Research article

Growth performance of Black Bengal goats at rural areas of Gaibandha district in Bangladesh

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A R T I C L E I N F O	A B S T R A C T
	The present study was conducted to assess the growth performance of Black Bengal goats along with investigating the effect of sex of kids, type of kidding and parity of dam on the body weight at birth and subsequent 3, 6 and 9 month of age reared under field conditions at Gaibandha district of Bangladesh. All goats of the study area were reared extensively. Data were collected on a regular basis from June 2018 to February 2019. Least- squares means for body weights at birth, 3, 6 and 9 month of age were 1.13±0.02, 5.22±0.13, 8.12±0.22 and 10.92±0.28 kg, respectively. The average body weight of male kids was higher than female kids at all the ages with significantly (p<0.05) higher body weight at 6 and 9-month of age. Litter size had significant (p<0.01) effect on birth weight and highest birth weight was found in single birth kids than the twin and triplet birth kids. Parity of dam significantly (p<0.01) influenced the birth weight and it increased with the progress of parity of dam. However, body weights at 3, 6 and 9 month of age did not varied significantly due to influence of litter size and parity of dam. It can be concluded that non-genetic factors should be adopted as a technique for improving the growth performance of Black Bengal goats.

1. INTRODUCTION

Goats play an important role to the stability of smallholder farming system by serving as assets that can be easily liquidated to provide cash for purchase of farm inputs and household needs in times of need, nutritional security, skin and fibers, organic manure and employment. Bangladesh has fourth highest population of goat among the Asiatic countries whichaccounts for about 26.38 million heads (BER, 2020). Bangladesh has only one goat breed of its own, known as the Black Bengal goat whichcovers more than 90% of goat population of the country (Husain, 1993; Amin et al., 2001). Goats are preferred livestock for rearing especially in small holding farming system due to its unique ability to adapt and maintain them in harsh environment. Goat rearing is becoming an attractive activity mainly among the poor women of villages (Choudhury et al., 2012). More importantly, above 98% of Black Bengal goats are being managed in the traditional

village system of the country (Husain et al., 1998). The average number of goats per household is 2.31 which are mostly reared by small, landless and medium farmers (Faruque, 2010).

Black Bengal goats are being reared primarily for meat production and for that reason trait such as body weight especially birth weight, growth rates and mature body weight could be considered as the most important factor. There is a positive correlation in birth weight and further increasing of the live weight of goats (Roy et al., 1989). Studies of various authors showed that birth weight is influenced by sex, type of birth, season of birth and maternal age (Supakorn and Pralomkarn, 2009; Bharathidhasan et al., 2009).The increase quantity of meat is determined principally by the growth rate and live weight at slaughter (Devendra, 1985). Production traits are affected by various non-genetic factors like sex, season, year and type of birth (Kumar et al., 2007). As more than 90% of goats are mainly kept by individual farmers in the various rural areas of the country, different strategies for the improvement of this important trait may be required. In order to develop goat production at field level in Bangladesh, it would be worthy to know details about the actual performance of Black Bengal goats in terms of birth weight, body weight at different stages and average daily gain during the first year of life along with factors that affect the growth. Knowledge about environmental factors on economic traits is essential for the production of goats that means it is possible to improve birth weight, body weight gain and milk yield of does, which in turn may cause to reduce kid mortality to thereasonable extent and increasing overall production potential (Husain, 2004).

Hence, the present work was undertaken to determine the growth performance of Black Bengal goats from birth to 9 months and also analyze the influence of various nongenetic factors like sex of kids, season of birth, type of kidding and parity of dam on the body weight at birth and subsequent 3, 6, and 9 months of age at Gaibandha district of Bangladesh. The information of this study will help to make need specific technical intervention to enhance the productivity of goats.

2. MATERIALS AND METHODS

Study site and data collection

The study was conducted at farmers level goat of three upazilas namely Gobindaganj, Palashbari and Saghataupazila of Gaibandha district in Bangladesh. The information was collected from June 2018 to February 2019. The records were taken from birth up to 9 months at an interval of 3 months of age. The collected data were classified according to sex, type of kidding and parity of dam as source of variation. A previously structured interview schedule was used as data gathering instrument by keeping in view the objectives of the study. Both open and closed questions were included in the schedule.

Animal management

Goats were maintained under extensive management system at farmers' houses. Most of the farmers housed their goats at night in the living room where few of the farmers had separate houses for their goats. Farmers also used corridor, kitchen, and cowshed to keep their goat at night. Farmers did not show extra care for bedding or feeding. They practiced bedding materials (e.g. rice straw, rice bran and dry tree leaves) only at winter season. In most of the situations, goat is looked after by the women and children. Feeding practices at village farmers' level was in two ways, viz. grazing and supplement of little homemade concentrate. Goats are generally allowed to graze in naturally available grass land around the village at day time. During rainy season, goats were allowed to graze only few hours if the weather was favorable and there was supply of tree leaves and green grass from cultivated land. Farmers often practice tethering in the area of free grazing lands. Certain percentages of farmers practiced both grazing and tethering (grazing in the morning & tethering in the afternoon). During the shortage of green grasses in the field especially from late winter to early summer, farmers supplied tree leaves, household scrapes and kitchen wastes as an alternative source to feed their goats. There was seriously lacking of prevention and treatment facilities in the studied areas.Farmers usually did not practice vaccination and medication to their goats due to financial constraints.

Parameters studied

The traits considered in the analysis were birth weights of kids, subsequent body weights at 3 months, 6 months and 9 months of age. The main effects considered in the analysis were sex, litter size and parity.

Statistical analysis

Data were analysed using GLM (General Linear Model) procedure of the SAS statistical program (2004). Duncan's Multiple Range Test (DMRT) was used to make pair wise comparison among the least squares means.

3. RESULTS AND DISCUSSION

Body weights at different ages

The complete summary statistics for all growth traits analysed, as well as least- squares means and coefficient of variation(CV) have been presented in Table 1. There was variation in gaining live weight during the different growth periods. Least-squares means for body weights at birth, 3, 6 and 9 month of age were 1.13, 5.22, 8.12 and 10.92 kg respectively. The coefficient of variation (CV) was highest for body weight at 3 month of age (28.13%) and lowest for 9-month body weight (18.30%). The mean birth weight in present study was comparable with those reported by Akhter et al. (2000), Hossain et al. (2004), Akhter et al. (2006), Mia et al.(2013) and Husain et al. (1997) for Black Bengal goats. Birth weight of kids observed in the present study seems to be lower than those reported by Mia (1992), Singh and Singh (1998) and Chowdhury et al. (2002) for the same breed but higher as reported by Ali et al. (1973). The mean for body weight at 3-month of age in the present study was comparable to those reported by Singh et al. (1991), Acharya (1992), Mia et

al. (1992), Husain et al. (1996), Singh (1997), Singh and Singh (1998).Akhtar et al. (2006) reported lower values for 3-month body weight than those in the present study. The mean for body weight at 6-month of age in the present study was comparable to those reported by Acharya (1992), Mia et al. (1992), Husain et al. (1992), Singh (1997). Akhtar et al. (2006) reported lower for 6-month body weight than those in the present study. The mean for body weight at 9-month of age in the present study was comparable to those reported by Acharya (1992), Miah and Alim (2009), Husain et al. (1992) and Singh (1997). Differences in body weight reported by various authors could be due to the management and environment variation in different studies.

Effect of sex of kid on body weight

There were differences in body weight of male and female at birth, 3, 6 and 9 month of age and the male goats were heavier than females at all ages but the difference between sexes was significant (p<0.05) at 6 and 9 month of age (Table 2). The result was in agreement with the findings of Husain et al. (1996) and Akhter et al. (2000). In our study, male kids were significantly heavier along with grew faster from weaning to onward, indicating that sex effects are more pronounced with age after weaning. These effects have been attributed to hormonal differences between sexes and their resultant effects on growth. Higher body weights of males compared to females at all the stages might be due to aggressive behavior of males during feeding and suckling and male sex hormone which has an anabolic effect. Non-significant (p>0.05) influence of sex on body weight at birth and 3-month of age in the present study agreed with the findings of Singh and Singh (1998) in Black Bengal and Beetal × Black Bengal kids but disagreed with the reports

Table 1. Summary statistics for growth traits of Black Bengal goats

Parameters	BW	3MW	6MW	9MW
Number of records	188	132	106	94
LSM (Kg)	1.13	5.22	8.12	10.92
Standard error	0.02	0.13	0.22	0.28
Range (Minimum-Maximum) Kg	0.53-2.18	2.52-9.40	3.65-12.64	6.80-16.75
CV (%)	24.78	28.13	26.85	18.30

BW, Birth weight; 3MW, Three month weight; 6MW, Six month weight; 9MW, Nine month weight; CV, Coefficient of variation; LSM, Least-squares means

Table 2. Effects of sex of kids on body weight at different ages

Sex of kid	Body weight, kg (LSM±SE)			
	BW	3MW	6MW	9MW
Male	1.16±0.07	5.70±0.21	8.65[a]±0.11	11.55[a]±0.33
Female	1.07±0.07	5.01±0.17	7.40[b]±0.27	9.93[b]±0.30
Level of Significance	NS	NS	*	**

BW, Birth weight; 3MW, Three month weight; 6MW, Six month weight; 9MW, Nine month weight; Means with uncommon superscripts at the same column differ significantly; *, $p<0.05$; **, $p<0.01$; NS, non-significant ($p>0.05$); LSM, Least-squares means; SE, Standard error

of Al-Shorepy et al. (2002) in Emirati goat. On the other hand, Singh (1997) reported significant effect of sex on body weights at 3, 6 and 9-month of age.

Effect of litter size on body weight at different ages

The litter size significantly ($p<0.01$) affected the body weight at birth (Table 3) and highest weight at birth was found in single birth kids followed by twins and triplet birth of kids. Similar results were reported by Mourad and Anous (1998) in other goat breeds reared in tropical and subtropical environments (Mourad and Anous, 1998). Moreover, the lower birth weight with increasing litter size has also been reported by Mia and Bhuiyan (1997) and Al-Shorepy et al. (2002). This variation may be due to the higher availability of nutrients, lack of competition as well as more space for the single kid in the intrauterine environment that could enhance growth. Singh et al. (1990) noticed that birth weight of single born kids was highest followed by twin and triplet but the differences in their study were not significant in the local and crossbred kids. Single born kids maintained their highest body weight followed by twin and triplet for all the period. Husain et al. (1995) observed significant effect of litter size on body weights of Black Bengal goat under extensive

system. Negative linear relationship of kid'sgrowth with litter size at birth is probably due to difference in birth weight and availability of mother's milk to their kids during early stage of life. Robinson et al. (1977) reported that for lambs/kids in uterus, as the number of foetuses increases, the number of caruncles attached to each foetus decreases, thus reducing the feed supply to the foetus and hence reduction in the birth weight of the lambs or kids.

Effect of parity on body weight at different ages

Parity of dam had significant ($p<0.01$) influence on birth weight of Black Bengal goat. But the body weight at 3, 6 and 9 month of age did not varied significantly ($p>0.05$) due to parity of dam. There was a tendency to increase birth weight with the progress of parity of dam. Significantly highest birth weight was found in 3rd parity and lowest in 1st parity (Table 4) which was agreed with the findings of Thiruvenkadan et al. (2009), Baiden, (2007) and Chowdhury et al. (2002). A similar result was also found by Mia et al. (2013) who reported that parity of dam had significant effect on body weight at birth but it had no influence on the body weight at 3, 6 and 9 month of age. Husain et al. (1996) also reported that among the four parities, kid's birth weight was lower in 1st parity does compared to 2nd, 3rd and 4th parity.

Table 3. Effects of litter size on body weight at different ages

Litter size	Body weight, kg (LSM±SE)			
	BW	3MW	6MW	9MW
Single	1.11[a]±0.01	5.48±0.19	8.58±0.13	11.66±0.31
Twin	1.09[a]±0.01	5.23±0.16	7.76±0.16	11.56±0.28
Triplet	0.86[b]±0.01	4.78±0.11	7.57±0.16	10.72±0.24
Level of Significance	**	NS	NS	NS

BW, Birth weight; 3MW, Three month weight; 6MW, Six month weight; 9MW, Nine month weight; Means with uncommon superscripts at the same column differ significantly; **, $p<0.01$; NS, non-significant ($p>0.05$); LSM, Least-squares means; SE, Standard error

Table 4. Effect of parity of dam on body weight at different ages

Parity of dam	Body weight, kg (LSM±SE)			
	BW	3MW	6MW	9MW
First	1.03[b]±0.10	4.70±0.11	7.76±0.16	11.06±0.23
Second	1.17[a]±0.17	5.62±0.18	8.51±0.13	11.01±0.22
Third	1.24[a]±0.10	5.70±0.17	8.33±0.13	10.63±0.18
Level of Significance	**	NS	NS	NS

BW, Birth weight; 3MW, Three month weight; 6MW, Six month weight; 9MW, Nine month weight; Means with uncommon superscripts at the same column differ significantly; *, $p<0.05$; NS, non-significant ($p>0.05$); LSM, Least-squares means; SE, Standard error

Body weight of does increases with parity number which reflects on the birth weight of their kids (Bemji et al., 2006). Older dams have larger body along with the capacity to produce better milk (Stobart et al., 1986) and resulted in increased kid weight at birth and up to weaning (Negi et al., 1987). Thus the influence of parity of dam on kids is imparted as maternal impact whose direct effect is limited to the nursing period (Deribe and Taye, 2014).

4. CONCLUSION

The findings of present study revealed that male kids grow faster than females and single born kids showed highest birth weight followed by twins and triplet. Besides, birth weight increased with the advancement of parity number of dam. However, non-genetic factors under the study had major effect on the birth weight and subsequent growth of Black Bengal goats, indicating that these factors should be considered in the development of sound breeding schemes for profitable goat rearing at rural farmers' level.

ACKNOWLEDGEMENTS

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