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Reproductive performances of Black Bengal goat under semi-intensive and extensive conditions at rural areas in Bangladesh

Md. Jahid Hasan[1,*], Jalal Uddin Ahmed[2] and Md. Mahmudul Alam[2]

[1]Veterinary Officer, Char Livelihood Project, Durgapur, Rajshahi, Bangladesh;
[2]Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.
[*]Corresponding author's e-mail: jahid.therio@gmail.com

ABSTRACT

The current study was aimed to investigate the influence of housing system on female reproductive traits of Black Bengal goats at rural areas in Bangladesh during the period of July to December 2012. A total of 200 Black Bengal goats reared under semi-intensive (n=100) and extensive conditions (n=100) were selected considering their age, body weight, body shape, and conformation. In semi-intensive condition, average age at puberty was 197.82±12.58 days, and age at first conception was 292.96±0.50 days; whereas, these lengths were 208.82±12.60 days and 287.65±0.52 days in extensive condition, respectively. Age at first kidding was 448.26±25.48 days under semi-intensive condition, whereas under extensive condition it was 450.07±22.43 days. Under semi-intensive condition, average litter size at the first, second and third parity were 1.06±0.13, 1.76±0.12 and 1.96±0.12, respectively. In contrast, under extensive condition, these values were 1.01±0.10, 1.62±0.12 and 1.75±0.11, respectively. The average kidding interval under semi-intensive system was 190.2±20 days, and the length reduced to 178.23±0.50 days (p<0.01) in the case of extensive housing system. It is concluded that rearing under extensive condition provoked better reproductive performance in Black Bengal goats as compared to semi-intensive housing system at rural level in Bangladesh.

Keywords

Black Bengal goat, Housing, Management, Reproductive performance, Rural level

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INTRODUCTION

The success of goat husbandry largely depends on the environment where the goats are reared, and their management system. However, reproductive efficiency of goat is considered as one of vital factors that ensures better productivity in certain environmental conditions. Although genetic quality of a goat herd is important, reproductive traits in goats consider low heritability, and improvement of reproductive efficiency of goat herd by genetic selection is slow and sometimes difficult (Hossain et al., 2004). It is obvious that better production efficiency can be obtained from goats when they have a high reproductive efficiency with the potentials for increased litter size and shorter generation interval specifically having higher fertility rate in comparison to other farm animals (Haque et al., 2013).

Reproductive performance in goats is an indicator of their adaptation in unfavorable conditions. Reproductive efficiency of doe is determined by different processes, for example, the length of the breeding season, cyclic activity, ovulation rate, age at puberty, age at first conception, age of first kidding, birth weight of kids, litter size, kidding interval fertilization rate, and post-partum anestrus period. For these, among other factors (e.g., genetic and environmental), housing can be considered as crucial.

Of several breeds, Black Bengal is a promising dwarf goat known to be famous for their excellent adaptability, fertility, prolificacy, delicious meat and high quality skin (Moniruzzaman et al., 2002). It is worth mentioning that goat production system in tropical countries includes extensive, semi-intensive, tethering, intensive and integration into crop. Semi-intensive rearing represents in between extensive and intensive rearing system, and largely depends on the availability of land (Choudhury et al., 2012). The most convenient aspect of this method is controlling goat herd with minimum damage to the environment as well as cheap labor for maintenance (Roy et al., 2007). Besides, systemic stall feeding for goat is infrequently practiced during adverse climatic conditions when farmers keep their goats install and feed with tree leaves, natural grasses, and kitchen wastes (Haque et al., 2013).

As stated earlier that reproductive efficiency is one of the important prerequisites for increasing production potential in goat, it seems rationale to investigate influences of specific environmental factor on some selective reproductive traits in Black Bengal goat. However, few researches have been conducted to assess reproductive traits, which are influenced by housing in rural goat. The present study was, therefore, undertaken to assess the differences in certain reproductive traits considering different housing systems of goat at rural level in Bangladesh.

MATERIALS AND METHODS

Experiment site and period: The experiment was run through door to door visit of farmers' houses at Mukterpur village in Charghat *upazilla* (sub-district) under Rajshahi district, Bangladesh during July to November 2012.

Selection of experimental goats: A total of 200 Black Bengal goats comprising of 100 goats reared under semi-intensive condition, and 100 goats reared under extensive condition were selected considering their age, body weight, body shape and, conformation of the goats. In case of semi-intensive condition, among the 100 goats, 40 were at pre-pubertal stage, aging approximately 10 months and weighing 12 kg each, and the remaining 60 goats were at first and second parity, aging approximately 16 months and 22 months, respectively. For extensive study, 45 goats were at pre-pubertal stage aging approximately 10 months and 12 kg body weight each, and the remaining 55 were in first and second parity with age approximately 16 months and 23 months, respectively.

Feed: Under semi-intensive condition, the goats were given stall-feed with mostly jackfruit tree leaves, wheat bran, and matikali bran. Common grass was provided for both semi-intensive and extensive conditions. The feed chart is presented in **Table 1**.

Table 1. Roughage and concentrate feeding plan (in kilogram)

Ingredients	Feeding system	Amount (%)
Roughage		75
Common grasses	Pasture land	80
Jackfruit tree leaves	Cut and carry	20
Concentrate		25
Wheat bran	Stall feeding	60
Matikali bran	Stall feeding	40

Housing

(i) ***Semi-intensive system*****:** Rearing of goats under semi-intensive condition is widely practiced by marginal poor farmers. In most cases, goats are suited even at grazing time. In some cases, goats are unsuited at day times. In our study, in case of semi-intensive system, the goats walked outside freely and took food and water; where they were allowed to graze on public pasture, and at night they were kept in fenced shelter. In most cases, flock size ranged from 1 to 4, and were housed along with residential housing; the houses were mostly of '*kacca*' type (dried mud type) with straw roof. Floor space was about 1.85 m^2/doe and 2.3 m^2/kid. Almost all the farmers used to graze their goats for feeding. The houses were well ventilated and the kids were housed along with their mother in the platform up to weaning.

(ii) ***Extensive system*****:** During the dry season when green grasses and plants nearly disappear and water becomes scarce, many herdsmen join together and migrate to another area to access available pasture and water; this is an indigenous knowledge of goat farming. In the extensive system, we found that the goats were grazed as unsuited over large area of marginal lands. In this system, little management was needed though the goats were allowed to roam feeding at day time. The goats were kept on the bamboo made tin slatted shed. The house was well-ventilated and the kids were housed with their mother and other goats in the platform. Floor space was about 235 m^2/100 goats. The goats were kept free during day and at night. Fresh drinking water was made available for the goats in buckets.

Methods of data collection: For collection of data, selected houses in the study areas were visited door to door. Direct interview method was used for collection of information. Information given by the goat owners were recorded on pre-structured questionnaire. The questionnaire was prepared considering to the objectives of the study, and was designed in such a way that the farmers can understand easily. The questionnaire included questions to collect following information:

a. Age at puberty
b. Age at first conception
c. Age of first kidding
d. Birth weight of kids
e. Litter size
f. Kidding interval

Statistical analysis: The collected data were loaded on to the Excel spread sheet for statistical analysis. The values of age at puberty, age at first conception, age at first kidding, birth weight of kids, litter size, kidding interval and birth type at first and second parity were analyzed using STATA version 9.0. Values of birth type at 1st and 2nd parity were expressed in percentage. The *p*-value less than 0.05 were set as significant.

RESULTS AND DISCUSSION

The overall female reproductive traits of Black Bengal goats are summarized in **Table 2**. It was revealed that average age at puberty was 197.82±12.58 days under semi-intensive condition, and 208.82±12.60 days under extensive condition. These results were in agreement with the findings of Hassan et al. (2007). Our results are also supported by Banerjee (2004) who described the age at puberty in Black Bengal goats as 200 days. In contrast, our results were varied with report of Amin et al. (2001) who found the age at puberty of Black Bengal goat as 250 days. The variations might be due to several causes like presence of buck in the herd, availability of forage, differences in feed intake and temperature. The age at puberty of Black Bengal goats was lower under semi-intensive condition as compared to extensive condition, and this might be due to more nutritive stall feeding and seasonal effect.

The overall age at first conception was 292.96±0.50 days and 287.65±0.52 days under semi-intensive and extensive condition, respectively. Amit et al. (2011) found that Black Bengal goats have significantly lower age at first conception, and age at first kidding. We found the average age at first conception was higher in semi-intensive condition. This might be due to more stressful condition and lower heat detection.

Table 2. Effect of rearing system on reproductive parameters in Black Bengal goats.

Parameters	Semi-intensive condition (mean±SE)	Extensive condition (mean±SE)
Age at puberty (d)	197.82±12.58	208.82±12.60
Age at 1st conception (d)	292.96±0.50	287.65±0.52
Age at 1st kidding (d)	448.26±25.48	450.07±22.43*
Litter size (N)	1.06±0.13	1.01±0.10*
Kidding interval (d)	190.2±0.20	178.23±0.50*
Post-partum weight of does (kg)	18.3±0.54	16.2±0.50*
Kid mortality (%)	15.0±0.50	10.07±0.32*

* = Significant; SE = Standard Error; d= Day; N= Number

In our study, it was revealed that the average age at first kidding as 448.26±25.48 days under semi-intensive condition, and 450.07±22.43 days in case of extensive condition. Our results were slightly differed from report of Chowdhury et al. (2002) who observed the average age at first kidding of Black Bengal goat under semi-intensive system was 405 days. Hassan et al. (2007) found the average age at first kidding in this species as 360.5±10 days. The variation in the age at first kidding could be due to difference in photoperiod, kidding season, and nutritional status (Haque et al., 2013). Under semi-intensive condition, age of first kidding was lower which might be due to more concentrate feeding, and good management system.

Table 3. Litter size at different parity in Black Bengal goats.

Parity	Litter size (Number)	
	Semi-intensive condition (mean±SE)	Extensive condition (mean±SE)
First	1.06±0.13	1.01±0.10
Second	1.76±0.12	1.62±0.12
Third	1.96±0.12	1.75±0.11
Overall	1.60±0.06	1.46±0.05

SE = Standard Error

Litter size in different parity was illustrated in **Table 3**. In the first, second and third parity under semi-intensive condition, litter sizes were 1.06±0.13, 1.76±0.12 and 1.96±0.12, respectively; whereas it was 1.01±0.10, 1.62±0.12 and 1.75±0.11 in the cases of extensive condition, respectively. Overall litter size was 1.60±0.06 under semi-intensive condition, and 1.46±0.05 under extensive condition. The average number of kid born per kidding increased significantly ($p<0.05$) from

Table 4. Birth weight/growth performance of kids at first and second parity in Black Bengal goats.

Parameters	Litter size	Sex	Parity (mean±SE)		Level of significance
			First parity	Second parity	
Birth weight (kg)	Single	M (single)	1.86±0.02	1.66±0.09	*
		F (single)	1.57±0.10	1.42±0.40	*
	Twin	M + F	1.72±0.01	1.52±0.81	*
	Triplet	M	1.41±0.02	1.28±0.18	*
		F	1.34±0.18	1.23±0.20	*
	Multifarious	M	1.18±0.02	1.09±0.10	*
		F	1.06±0.02	0.96±0.20	*

M= Male; F= Female; *= Significant (p<0.05); SE= Standard Error

Table 5. Birth type at first and second parity in Black Bengal goats.

Parity	Semi-intensive condition (%)			Extensive condition (%)		
	Single	Twin	Triplet	Single	Twin	Triplet
First	90	10	0	85	15	0
Second	0	90	10	5	80	15

first parity up to third parity under both semi-intensive and extensive conditions. These results were in agreement with the results of Chowdhury et al. (2002) who reported that up to third parity, number of kids increased linearly (r^2=0.91, p<0.01). Litter size might be affected by nutritional level, body weight, parity, age and genetic factors.

The birth weights of kids at first and second parity are shown in **Table 4**. The kids at first parity were heavier as compared to the kids at second parity, and both male and female kids of both parities were significantly (p<0.05) heavier. In this study, the male kids were about 16% heavier at birth than the female kids in both parities. The birth weight of kid was heavier (1.86±0.02 kg) under semi-intensive condition as compared extensive condition (1.66±0.09 kg). This variation might be due to more body weight of does and intake of more nutritive feed. These findings were in support of Mia et al. (1993) who reported the birth weight of Black Bengal as 1.35 kg. Similar results also reported by Choudhury et al. (2012). Relatively higher birth weight in male kid was observed in Black Bengal goat, as described by Chowdhury et al. (2002) and Bobhate et al. (2003). Kids born within October to January had higher birth weight as compared to the kids born in other seasons. Single born kids had higher birth weight than of twins and triplets. The birth weights of kids at first parity was heavier; this might be due to more single type kid born than twin or triplet under both systems of goat housing speculated in this study.

Birth types at first and second parity are shown in **Table 5**. In the present study, 90% single and 10% twin kids were born, and there was no triplets under semi-intensive condition. In case of extensive condition, 85% single and 15% twin kids were born, and similar to semi-intensive system, there was no triplets. On the other hand, 90% twins and 10% triplets were born in second parity, but there was no single kid under semi-intensive condition. However, 5% single, 80% twin and 15% triplets kids were born under extensive condition (**Table 5**). In this study, we found that number of kid born was increased with parity. This might be due to more body weight of does and the enlargement of uterine size after parturition of first parity kids.

CONCLUSION

Extensive rearing condition with improved feeding and better management practices may help in better reproductive performances of Black Bengal goats, which can be profitable at rural areas in Bangladesh. This study can be beneficial for those who are interested to establish goat farm in the rural areas in Bangladesh, which may help in alleviating poverty.

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