).

Thiruvenkadan *et al.* (2009) reported at the body weight of 566 the Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu, India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. The results of the experiment revealed that the highest body weight 2.24 kg in the period of (2000-2003) and the lowest body weight 2.07 kg in the period of (2004-2007).

Boujenane and Hazzab (2008) studied that there were raised in a station at Ouarzazate region (South-East of Morocco). Data were collected between 1988 and 2005 from a total of 1498 kids (735 males and 763 females), the progeny of 46 sires and 404 dams. All kids were weighed at birth, every 3 weeks up to weaning, then every month until 6 months of age. The result of the experiment observed that the highest coefficient of variation (CV) was observed for body weight at 6 month of age (22.4%) and the lowest CV was (17.05%) at 3 month.

Dadi *et al*. (2008) found that at the effects of non-genetic factors on post weaning growth and reproductive performances of Arsi-Bale goats maintained at Adami Tulu Agricultural Research Center in the mid Rift Valley of Ethiopia from (1999-2003). The results of the experiment revealed that the year of birth had a significant effect ($P < 0.05$ and $P < 0.001$) on all traits studied except for 18MW. Live weights tended to increase from 1999 to 2001 and decreased thereafter.

Rahman *et al.* (2007) conducted at the Artificial Insemination Center, Bangladesh Agricultural University, Mymensingh to record the Black Bengal bucks morphology and to relate body weight with different body measurements. A total of 22 Black Bengal bucks of different ages were taken and were divided into six age groups (0, 3, 6, 9, 12 and 15 months). The body weight of Black Bengal bucks at 0, 3, 6, 9, 12 and 15 months of age were 1.21 ± 0.12, 4.26 ± 0.25, 7.68 ± 0.31, 12.76 ± 0.42, 16.56 ± 0.57 and 21.82 ± 0.70 kg respectively.

Rashidi *et al.* (2008) observed that in the genetic parameters for economic traits in Markhoz goats. Data collected from 1993 to 2006 by the Markhoz goat Performance Testing Station in Sanandaj, Iran, were analyzed. The traits recorded as body weight performance at birth (BW), weaning (WW), six month (6MW), nine month (9MW), yearling (YW) and yearling fleece weight (YFW) were investigated. Flocks were housed in semi-intensive conditions with dry summer and cold winter. The result of the experiment revealed that the highest coefficient of variation (CV) was observed for body weight at 6 month of age (24.57%) and the lowest CV was for birth weight (17.05%).

Baiden (2007) reported that the 441West African Dwarf goat (WADG) kids born from September 1999 to August 2002 at three locations in the Dangme West District of the

Greater Accra Region in Ghana to determine the effect of environmental factors on birth weight, birth type and pre weaning survivability. Results of the experiment overall mean birth weight for kids was 1.32 ± 0.01 kg. Kids born at Baabi were significantly ($p < 0.05$) heavier than those born at Minya but closer ($p > 0.05$) in weight to those born at Sota.

Bosso *et al.* (2007) stated at the genetic parameters for growth traits and to evaluate genetic trends in West African Dwarf goat and Djallonke sheep. The West African Dwarf is a goat breed found on the coast of west and central Africa. In that study they observed that the average birth weights for West African Dwarf kids and Djallonk´e lambs were about 1.57 and 2.01 kg, respectively. Kids and lambs were weaned at 5.75 and 8.51 kg, respectively.

Gaddour *et al.* (2007) stated that the kid's weight of local Alpine, Damascus, Murciana goat averages at birth and at 120 days age were about 3.49 and 15.78 kg, respectively.

Hassan *et al.* (2007) reported the status of different productive and reproductive parameters of Black Bengal and Crossbred goats at Bandaikhara village under Atrai Upazilla of Naogaon district during the period of September to December/2005. The results of the experiment revealed that the average birth weight of Black Bengal goat and Crossbred goats were 1.60±.50 and 1.90±.75 respectively and differences are statistically significant (P<0.05).

Rahman (2007) showed that an experiment on Black Bengal buck and reported that body weight of Black Bengal bucks at 0, 3, 6, 9, 12 and 15 months of age were 1.2140.12, 4.26±0.25, 7.68+0.31, 12.76+0.42, 16.56+0.57 and 21.82+0.70 kg, respectively. Body weight significantly (p<0.05) differ with different age groups.

Snyman (2007) conducted an investigation into reproductive performance and kid mortality aspects in South African Angora goats. This study was conducted from 2000 to 2004 on 12 South African Angora goat studs, kept under a variety of management systems. The result of the experiment revealed that coefficient variation (CV) of birth weight, weaning weight and 12 month weight 16.0%, 20.3% and 16.1% respectively.

Alam (2006) showed an experiment on white goat and reported that the body weight of does at birth, 3, 6, 9, 12 months of age were 1.18, 4.17, 6.78, 10.91, 13.22 and 1.07, 3.18, 6.48, 10.32, 12.18 kg, respectively.

Muluken (2006) on farm growth assessment of goats in Sekota woreda revealed that the average birth weight and weaning to be 2.27 kg and 7.91 kg respectively.

Tesfaye, *et al.* (2006) observed that the mean birth weight and weaning weight of Central Highland goats were 2.32 kg, 6.72 kg and 62.63 g/day, respectively.

Kumar *et al.* (2005) studied at the data containing 236 the Tellicherry kids (123 male and 113 female) born in four seasons i.e. 1- Southwest monsoon (June to September), 2- Northeast Monsoon (October to December), 3- Winter (January to February) and 4- Summer (March to May) maintained at Mecheri Sheep Research Station, Pottaneri, Tamilnadu from 1991- 2001. In the experiment they observed that the least square mean in birth weight, 3-month and 6 month were 2.274±0.08, 9.303±0.19, 13.137±0.022 kg respectively.

Banerjee (2004) observed that the birth weight of Black Bengal goat and Black Bengal goat Crossbred goats were 1.5 kg and 2.0 kg respectively under traditional farming condition of subcontinent.

Hague (2004) reported an experiment on Black Bengal goat and reported that body weights of does at birth, 1, 2, 3, 4, 5 and 6 months of age were 1168.33±58.21, 3295±130.0, 4554.16±230.07, 6354.16±331.40, 7675.0±414, 8395.83±452.28, 8958.75±508.73 g, respectively.

Hasanat *et al.* (2003) also reported that according to coat color of Black Bengal goats at 12 months of age, the body weights were 12.42, 12.81, 12.77 and 12.38 kg, respectively for solid black, black with white, white and brown. Brown and solid black coat colored goats differed significantly ($p<0.05$) in their live weight.

Tesfaye *et al*. (2000) reported that the mean birth, weaning, 6-month and yearling weight were 2.32 ± 0.46, 7.17 ± 1.6, 9.3 ± 1.72 and 13.04 ± 2.59 kg for Borana goats and 1.5 ± 0.46, 6.32 ± 2.77, 7.87 ± 1.62 and 12.85 ± 2.55 kg for Mid Rift Valley kids, respectively.

Husain *et al.* (1997) observed in different production locations in Bangladesh between July, 1987 and September, 1991. The four locations were Bhabakhali (1) and Trisal, (2) in the district of Mymensingh, and Aishara (3) and Akhrail (4) in the District of Tangail and Rangpur respectively. In the study they observed that birth weight was similar in regions 1, 2 and 3 with a range of 1.00 to 1.02 kg, but significantly lowest in region 4 (0.88±0.02 kg).

Singh (1997) reported that the body weights of purebred Black Bengal and its half-bred with Jamnapari and Beetals kids the overall 3, 6, 9 and 12-month of age were 5.88, 10.62, 13.59 and 15.95 kg respectively.

Husain, *et al*. (1996) observed the weights of kids at 9 and 12 months ranging from 5.0 to 18.0 kg and 16.0 to 19.0 kg, respectively in Black Bengal and crosses.

Husain, *et al*. (1996) stated that birth weight of Black Bengal kids in Mymensingh, Trisal and Tangail regions were similar (1.01 kg) and it was significantly lower in Rangpur (0.88 kg) than in the other regions. They also observed that birth weight of kids of selected group (1.13±0.2kg) different significantly ($p<0.01$) with that of random group (0.93±0.5kg) of Black Bengal goats. The weight of progeny of selected group for 3 and 6 months were 4.94±0.04 and 8.40±0.05 kg which are significantly higher than that of 3.990.08 and 7.070.11 kg for random groups, respectively.

Singh (1994) and Kanaujia and Pander (1988) conducted that birth weight (g) of Black Bengal kids were 1123.80±56.00 g and 11 3083.51 g, respectively.

Mia *et al*. (1993) observed that the birth weight, 6 months body weight and 12 months body weight to be 1.35, 7.69 and 11.28 kg, respectively in Black Bengal goats of Bangladesh reared in intensive farm.

Husain (1993) conducted that the body weight of kids at 3, 6, 9, and 12 month of age were 4.9±0.17, 8.4±0.28, 10.7±0.36 and 12.8±0.2 kg, respectively in Black Bengal goats.

Singh *et al.* (1991) found the average birth weight and 3 months weight of Black Bengal kids were 1.24 and 5.65 kg, respectively.

Verma *et al*. (1991) stated that the average birth weight of Black Bengal kids were 1.45 kg.

Singh and Sengar (1990) observed that the body weight of Black Bengal goat was 4.31, 7.23 and 11.92 kg for the period 3, 6 and 9 month respectively.

Devendra and McLeroy, 1988) studied that the birth weight of animals is one of the most important factors influencing the pre-weaning growth of the young They revealed that there is a positive correlation between birth weight and subsequent live body weight development in goat.

Kanaujia and Pander (1988) observed birth weight and weight at 3, 6 and 12 months of age in Black Bengal goats to be 1.13, 5.41, 7.96 and 12.12 kg, respectively.

Patnaik and Nayak (1988) reported the growth in Black Bengal goats in India and found highly significant difference ($p<0.001$) in body weights at birth and 3 months of age. The average body weight at birth and 3 months of age in Black Bengal goats were 1.52 and 5.85 kg, respectively.

Singh (1987) stated a wide range of variation in Birth weight of male and female Black Bengal kids (male 1.18 to 1.43 kg and female 1.01 to 1.22kg).

Devendra and Burns (1983) obsrved that birth weight of kids considered to be a very important criterion as it is strongly correlated with growth rate and adult body size and also with kid viability and hence an important factor affecting overall productivity.

2.2 Effect of sex on the body weight of kids

Sex of the kid was grouped into male and female. Growth performance highly influence by sex in the Black Bengal goat. Generally male kids were heavier than female kids. A number of experiments have been carried out in this regard which are summarized as follows:

Belay *et al.* (2018) suggested that evaluate the pre and post weaning growth of F1 crossbred Boer-Abergelle goat kids, and reproductive performance of pure Abergelle under a semi-intensive management system. The study was implemented in Abergelle Agricultural Research Centre goat farm from 2009 to 2011 in northern Ethiopia. The

results of the experiment revealed that the birth weight of male kids (2.98 kg) was heavier than female (2.82 kg).

Routa *et al.* (2018) stated that the Jamunapari goats were introduced to the study area (CIRG) from their natural habitat, the Chakarnagar area of Etawah district of Uttar Pradesh, which is situated 150 km from the Central Institute for Research on Goats (CIRG) in Mathura, India, 1982 to 2012. The result of the experiment observed that the sex had significant effect ($P < 0.05$) on body weight at different ages.

Islam *et al.* (2016) was carried out an experiment in Beltoli and Sobagia villages under Sadar upazila of Mymensingh district. Data were collected from 16 goat owners at Beltoli village and 34 goat owners at Sobagia village under Sadar upazila of Mymensingh district during June 2014 to July 2014. The result of the experiment revealed that the birth weight of female and male kids in the surveyed areas were 1.35±0.06 kg and 1.65±0.10 kg respectively.

Deribe *et al.* (2015) conducted an experiment where evaluate the growth performance of Boer-Central Highland Goats (CHG) cross kids at Sirinka Agriculture Research Center SARC. The study was performed in a period of 5 successive years from 2009 and 2013. In a study they reported that there was a significant difference ($p<0.05$) between male and female kids in weight from birth to weaning. However, males had higher body growth than females.

Paul *et al.* (2014) reported at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the birth weight of kid was not significantly influenced by sex of kid at three different regions.

Patel and Pandey (2013) studied at the production and reproduction performance of Mehsana goats and growth performance of their offspring under farm condition. Data pertaining to growth traits of 381 Mehsana kids born during the years 2007 to 2010 and production and reproduction performance of does maintained at Sheep-Goat Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar,

India. They reported that the mean birth weight was significantly higher in male kids as compared to female kids.

Khan *et al.* (2013) reported at the live weight gain of goats under semi-intensive conditions of Chittagong district of Bangladesh during the period of July, 2012 to January, 2013. Data were collected from 72 black Bengal and 32 Jamunapari goats and the kid's birth weight and their subsequent live weight at weekly intervals up to age and weight of weaning at sexual maturity was recorded. The weight gains from birth to sexual maturity of two different breeds under 2 different farms were studied. The experiment was revealed that the Average birth weight of male and female black Bengal goat's kids were 1.22±0.15, 1.01±0.14, 1.42±0.10 and 1.12±0.27 kg, respectively for farm 1 and 2. For Jamunapari goats kid birth weight were 1.51±0.07 and 1.42±0.09 kg, for male and females, respectively in the farm 2.

Mia *et al.* (2013) observed that the nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. In that study they reported that the male kids were heavier than females from birth to 12- month of age, and the differences between the two sexes were significant at all ages under study, except at birth and 3 month of age. Sex had an appreciable effect on growth after weaning until mature age of the goat.

Sundaram *et al.* (2012) stated at 27 male Tellicherry goats and 10 female Tellicherry goats maintained at the Livestock unit of Tamilnadu Agricultural University were taken for the study (Coimbatore, India). The goats were maintained as per the routine feeding and management practices of the farm. In that study they found that the birth weight of the Tellicherry goats in the farm was 2.62 ±5.04 Kg for male and 2.34 ±0.72 Kg for female.

Mioc *et al.* (2011) studied at production characteristics of Croatian multicolored goat kids (birth weight, age and body weight at weaning, and average daily gain) in extensive

breeding conditions. The experiment reported that the average birth weight of male kids was higher than female kids (2.3: 2.27 kg), although the differences were not significant (P> 0.05). On the other hand, the research determined the significant influence of sex on average.

Faruque *et al*. (2010) found at the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Savar, Dhaka. Ninety elite pre-pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi-intensive management to compare performance. In the study they observed that overall birth weight was observed as 1.37 + 0.039 kg and 1.37+0.10 kg, respectively for male and female kid.

Alex *et al.* (2010) reported that the farmer's flocks of All India Co-ordinated Research Project (AICRP) on goats for improvement of Malabari goat. The data was collected from three centres of AICRP on goats located in Tellichery, Tanur and Badagara, which are respectively in Kannur, Malappuram and Kozhikode districts of Kerala. These are three northern districts of Kerala, which is the home-tract of Malabari goats. In the study they observed that the birth weight of female and male kids were 2.36±0.04 kg and 2.39±0.04 kg, respectively.

Hassan *et al.* (2010) conducted that which goats were ear-tagged and maintained under semi-intensive conditions from July 2007 to June 2009. Ninety-six does and eight bucks were housed in slatted floor permanent house raised above the ground. Buck was kept separate from does to avoid unplanned mating. In the study they observed that the growth rate and weight of the male kids were higher than the female at all stages but the effect was non-significant (P<0.05).

Bharathidhasan *et al.* (2009) observed that the growth performance of 99 Barbari kids from birth to weaning age (90 days) and the influence of nongenetic factors like sex, season, type, parity and year on birth weight, weaning weight and preweaning weight gain at University Research Farm, Madhavaram Milk Colony, Chennai. Barbari kids born in summer (March - May), southwest monsoon (June-August), northeast monsoon

(September-November) and winter (December-February) during the period between 2005 and 2007. The experiment revealed that the average birth weight of male and female kids was 1.92 ± 0.07 and 1.84 ± 0.07 kg, respectively. Even though male kids weighed 4.17 % higher birth weight than female kids, there was no-significant difference observed.

Thiruvenkadan *et al.* (2009) reported at the body weight of 566 Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu, India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. They reported that the sex highly significant effects on body weights at different ages and male birth weight (2.28±0.03) was heavier than female (2.07 ±0.03).

Paul (2008) reported an experiment on Black Bengal goats in the central part of Bangladesh and reported that body weight of Black Bengal bucks and does at 0, 3, 6, and 12 months of age were 1.08±0.06, 5.22±0.33,8.95±0.34, 12.05±0.47 14.20±0.41 and 1.01±0.23, 3.93±0.19, 7.41±0.27, 9.53±0.38, 12.40±0.41 kg, respectively. Body weight significantly ($p<0.05$) differ with different groups.

Rashidi *et al.* (2008) studied that the estimate genetic parameters for economic traits in Markhoz goats. Data collected from 1993 to 2006 by the Markhoz goat Performance Testing Station in Sanandaj, Iran, were analyzed. The traits recorded as body weight performance at birth (BW), weaning (WW), six month (6MW), nine month (9MW) and yearling (YW) were investigated. Flocks were housed in semi-intensive conditions with dry summer and cold winter. In that study they observed that the effect of sex was significant ($p<0.01$) and male weight was heavier than female weight in every stage.

Alam (2006) reported an experiment on white goat and reported that the body weight of bucks and does at birth, 3, 6, 9, 12 months of age were 1.1 8, 4.1 7, 6.7 8, 10.91, 13.22 and 1.07, 3.81, 6.48, 10.32, 12.18 kg, respectively.

Afzal *et al.* (2004) found that the pedigree breeding and performance records (N=1850) of Beetal goats maintained at the Angora Goat Farm Rakh Kharewala, District Layyah, Livestock Production Research Institute, Bahadurnagar District Okara and Livestock Experiment Station, Allahdad (Jahanian) District Khenawal during the period from 1988 to 2000 to study Environmental effects on birth weight in Beetal goat kids. In that

study the male kids were heavier (P<0.01) than female Kids. It may be due to the fact that the gestation period of does carrying male kids is usually slightly longer (1-2 days) than those carrying female kids

Kosum *et al.* (2004) conducted the body weights at birth and weaning of 127 Saanen, 140 Bornova and 80 Saanen Kilis crossbred were obtained in Faculty of Agriculture, Ege University, Izmir Turkey to study heritability estimates of birth and weaning weights in Suanen, Bornova and Suanen Kilis goats. The experiment revealed that the birth weight of male and female 3.50 kg and 3.27 kg respectively. The effect of sex were significant (p <0.01) while other effects were not (p> 0.05).

Hasanat *et al*. (2003) stated that the body weight of male and female Black Bengal goats at 3, 6, 9, 12 months were 5.08, 7.94, 10.71, 13.19 and 4.48, 7.2 7, 9.90, 12.47 kg, respectively. Male goats found significantly (p<0.0 1) higher in live weight than female.

Chowdhury *et al.* (2002) stated that at the Bangladesh Livestock Research Institute. Black Bengal goats of 90 does and 15 bucks were collected at pre-puberal stage from different parts (Mymensingh, Manikganj, Sirajgang, Rajbari, Dhaka, Noakhali and Faridpur) of Bangladesh on the basis of body type, conformation, and their ancestral history on production and reproduction. In the experiment they observed that the birth weight of male and female kids was 1.24 ±0.036 and 1.19 ±0.128 kg, respectively.

Chikagwa-Malunga (2001) also revealed that mean birth weight for male and female born singles was 2.1 and 1.9 kg respectively, for local Malawi goats, while that of kids from multiple births were 1.6 kg for both male and female kids.

Average birth weights of Black Bengal kids were 1.03 and 0.93 kg for male and female in Bangladesh (Husain, 1993; Amin, 2000) and 1.13 kg in India (Acharya, 1988).

Husain *et al*. (1996) stated that birth weight of Black Bengal kids in Mymensingh, Trisal and Tangail regions were similar (1.01kg) and it was significantly lower in Rangpur (0.88kg) than in the other regions. The effects sex was significant for birth weight. They further reported that weight at birth and 3 months of age varied significantly (p<0.01) according to sex in Black Bengal goats; the male kids had higher (1.03±.02 kg) than females (0.93±0.02 kg). Males at 3 months of age birth weight were heavier (5.1± 0.18 kg) than females (4.7±0.19 kg).

Islam *et al.* (1991) studied an experiment on Black Bengal goats and reported that the body weight of male Bengal goats at 12 months of age was 12.43±0.495 kg.

Singh (1989) described the performance of Black Bengal goats of 50 female and 5 male. Birth weights averaged 1.18+0.04 to 1.43+0.4 kg for male (depending on year) and 1.01±0.04 to 1.22±0.05 kg for female. Six month body weight was 8.16 and 6.23 kg respectively for male and female. Slaughtered weight averaged 9.23 ± 2:2 0.95 kg.

Singh *et al.* (1987) stated male and female of Black Bengal goats at 12 months of age was 14.93 and 14.35 kg, respectively.

2.3 Effect of type of birth on growth performance of kids

Type of births has three sub-groups single, twines and triplets. Type of birth was a significant source of variation for parameter. A number of experiments have been carried out in this regard which are summarized as follows:

Paul *et al.* (2014) studied at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the different types of birth, single kids showed the highest weight at birth followed by twins and triplets.

Mia *et al.* (2013) reported at nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. In that study they observed that the effect of type of birth was significant ($P<0.01$) on the body weight at birth only. Single and twin kids had a heavier weight at birth than the triplet, whilst no marked difference was found between single and twin kids.

Banerjee and Jana (2010) studied at a flock of Sirohi (45 does) goats that were/ are reared at the Government Livestock farm from 2003 to 2007 to study the factors affecting birth weight of Sirohi Goat kids reared in hot and humid climate of West Bengal. In that study they indicated that the single born kids were heavier than the twins and the triplets. The difference in body weights for different types of births may be due to that littermates had to share the prenatal maternal nourishment in contrast to the single born kids.

Thiruvenkadan *et al.* (2009) observed that the body weight of 566 Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. In that study they reported that the single type birth weight (2.34±0.03 kg) was comparatively higher than multiple type birth weight (2.01±0.03 kg).

Toplu and Altinel (2008) suggested that the viability in pre-weaning period and growth performance in the period from birth to 8 months of age of Hair kids (Anatolian Black Goat). A total data of 439 kids in 2003 and 2004 years were used in the study. In that study they revealed that the single kids weight at birth 2.60 kg and twins 1.78 kg.

Elabid (2008) conducted at ninety-two male and female Sudan Nubian kids used in this experiment and kids were born to Nubian parent stock during the period 1998 to August 2000 to study various factors affecting birth weight of Sudanese Nubian goat kids. The result of the experiment revealed that the birth weight of single born kids was significantly higher than both twin and triplet born kids; following the same lines the birth weight of twins was significantly higher than that of triplets. The respective values for birth weight of singles, twins and triplets were 2.489 ± 0.522, 1.963 ± 0.325 and 1.500 kg, respectively.

Rashidi *et al.* (2008) studied that to estimate genetic parameters for economic traits in Markhoz goats. Data collected from 1993 to 2006 by the Markhoz goat Performance Testing Station in Sanandaj, Iran, were analyzed. The traits recorded as body weight performance at birth (BW), weaning (WW), six month (6MW), nine month (9MW) and yearling (YW) were investigated. Flocks were housed in semi-intensive conditions with dry summer and cold winter. In that study they revealed that the birth weight of single

born kids was significantly higher than both twin and triplet born kids; following the same lines the birth weight of twins was significantly higher than that of triplets. The respective values for birth weight of singles, twins and triplets were 2.56 ± 0.01, 2.53 ± 0.01 and 2.27 ±0.11 kg, respectively.

Baiden (2007) reported that the 441West African Dwarf goat (WADG) kids born from September 1999 to August 2002 at three locations in the Dangme West District of the Greater Accra Region in Ghana to determine the effect of environmental factors on birth weight, birth type and pre weaning survivability. Results of the experiment showed that there was no significant difference ($p > 0.05$) between the average birth weights of singles and twins, but singles were significantly heavier ($p < 0.05$) than triplets. The average birth weight of quadruplets (1.25 ± 0.11 kg) was similar ($p > 0.05$) to that of triplets (1.24 ± 0.05 kg).

Kumar *et al.* (2005) showed that the data containing 236 the Tellicherry kids in Tamilnadu from 1991- 2001. In the experiment they observed that the effect of type of birth on body weight at six months of age was significant (P<0.01). As expected, the body weight of kids born as single was significantly heavier than the multiples.

Afzal *et al.* (2004) analyzed that the pedigree breeding and performance records (N=1850) of Beetal goats maintained at the Angora Goat Farm Rakh Kharewala, District Layyah, Livestock Production Research Institute, Bahadurnagar District Okara and Livestock Experiment Station, Allahdad (Jahanian) District Khenawal during the period from 1988 to 2000 to study Environmental effects on birth weight in Beetal goat kids. In that study they reported that Single born kids were heavier than the multiple born kids.

Tesfaye *et al*. (2000) revealed that by the mean birth weight of single and twin births was 1.69 ± 0.43 and 1.23 ± 0.37 kg for Mid Rift Valley goats, respectively.

Saddul *et al.* (1999) reported the result of the experiment that the birth weight of single and twin kids (male and female) born from multiparous does was 2.0 kg while that of triplets was 1.5 kg with no significant sex effect in the birth weight of kids born from either multiparous or primiparous local goats of Mauritius. Kids born as singles and twins had significantly higher birth weight than kids born as triplets.

Mohammed and Amin (1997) observed that the average weights of Sahel (Born white) goat at birth were 2.7+0.5, 2.3±0.2 and 1.6±0.4 kg for single, twins and triplets, respectively. The average weights at six months were 13.7+0.5, 13.3+3.4 and 12.9+2.8 kg.

Toamr *et al.* (1997) stated that birth weight of Birochi and Kutchigoats averaged 2.88 and 2.95 kg respectively. Single born kids were significantly heavier than twin born kids (3.22 vs 2.65 kg).Husuin *et al.* (1996). The experiment was conducted in four different regions of Bangladesh from July 1987 to September 1991.The four regions were (1) Mymensingh, (2) Trisal, (3) Tangail and (4) Rangpur. Goats and kids were maintained under an extensive system allowing grazing from morning to evening. In that study they reported that the different types of birth, single kids showed the highest weight at birth (1.03 ± 0.02 kg) followed by twins and triplets. The weight of single kids was higher *(P* < 0.01) than twins and triplets.

Husain, *et al*. (1996) stated that birth weight of Black Bengal kids in Mymensingh, Trisal and Tangail regions were similar (1.01kg) and it was significantly lower in Rangpur (0.88kg) than in the other regions. The effects of birth type was significant for birth weight.

2.4 Effect of parity of dam on the body weight of kids

Parity of dam has play a vital role in the growth performance of Black Bengal Goat. Parity of dam are subdivided into first, second and third parity. A number of experiments have been carried out in this regard which are summarized as follows:

Routa *et al.* (2018) conducted that the Jamunapari goats were introduced to the study area (CIRG) from their natural habitat, the Chakarnagar area of Etawah district of Uttar Pradesh, which is situated 150 km from the Central Institute for Research on Goats (CIRG) in Mathura, India, 1982 to 2012.The study area has semiarid climate and an average annual rainfall of about 375mm which is scattered during the months of June to September. The result of the experiment observed that the parity of dam had significant effect (P < 0.05) on body weight at different ages.

Paul *et al.* (2014) studied at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the parity of dam significantly ($p<0.01$) influenced the birth weight in three different regions. There was a tendency to increase weight with the advance of parity in all regions. Significantly highest birth weight was observed in 3rd parity and lowest in 1st parity in all regions.

Deribe and Taye (2013) conducted at Abergele in the semiarid parts of Sekota district to evaluate growth performance of Abergele goats managed under traditional management systems. Data on growth and growth rates were collected from 724 kids for two years. The results of the experiment revealed that the parity of doe had significant effect ($p<0.01$) on kid birth weight that kids born from first parity dams had lower weight than kids born from other higher parity dams.

Mia *et al.* (2013) stated at nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. The result of the experiment revealed that parity of the dam has significant ($P<0.01$) influence on birth weight. Birth weight increased with the progress of parity.

Faruque *et al*. (2010) reported at the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Savar, Dhaka. Ninety elite pre-pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi-intensive management to compare performance. In the study they observed that the birth weight of male kids was significantly ($P<0.001$) affected by parity. Whereas, birth weight of female kids was not affected ($P>0.05$) by parity.

Bharathidhasan *et al.* (2009) studied at the growth performance of 99 Barbari kids from birth to weaning age (90 days) and the influence of nongenetic factors like sex, season, type, parity and year on birth weight, weaning weight and pre-weaning weight gain at University Research Farm, Madhavaram Milk Colony, Chennai. Barbari kids born in summer (March-May), southwest monsoon (June-August), northeast monsoon (September-November) and winter (December-February) during the period between 2005 and 2007. The experiment observed that the effect of second parity on birth weight was more than first and third parity. The weaning weight and average pre-weaning daily gain had increased in second parity than first parity.

Thiruvenkadan *et al.* (2009) conducted at the body weight of 566 the Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. The results of the experiment revealed that the increased birth body weight 1st to 3rd parity and then decline birth weight in 4th parity. Then again increased body weight 5th and 6th parity.

Kumar *et al*. (2005) reported in 236 the Tellicherry kids (123 male and 113 female) born in four seasons i.e. 1- Southwest monsoon (June to September), 2- Northeast Monsoon (October to December), 3- Winter (January to February) and 4- Summer (March to May) maintained at Mecheri Sheep Research Station, Pottaneri, Tamilnadu from 1991-2001.The result of the experiment revealed that the parity had significant effect on body weight at birth and three months of age. The mean birth weight was higher at 4th parity and the mean three month body weight was higher at the 3rd parity. The birth weight reached maximum at 4th parity but the three months weight was maximum at 3rd parity itself indicating that the kids can be selected from 3rd parity for higher growth rate than at 1st and above 4th parity.

Chowdhury *et al.* (2002) studied at the Bangladesh Livestock Research Institute. Black Bengal goats of 90 does and 15 bucks were collected at pre-puberal stage from different parts (Mymensingh, Manikganj, Sirajgang, Rajbari, Dhaka, Noakhali and Faridpur) of Bangladesh on the basis of body type, conformation, and their ancestral history on production and reproduction. In the experiment they observed that the birth weight were 1st, 2nd , 3rd , 4th parity respectively 1.38 kg, 1.91 kg, 2.07 kg, 2.84 kg.

Husain *et al.* (1996) was conducted the experiment in four different regions of Bangladesh from July 1987 to September 1991.The four regions were (1) Mymensingh, (2) Trisal, (3) Tangail and (4) Rangpur. Goats and kids were maintained under an extensive system allowing grazing from morning to evening. In that experiment they revealed that there was a tendency to increasing weight with the advance of parity at least up to 3rd parity in all periods.

2.5 Effect of season on growth performance of kids

Season is an important parameter for the growth performance of Black Bengal Goat. Some what season variation also found one place to another. A number of experiments have been carried out in this regard which are summarized as follows:

Routa *et al.* (2018) investigated that the Jamunapari goats were introduced to the study area (CIRG) from their natural habitat, the Chakarnagar area of Etawah district of Uttar Pradesh, which is situated 150 km from the Central Institute for Research on Goats (CIRG) in Mathura, India, 1982 to 2012.The study area has semiarid climate and an average annual rainfall of about 375mm which is scattered during the months of June to September. The result of the experiment observed that the Season of birth had significant effect ($P < 0.01$) on body weight at 3 months of age.

Paul *et al.* (2014) studied at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the season of birth has a significant ($p<0.05$) effect on birth weight. Winter born kids were significantly ($p<0.05$) heavier than that of other seasons at three different regions.

Kuthu *et al*. (2013) conducted on pedigree, breeding and performance records of Teddy goats (both male and female) kept at (I) Livestock Experiment Station Rakh Ghulaman, District: Bakkhar (1984-2008) (II) Livestock Experiment Station, Rakh Khariewala District: Layyah (1972-2008) and (III) Livestock Experiment Station Chak Katora, District: Bahawalpur (1974-2008) Pakistan were utilized in this study. In the experiment they revealed that the study showed that monsoon born kids continued to weigh heavier than those of summer born due to adequate availability of greens to dams during winter and the proceeding monsoon season.

Mia *et al.* (2013) stated at nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. The result of the experiment reported that the different stages of growth, the variation in body weights due to season of birth was highly significant ($P<0.05$). Winter born kids were significantly ($P<0.05$) heavier at birth to 9 month of age, than their counterparts from the rainy season.

Mioc *et al.* (2011) studied at production characteristics of Croatian multicolored goat kids (birth weight, age and body weight at weaning, and average daily gain) in extensive breeding conditions. The experiment reported that the kids born in spring had significantly higher ($P>0.001$) average birth weight (2.3 kg) than kids born in winter (1.77 kg).

Banerjee and Jana (2010) suggested in a flock of Sirohi (45 does) goats that were/ are reared at the Government Livestock farm from 2003 to 2007 to study the factors affecting birth weight of Sirohi Goat kids reared in hot and humid climate of West Bengal. In that study they indicated that the kids born as twins in the summer months of the first year heavier than those of the monsoon and winter months respectively, the female kids born in the summer months are heavier than those born in monsoon and winter months respectively.

Faruque *et al.* (2010) observed that the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Savar, Dhaka. Ninety elite pre-pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi-intensive management to compare performance. In the study they observed that there were no significant effects of season on birth weight of kids, but it was affected ($P<0.10$) by rearing system.

Bharathidhasan *et al*. (2009) reported that the growth performance of 99 Barbari kids from birth to weaning age (90 days) and the influence of nongenetic factors like sex, season, type, parity and year on birth weight, weaning weight and preweaning weight gain at University Research Farm, Madhavaram Milk Colony, Chennai. Barbari kids born in summer (March – May), southwest monsoon (June-August), northeast monsoon (September-November) and winter (December-February) during the period between 2005 and 2007. In that study they reported that the birth weight in summer season (1.94 ± 0.08 kg) was heavier than winter season (1.72 ± 0.10 kg).

Elabid (2008) observed that the ninety-two male and female Sudan Nubian kids used in this experiment and there were born to Nubian parent stock during the period 1998 to 2000 to study various factors affecting birth weight of Sudanese Nubian goat kids. The result of the experiment revealed that the effect of year/season of kidding on birth weights. The results verified significant effects on the birth weight ($P< 0.05$). The heaviest kids were kidded at wet summer 1999 (2.82 ± 0.51 kg) while the lightest kids were delivered at winter 2000 (2.06 ± 0.26 kg).

Kumar *et al.* (2005) analyzed in 236 the Tellicherry kids (123 male and 113 female) born in four seasons i.e. 1- Southwest monsoon (June to September), 2- Northeast Monsoon (October to December), 3- Winter (January to February) and 4- Summer (March to May) maintained at Mecheri Sheep Research Station, Pottaneri, Tamilnadu from 1991-2001.The result of the experiment revealed that the effect of season of kidding was found significant on birth weight of Tellicherry kids. The study showed that monsoon born kids continued to weigh heavier than those of summer born due to adequate availability of greens to dams during winter and the proceeding monsoon season, which resulted in improvement and availability of dam's milk to the kids. Season showed significant effect on three and six month body weight also.

Afzal *et al.* (2004) studied at pedigree breeding and performance records (N=1850) of Beetal goats maintained at the Angora Goat Farm Rakh Kharewala, District Layyah, Livestock Production Research Institute, Bahadurnagar District Okara and Livestock Experiment Station, Allahdad (Jahanian) District Khenawal during the period from 1988 to 2000 to study Environmental effects on birth weight in Beetal goat kids. The experiment revealed that autumn season birth weight was heavier than spring season.

Husuin *et al.* (1996) was conducted an experiment in four different regions of Bangladesh from July 1987 to September 1991.The four regions were (1) Mymensingh, (2) Trisal, (3) Tangail and (4) Rangpur. Goats and kids were maintained under an extensive system allowing grazing from morning to evening. In that study they reported that body weight was highest in summer season and lowest in rainy season.

CHAPTER 3

MATERIALS AND METHODS

The present experiment was conducted under the Department of Animal Nutrition, Genetics and Breeding, Sher-e Bangla Agricultural University (SAU), Dhaka, with the financial support of the Sher-e Bangla Agricultural University Research System (SAURES) in a project entitled "Performance traits Study of Black Bengal Goat in Savar Upazila in Dhaka District".

3.1 Study area

The study was conducted at Savar Upazila under Dhaka district. Out of 12 villages, 3 villages namely Kalma, Adorshagram and Anarkoli were purposively selected for the study. Maps of Dhaka district and Savar upazila showing the study area are presented figure 1 and figure 2 respectively.

3.2 Population and Sampling of the Study

The goat farmers of selected three villages under savar upazilla of Dhaka district were considered as the population of the study.

3.3 Instrument for data collection

A previously structured interview schedule was used as data gathering instrument by keeping in view the objectives of the study. Both open and closed question were in the interview were included in the interview schedule. A weight measuring digital balance was also used by manually.

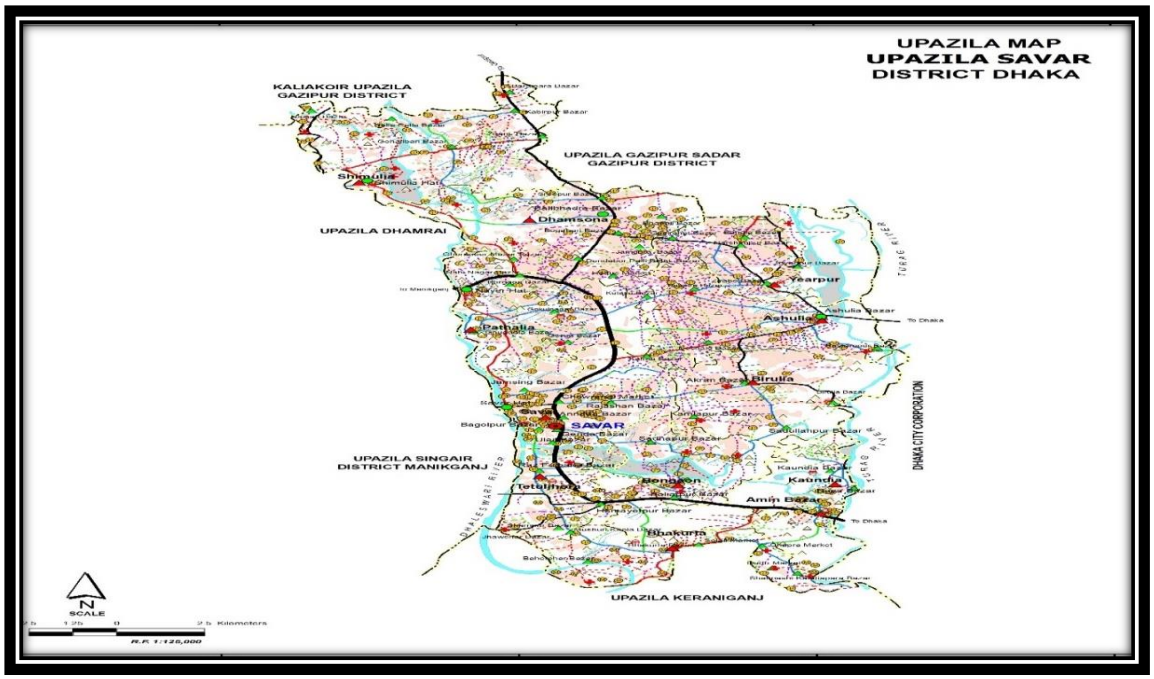

Figure 1. Map of Dhaka district showing in the Savar upazila

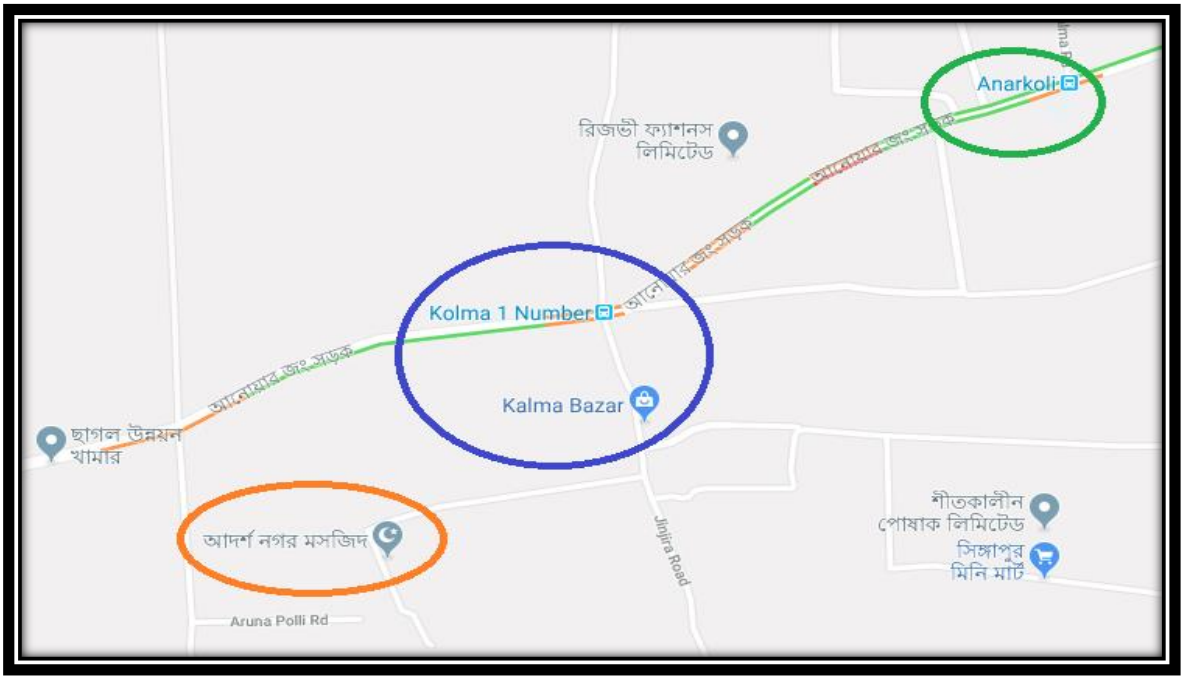

Figure 2. Map showing the study area in Savar upazila

Before finalization, the interview schedule was pre-tested with 10 goat farmers of the study. On the basis of pre-test experience necessary corrections, modifications and alterations were made before finalizing the interview schedule for final data collection. During Modification of the schedule, valuable suggestions were received from the research supervisors. The interview schedule was then printed in its final form and multiplied. A copy of interview schedule in English version has been furnished in appendix-1.

3.4 Data collection

Data were collected by the researcher himself from the selected goat farmers. The interviews were conducted with the respondents individually in their respective houses. The possible care was to establish rapport with the respondents so that they would not feel any trouble while starting the interview. If the respondents felt any difficulty in understanding any question, the researcher took utmost care to explain and clarify the same properly. Data were collected the period from May/2017 to April/2018.

3.5 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 semi-intensive system and some farmers reared extensive system. Some farmers made their goat keeping house in a galvanized iron sheet with a wooden slatted floor raised above the ground level. Some farmers made their goat keeping house with straw or bamboo and polythin. Moreover some farmers keeps their goat besides their living room or under the space of their bed. Generally, farmers provided bedding materials (eg. 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. At night, they were kept confinement in the goat shed or other places suitable for the farmers. In some occasion, the goats are tethered by rope and allowed to graze by road side or suitable pasture land convenient to the farmers. Leaves of tree viz., mango leaves, jack fruit leaves, banana leaves or cut grass from the cultivated land was fed during the rainy season. Some farmers cultivated Napier, German and Maize for their goats. Farmers someone used to commercial concentrate (BRAC feed mill, Aftab feed mill, Sreepur, Gazipur) in pellet form in the morning and again in the afternoon at the

rate of 200-250 g/ goat. Wheat bran and rice bran are also used in daily basis. Animals in an advanced stage of pregnancy, farmers generally take it close observation for kidding and proper care of kids during and after birth.

Major sources of drinking water for goats were tube well and during rainy season, most of the farmers grazed their goats. Farmers supplied little bit more grass and tree leaves to their lactating does than that of pregnant does while they supplied more amount of concentrates feed to their pregnant does than that of lactating does. This system allowed the does to procure their feeds from the naturally available feeds in the day times and kept in confinement in the night time. Birth and weaning weight were higher in male kids than female kids. Farmers did not keep breeding buck and they did not use artificial insemination (AI) for their does. The bucks were allowed to mate naturally. The bio-security was not strictly maintain all of farm to reduce the incidence of diseases. Some farmers are alert and some are not follow that. Village farmrs are not so eager for the treatment of goat. Although some farmers are so careful with their goat not only in treatment but also feeding .Farmers mostly faced diseases are Peste des Petits Ruminants (PPR), fever, cough diarroea, naval infection etc.

Few farmers vaccinated their goats against Peste des Petits Ruminants (PPR). The animals were dewormed with broad spectrum anthelmintic such as Endex (Triclabendazole-900mg, levamisol-600), levanid (Tetramisole HCL-2gm, Oxyclozanide 1.4gm), Injection of vermic (Ivermectin) or with Fasinex (Triclabendazole-900mg). Anti-diaorrheal drug and saline also they used. Sumitvet powder generally used if any wound occurred. Treatment of animals for any disease was done when the disease was prevailed. Above discussions might be indicative that farmers were more careful about housing, feeding but less careful about health care and breeding buck keeping issues.

3.6 Parameters studied

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

3.6.1 Growth pattern in different ages of Black Bengal goat

It is one of the unit to measure of the animal. The purpose of this study was to evaluate the body weight in Black Bengal goat in different ages such as 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. It was measured in kg and weaning weight of kids was recorded at 3 months of age using digital balance. It was measured in kg. Body weight effect growth performance in different ages of Black Bengal goats.

3.6.2 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. Body weight variation in all ages due to influence of sex. Effect of sex plays a vital role in growth performance of their body weight. Male and female behavior also some different. Generally male is heavier than female in their body weight.

3.6.3 Effect of type of birth on growth performance of kids

Type of birth means that the animals gives birth kids which may be single, twins or triplets. Type of birth also influence the growth performance of their kids. Type of birth was grouped into single, twins and triplets. Single type birth kids always heavier than twins and triplets.

3.6.4 Effect of parity of dam on the body weight of kids

Parity of the dam was grouped into first, second and third parity. Parity of dam means that 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.

3.6.5 Effect of season on growth performance of kids

Season refers that animal gives birth which season. Season of births also effect 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).

3.7 Statistical analyses

The 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.

Plate 1. Digital weight balance

Plate 2. Data collection from the women

Plate 3. Body weight measuring of kids

Plate 4. Village goat housing system

CHAPTER 4

RESULTS AND DISCUSSION

In this chapter the finding are described in accordance with the objectives of our study. The results of this study for different traits are presented in different Tables and Figures.

4.1 Growth pattern in different ages of Black Bengal goat

Basic statistics of 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. The sequential selection of individuals due to death and the individuals who survived were stronger and more productive. Therefore, the productive differences between them are much lower than in previous stages, and the coefficient of variation is much lower.

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 mean birth weight in the present study was comparable with those conducted by Mia *et al*. (2013), Hossain *et al*. (2004), Akhter *et al*. (2000), Husain *et al*. (1997), Husain *et al*. (1996), Acharya (1992), Singh *et al*. (1991), Gupta *et al.*

(1989), Kanaujia and Pander (1988), Singh (1987), Kumar and Singh (1983), Acharya *et al.* (1982) and Moulick and Syrstad (1970) in Black Bengal goats. Births weights of kids obtained in our study to be lower than those studied by Singh and Singh (1998), Mia (1992), Verma *et al*. (1991), Patnaik and Nayak (1988) and Devendra (1985) for the same breed but higher observed by Ali *et al*. (1973). The mean body weight at 3 month of age in the present study was comparable to studied by Akhter *et al*. (2000), Singh and Singh (1998), Singh (1997), Husain *et al*. (1996), Acharya (1992), Mia (1992), Singh *et al*. (1991), Singh and sengar (1990), Kanaujia and Pander (1988), Patnaik and Nayak (1988) and Acharya *et al.* (1982). Husain *et al*. (1996) and Akhter *et al*. (2000) also conducted the lower values for 3 month body weight than our present study. The mean body weight at 6 month of age in the present study was comparable to those studied by Akhter *et al*. (2000), Singh (1997), Husain *et al*. (1996), Acharya (1992), Mia (1992), Singh and sengar (1990), Kanaujia and Pander (1988), Patnaik and Nayak (1988), Kumar and Singh (1983) and Acharya *et al.* (1982) analyzed the lower value for 6 months body weight than our present study. The mean body weight at 9 month of age in our study was comparable to those studied by Singh (1997), Husain *et al*. (1996), Acharya (1992), Mia (1992) and Singh and Sengar (1990). The average body weight at 12 month of age in the present study was comparable to those conducted by Mia *et al*. (2013), Singh (1997) and Randhawa (1958) reported the average body weight of 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 studied by Mia (1992) and Husain *et al*. (1996).This could be due to the better managemental 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.

4.2 Effect of sex on the body weights of kids

The body weight of Black Bengal goat in male and female at birth, 3, 6, 9 and 12 months of age were found (0.98±0.01, 5.22±0.04, 8.74±0.04, 10.66±0.09 and 12.88±0.06 kg) and (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 and Figure 3. 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 get 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) of 9 months and (12.88±0.06 and 11.82±0.07 kg) 12 months of ages.

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

Factor	Birth	3-month	6-month	9-month	12-month
	LSM+SE	LSM+SE	LSM+SE	LSM+SE	LSM+SE
Sex	NS	**	**	*	*
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

Means with different superscripts within each column and trait differed significantly *, ($p<0.05$); **, ($p<0.01$). NS: non-significant.

At birth male and female body weight (0.98±0.01 and 0.88±0.01 kg) are statistically similar significant difference. In 3 months body weight male (5.22±0.04 kg) and female (4.77±0.04 kg) are statistically different significant difference. In the same way body weight in male (8.74±0.04 kg) and female (7.96±0.04 kg) are statistically different significant difference in 6 months. In the body weight in in 9 months male (10.66±0.09 kg) and female (10.10±0.10 kg) are also statistically different significant difference. Besides that the body weight in in 12 months male (12.88±0.06 kg) and female (11.82±0.07 kg) are statistically different significant difference. The growth rate in male and female slightly decrease after 6 months. Because after 6 months of age kids are not get help from their mother to drink milk as like as before. Kids are try to start eat soft green leaf and grass. So sex had an appreciable effect on growth after weaning until mature age of the goat. Our result was in agreement with the reports of Paul *et al.* (2014), Afzal *et al.* (2004), Portolano *et al.* (2002), Akhter *et al.* (2000) and 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 conducted for goat breeds and Hermiz *et al.* (1997), Blackburn and Field (1990), Warmington and Kirton (1990). Average birth weights of Black Bengal kids were 1.03 and 0.93 kg for male and female in Bangladesh (Amin,

2000; Husain, 1993) which are similar in our study (0.98 and 0.88 kg) for male and female. 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 higher our present study.

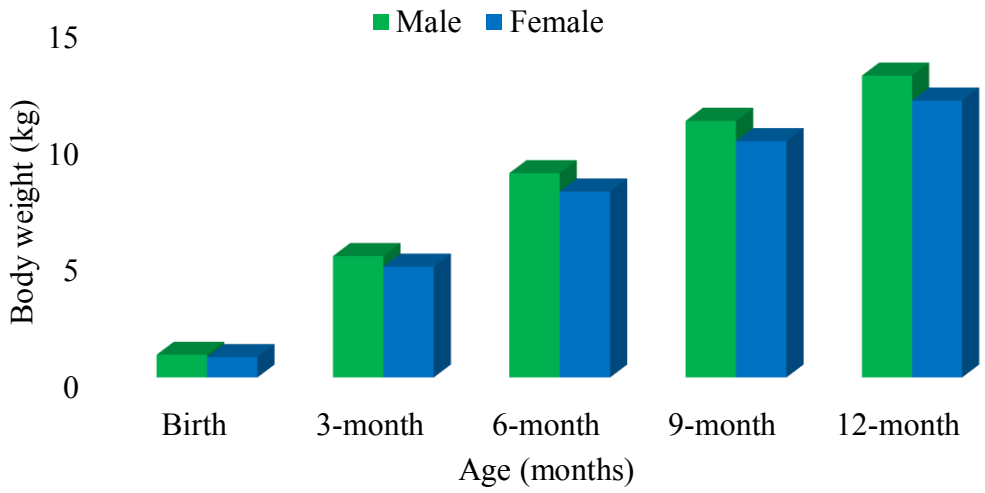

Figure 3. Effect of sex on the body weights (kg) of kids in different periods

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 at 9 months and 12 months of age were 10.91, 13.22 and 10.32, 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 (Hafez, 1993). Singh (1997) reported significant effect of sex on body weights at 3, 6, 9 and 12 months of ages. Husain *et al*. (1996) also observed significant effect of sex on body weights at birth, 3, 6, 9 and 12 months of ages of Black Bengal goat under the extensive system. 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 (Hussain, 1999; Amin *et al.* 2001). The progressive increases in the body weight of male vis-a-vis 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; implying that sex effect is more pronounced with age after weaning. 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 (2008) and Das *et al*. (1994) on live weights of different tropical goats.

4.3 Effect of type of birth on growth performance of kids

The type of birth of Black Bengal goat at birth, 3, 6, 9 and 12 months of age were found in single (0.99±0.01, 5.19±0.06, 8.66±0.06, 10.78±0.12 and 12.84±0.09 kg); twins (0.93±0.01, 5.04±0.04, 8.43±0.04, 10.39±0.08 and 12.42±0.06 kg) and triplets (0.87±0.01, 4.87±0.06, 8.14±0.06, 10.12±0.12 and 11.99±0.10 kg) respectively which presented in Table 3 and Figure 4.

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

Factor	Birth	3-month	6-month	9-month	12-month
	LSM+SE	LSM+SE	LSM+SE	LSM+SE	LSM+SE
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

Means with different superscripts within each column and trait differed significantly **, ($p<0.01$).

The effect of type of birth has highly significant ($P<0.01$) on the body weight at birth. Single and twins kids had a heavier weight at birth than triplets, whereas no significant difference was found between single and twin kids. Single and twins were similar body weight in birth to 3 months however in case 6 to 12 months single and twins body weight has significant difference. The effect of type of birth has highly significant ($P<0.01$) in the body weight at 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). Birth weight in single (0.99±0.01 kg) and twins (0.93±0.01 kg) are statistically similar significant difference. But triplets (0.87±0.01 kg) has statistically different significant difference with the single (0.99±0.01 kg) and twins (0.93±0.01 kg) kids body weight at birth. In case body weight in 3 months single (5.19±0.06 kg) and twins (5.04±0.04 kg) kids are statistically similar significant difference. On the other hand triplets (4.87±0.06 kg) has statistically different significant difference with the single (5.19±0.06 kg) and twins (5.04±0.04 kg) kids at 3 months body weight. The growth performance is 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. In this period growth rate is high due to kids get milk from their mother. After 3 month growth rate decreases. Body weight in the 6 months single (8.66±0.06 kg), twins (8.43±0.04 kg) and triplets (8.14±0.06 kg) has statistically different significant difference among them. Body weight in the 9 months single (10.78±0.12 kg) twins (10.39±0.08 kg) has statistically different significant difference.

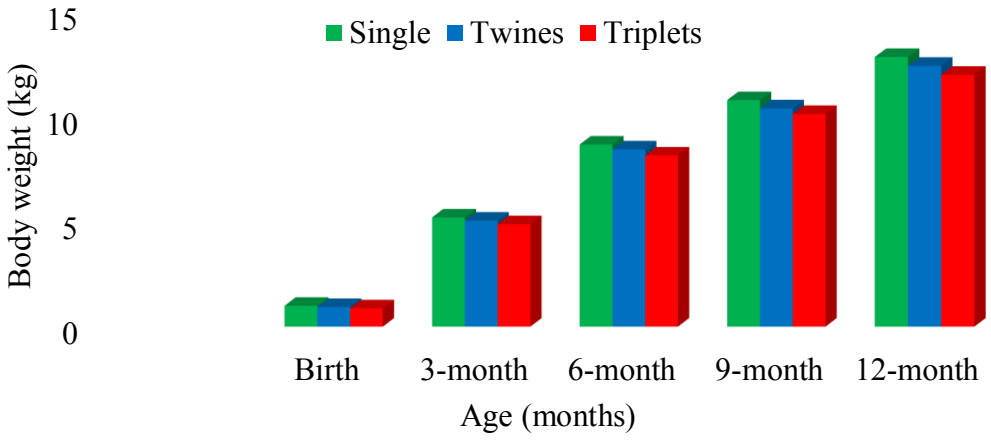

Figure 4. Effect of type of birth on the body weights (kg) of kids in different periods

But statistically similar significant difference in the twins (10.39±0.08 kg) and triplets (10.12±0.12 kg) in the body weight 9 months. Body weight in the 12 months single (12.84±0.09 kg), twins (12.42±0.06 kg) and triplets (11.99±0.10 kg) has statistically different significant difference among them. These results are in accordance with those

obtained in other goat breeds reared in tropical and subtropical environments (Mourad, 1994). The lower birth weight with increasing litter size has also been observed by Al-Shorepy *et al*. 2002), Mourad and Anous (1998), Mia and Bhuiyan (1997) and Gokhale *et al*. (1996). 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.* (2012), Boujenane and El Hazzab (2008), Dadi *et al.* (2008), Elabid. (2008), Rashidi *et al.* (2008), Kumar *et al.* (2005), Portolano *et al.* (2002), Husain *et al.* (1996), Sanchez *et al*. (1994), Singh *et al*. (1990) and Wilson (1987) 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), Mourad and Anous (1998). Husain *et al*. (1996) observed significant effect of type of birth on body weights at birth, 3, 6, 9 and 12 months of ages of Black Bengal goat under the extensive system. 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 are strongly support the results of the present study. 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 (8.14±0.06 kg) present study. Because in this study most of the farmers reared goat in semi-intensive system and that's why goats get more proper care and feeding management. But Husain *et al*. (1996) studied was extensive rearing system where goats are not get proper care and management as like as our 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) studied 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). They also reported that body weight of 6 months were (8.61±0.51, 7.68±0.40, and 7.56±1.10 kg) respectively which are lower than the (8.66±0.06, 8.43±0.04 and 8.14±0.06 kg) our

present study. In case of single, twins and 12 months 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. In the Figure 4 in our study we observed that body weight in single, twins and triplets were at birth and 3 months about same growth rate.

4.4 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 presented in Table 4 and Figure 5.

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

Factor	Birth	3-month	6-month	9-month	12-month
	LSM+SE	LSM+SE	LSM+SE	LSM+SE	LSM+SE
Parity of dam	*	**	*	NS	**
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

Means with different superscripts within each column and trait differed significantly *, ($p<0.05$); **, ($p<0.01$). NS: non-significant.

Parity of dam has highly significant ($p<0.01$) effect in the body weight of 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) respectively. On the other hand significant ($P<0.05$) effect at the age of birth weight (0.94±0.01, 0.95±0.01 and 0.97±0.01 kg) and 6 months (8.29±0.06, 8.37±0.05 and 8.54±0.05 kg) respectively. There is non-significant effect in the body weight 9 months (10.27±0.13, 10.35±0.11 and 10.64±0.10 kg). In the birth weight first parity (0.94±0.01 kg) and second parity (0.95±0.01 kg) are 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) are 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.

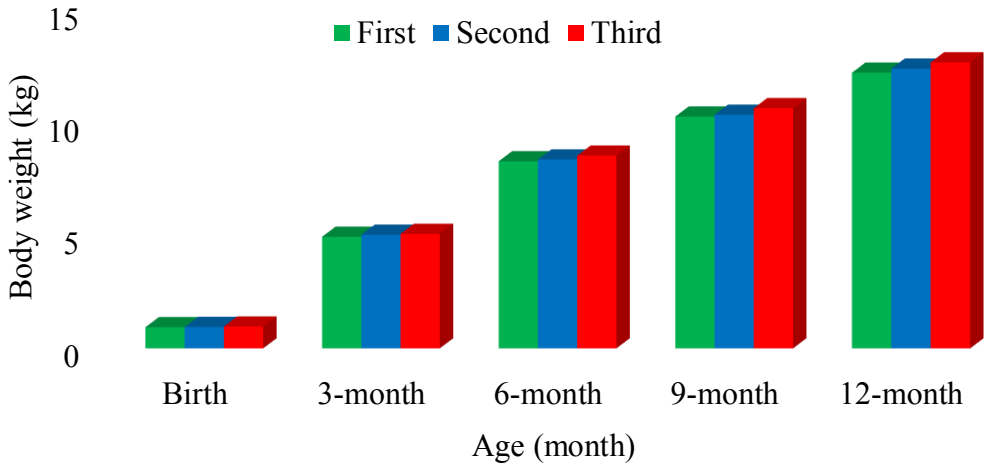

Figure 5. Effect of parity of dam on the body weights (kg) of kids in different periods.

In the body weight 3 months first parity (4.95±0.05 kg) and second parity (5.04±0.04 kg) are statistically similar significant difference. In the same way 3 months body weight second parity (5.04±0.04 kg) and third parity (5.08±0.05 kg) are 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) are statistically different significant difference. The growth rate is highest observed first, second and third parity in the birth weight (0.94±0.01, 0.95±0.01 and 0.97±0.01 kg) to 3 month body weight (4.95±0.05, 5.04±0.04 and 5.08±0.05 kg) respectively. After 3 month body weight growth rate decrease. In 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) more or less similar. In 12 month highest body weight observed 12.67 kg in third parity and lowest in first parity 12.21 kg. In the 6 months body weight first parity (8.29±0.06 kg) and second parity (8.37±0.05 kg) are 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) are 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) are statistically different significant difference among them. Birth weight increased with the progress of parity. Significantly higher birth weight was observed in third parity (0.97±0.01 kg) and birth weights were lowest in first parity (0.94±0.01 kg). Paul *et al.* (2014), Taye *et al.* (2013), Thiruvenkadan *et al.* (2009), Baiden (2007) Chowdhury *et al.* (2002) and Husuin *et al.* (1996) also noticed that body weight third parity > second parity > first parity which are strongly support in our study (0.97±0.01 > 0.95±0.01 > 0.94±0.01 kg) respectively first ,second and third parity. 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 in our 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 in our present study. Wilson (1987) reported that the effect of age of the dam was significant on birth weight and growth rate at pre-weaning, and those young ewes tend to produce smaller progeny at birth. Mia *et al.* (2013) observed that birth weight only significant but 3 months, 6 months, 9 months and 12 months were non-significant where our present study only 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 in our 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. Older ewes are larger in body and tend to be better milkers. 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.

4.5 Effect of season on growth performance of kids

Season of birth of Black Bengal goat at birth, 3 months, 6 months, 9 months and 12 months of age body weight was measured 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) were respectively which are presented in Table 5 and Figure 6.

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

Factor	Birth	3-month	6-month	9-month	12-month
	LSM+SE	LSM+SE	LSM+SE	LSM+SE	LSM+SE
Season	**	**	*	NS	**
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

Means with different superscripts within each column and trait differed significantly *, ($p<0.05$); **, ($p<0.01$). NS: non-significant.

Season (winter, summer and rainy) has a highly significant ($P<0.01$) influence of 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) and 12 months (12.21±0.06, 12.65±0.07 and 12.30±0.10 kg) of ages. But body weight (10.30±0.09, 10.56±0.10 and 10.31±0.13 kg) in 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 winter, summer and rainy season has significant ($P<0.05$) effect. Statistically birth weight in winter season (0.91±0.01 kg) has significant difference with the summer season (0.99±0.01 kg) and rainy season 0.97±0.01 kg). But statistically similar significant difference with the summer season (0.99±0.01 kg) and rainy season 0.97±0.01 kg) in their birth weight. In 3 months body weight summer season (5.22±0.04 kg) has statistically different significant difference with the winter season (4.87±0.04 kg) and rainy season (4.89±0.06 kg). But winter season (4.87±0.04 kg) and rainy season (4.89±0.06 kg) are statistically similar significant difference in the 3 months body weight. In 6 months body weight 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 winter season (8.20±0.04 kg) and rainy season (8.23±0.07 kg) are statistically similar in the 6 months body weight. In the 9 months body weight winter season (10.30±0.09 kg), summer season (10.56±0.10 kg) and rainy season (10.31±0.13 kg) are statistically similar. In 12 months body weight 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). But winter season (12.21±0.06 kg) and rainy season (12.30±0.10 kg) are statistically similar in the body weight 12 months.

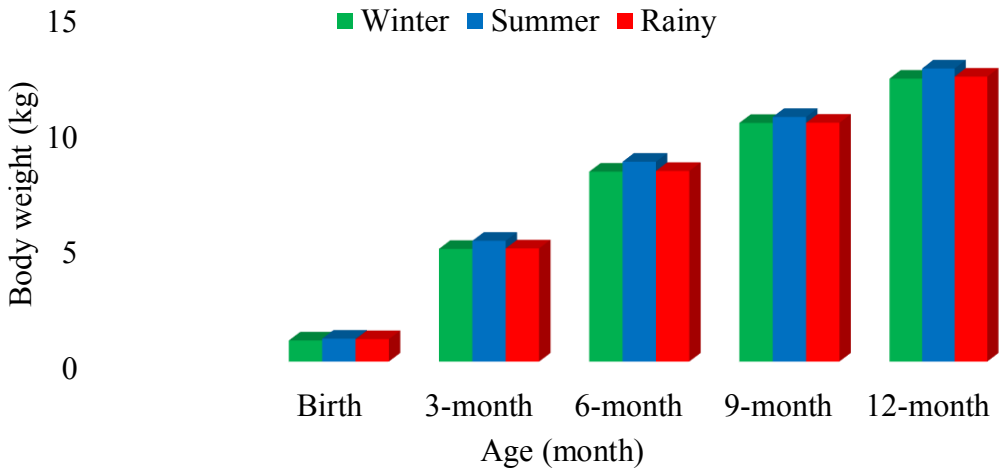

Figure 6. Effect season on the body weights (kg) of kids in different periods

Summer kids born are heavier at birth to 12 month of age than their counterparts the winter and rainy season. Overall more or less similar growth rate between summer and rainy season except 6months and 12 months. In summer season growth performance is higher than rainy and winter season in all different ages. The growth performance in our study follow the sequence: summer season > rainy season > winter season in all ages. The growth rate of Black Bengal goat season of winter, summer and rainy birth (0.91±0.01, 0.99±0.01 and 0.97±0.01 kg) to 3 months body weight (4.87±0.04, 5.22±0.04 and 4.89±0.06 kg) respectively which was highest observed in our study. Growth rate more or less similar increase until 6 months body weight and then gradually decrease. Summer season growth performance is better than other season because suitable environment, plenty of green grass and leaves available here and there. Harvesting different crops which are discard material that used to goat feed. 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 storage which are not sufficient for their requirement. In winter season lack of sufficient green grass and leaves hamper their body growth. Cold also hinder their body growth rate. Diseases prevalence rate also high in this period. Mia *et al.* (2013) observed that the body weight at winter season and summer season in 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 in our 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. Important influence of the season on kid live weights have been reported in several breeds Hermiz *et al*. (1997), Warmington and Kirton (1990). Singh and Singh (1998), Husain *et al*. (1996) and Singh *et al*. (1991) reported non-significant effect of the season of birth on body weights at different stages of growth. On the other hand of 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 was similar of our 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 in our present study. But our observed body weight summer season > rainy season > winter season in all ages. On the other hand Husuin *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 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 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.

CHAPTER 5

SUMMARY AND CONCLUSION

The study was conducted at Savar Upazilla under Dhaka District, out of 12 villages 3 villages are namely Kalma, Adorshagram and Anarkoli in from May/2017 to April/2018. The present experiment was conducted under the Department of Animal Nutrition, Genetics and Breeding in Sher-e Bangla Agricultural University (SAU), Dhaka, with the financial support of the Sher-e Bangla Agricultural University Research System (SAURES) in a project entitled "Performance traits Study of Black Bengal goat in Savar Upazila in Dhaka District". This study involves only field work for accumulation of data. The total 223, 168, 147, 132 and 119 data were taken from Black Bengal goat at the age of birth, 3, 6, 9 and 12 months; respectively. The main objectives of this study of growth performance of Black Bengal goat in village condition based on different factors.

In Black Bengal goat sex has non- significant effect in birth weight (0.98±0.01 and 0.88±0.01 kg) respectively male and female. But sex has highly significant ($p<0.01$) effect in the body weight of 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) respectively male and female. Besides that sex has significant ($p<0.05$) effect in the male and female body weight of 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) of ages. Body weight male is heavier than female in all the ages. Highest growth rate observed birth to 3 months body weight.

Type of birth has highly significant ($p<0.01$) effect body weight in birth, 3, 6, 9 and 12 months of ages. Body weight in birth weight in single (0.99±0.01 kg), twins (0.93±0.01 kg) and body weight in 3 months single (5.19±0.06 kg), twins (5.04±0.04 kg) kids are statistically similar significant difference. Single born kid is heavier than twins and triplets. Type of birth has significant different in the body weight of 6 months (8.66±0.06 and 8.43±0.04 kg), 9 months (10.78±0.12 and10.39±0.08 kg) and 12 months (12.84±0.09 and 12.42±0.06 kg) respectively single and twins.

Effect of parity of dam has highly significant ($p<0.01$) at body weight 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) respectively first, second and third parity. But 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 first, second and third parity. But non-significant 9 months body weight (10.27±0.13, 10.35±0.11 and 10.64±0.10 kg) respectively first, second and third parity. Body weight always third parity > second parity > first parity.

Season (winter, summer and rainy) 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). In 6 months body weights (8.20±0.04, 8.63±0.05 and 8.23±0.07 kg) winter, summer and rainy season has significant ($P<0.05$). But body weight (10.30±0.09, 10.56±0.10 and 10.31±0.13 kg) in 9 months has no-significant effect. The growth performance in our study following the sequence: summer season > rainy season > winter season in all ages.

At birth weight of Black Bengal goat here coefficient of variation is highest. Moreover Birth to 3 months growth rate is highest. So we should take proper care and management in this time. People has huge scope to work there. So mature and healthy male we should be used for breeding purpose. Female also should be selected which are healthy and diseases free. Type of birth especially single born kids is heavier than twins and triplet. In this case twins and triplets born kids we should supply extra feed (eg. cow milk or lactogen) because kids cannot get sufficient milk from their mother. Give nutritious feed and close monitoring for their better health condition especially first parity of kids. Providing improved nutrition and supply clean water. In winter and rainy season should take proper management protect adverse effect. As Black Bengal goat is high adaptability, prolificacy and high meat demand for all religion and skin quality is world famous so anyone can goat farming for their economic solvent.

This it can be concluded that male sex, single type of birth, third parity of dam and summer season should be better.

Recommendation:

Based on the findings and conclusions of the study, the following recommendations were made:

1. The present study was conducted only 3 villages namely Kalma, Adorshagram and Anarkoli in Savar Upazilla under Dhaka District. Findings of the study need further verification through similar research in other parts of the country.
2. This study investigated the effects of four factors of the Black Bengal goat. The receiving information regarding goat farming. Therefore, it is recommended that further studies should be conducted involving other variables in these regards.
3. It is recommended that some researches should be undertaken to determine the preferences goat farmers in wide range of situations particularly from ecological consideration.
4. It is recommended that proper care and management also helps for better growth performance of Black Bengal goat.

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APPENDICES

Appendix 1:

Questionnaire on performance traits study of Black Bengal goat in Dhaka district

Name of the owner:			
Name of the area/ Village:			
Occupation:			
Types and source of breed:	Black Bengal		Cross
Number of goat:	Doe:		Buck:
			Scrotum length:
			Scrotum circumference:
Rearing system:	Intensive	Semi intensive	Others
Age at puberty			
Types of service :	Natural		Artificial
No. of service per conception			

Parity number	Season of kidding	Body wt. at birth	Litter size at birth	Body wt. at weaning (Kg)	Litter size at weaning	Body wt. at 365 days
First	Winter					
	Summer					
	Rainy					
Second	Winter					
	Summer					
	Rainy					
Third	Winter					
	Summer					
	Rainy					

Types of birth	Season	Daily milk yield	
Single	Winter		Others
	Summer		
	Rainy		
Twins	Winter		
	Summer		
	Rainy		
Triplet	Winter		
	Summer		
	Rainy		

Sex of kid	Male	Female
Lactation length		
Post-partum heat period		
Kidding interval (days)		
Dry period		
Age at first kidding		
Gestation length		
Hearth girth length:		
Body length:		

Date: