Evaluation of semen quality of Black Bengal Goat in Bangladesh

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ABSTRACT

The study was conducted at the nuclear breeder farm of black Bengal goat belongs to the Department of Pathology, Faculty of Veterinary Science and Department of Animal breeding and Genetics, Bangladesh Agricultural University, Mymensingh from March to September, 2008. A total of 10 breeding bucks were used as experimental animal. The aim of the investigation was to analyze of goat semen by using Eosin-Nigrosin stain and Rose Bengal stain under differential interference microscope. The study included investigation of the age in month, ejaculation volume (ml), mass activity of the semen, spermatozoa motility (%), viable % spermatozoa and normal spermatozoa, and morphologically abnormal sperm especially in head that included the acrosome, midpiece, and tail. Semen was collected twice in a week from each buck by using Artificial Vagina method. Age of bucks were 14.9±4.1 months, ejaculate volume of semen was 0.5±0.3 ml, motility was 80.8±3.5 (%), mass activity was 4. The percentage of viable spermatozoa was 89.6±5.1 . The percentage of spermatozoa with midpiece was 6.9±2.5 and tail abnormalities was only 7.1±2.6 and that of with head abnormalities was 2.5±1.7. The morphologically normal spermatozoa were 90.84%.

Keywords: Black Bengal goat, semen, abnormalities, spermatozoa.

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INTRODUCTION

Goat rearing is an integral part of many farming systems in Bangladesh. Goats were probably the first domesticated animals (Herre and Rohrs, 1973). At present there are 677 million goats and represents fourth largest livestock group of the world (Morand-Fehr and Boyazoglu, 1999). Most of the goats (90%) reared are Black Bengal (Amin et al., 2001), reputed for their prolificacy, fertility, early sexual maturity, adaptability to hot humid conditions and superior quality meat and skin (Devendra and Burns, 1983; Hussain, 1999; Amin et al., 2001). The reproductive function in the male is complex. Semen is liquid or semi gelatinous cellular suspension containing the male gametes or spermatozoa and secretions from the accessory organs of the male reproductive tract (Hafez, 1993). Spermatozoa having abnormalities are unable to fertilize the oocytes (Hafez, 1993).

However, spermatozoa with abnormal morphology are not uncommon even in semen collected from a good, proven fertile buck; the proportion of abnormal spermatozoa must remain within a normal limit. It is said, maximum tolerable sperm abnormalities incase young animals up to 10% and in case of old animals up to 20%. Semen with more than15% abnormal spermatozoa should not be used for AI. The aim of the present study was to observe the basic characteristics of goat semen.

MATERIALS AND METHODS

Animals and source of data

The data were accumulated from a research project on "conservation of Black Bengal goat as the potential resources in Bangladesh at Bangladesh Agricultural University campus". The research period was from January to September, 2008. A

total of 10 breeding bucks were used as experimental animal. Semen was collected from each buck twice in a week. Preliminary sorting and checking of data were carried out at the Department of Pathology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh.

Feeding and management of animals

Feeding and management systems were more or less uniform throughout the year. The animals had access to regular exercise to avoid fattiness and laziness. These bucks were vaccinated against PPR. The experimental bucks were previously tested for breeding soundness. No remarkable abnormality was reported from any buck.

Semen collection

Semen was collected by artificial vagina (AV) method twice in a week. The time of semen collection was in the morning at 8.30 am. The buck was allowed usually at least one false mount. AV was served only when the buck mounted with erect penis. The semen was obtained in a graduated vial previously assembled with the rubber cone. After collection, semen held in tube was put into water bath at 37°c until going for further handling.

Semen evaluation

The routine evaluation of fresh semen was done immediately after collection. The volume, color, motility, mass activity, normal sperm count (%) and head-tail abnormalities and their counting % were recorded. The volume of semen was recorded by reading the graduated mark of the collection vial. The color of the semen was observed in collection vial with necked eye and recorded as milky to creamy. To observe the mass motility, one drop of semen was placed on a pre-warmed (+37°C) slide covered with cover slip and examined at higher magnification (100X). The mass activity was scored into four scales (+=no mass activity; ++=slow wave motion without forming any waves; +++= rapid wave motion with formation of eddies at the end of waves; ++++=very rapid wave motion with distinct eddies).

Proportion of spermatozoa with progressive movement was recorded as sperm motility. Live sperm was estimated by using Eosin-Nigrosin stain as Evans and Maxwell (1990).One large drop of Eosin-Nigrosin stain and one drop of representative semen (proportion about 10 to 1) were placed closely on grease free glass slide. A clean microscope slide was placed over the mixed stain and semen. The mixture was uniformly distributed between the slides and then they were drawn apart quickly and immediately dried on a warm plate in a strong current of air and examined under microscope (40×). Eosin-Nigrosin stain was used for head abnormalities evaluation. A clean dry glass slide was taken and one drop of E-N stain was placed on the middle of the slide with the help of glass rod. A small drop of semen was mixed with the stain. The smear was spreaded over the slide with the help of another slide. The second slide was taken down over the semen on the first slide and thus the smear was made. The smear was dried rapidly by placing on hot plate at 65.56-93.99°C until the semen dried up. Then the slide was placed on the stage of microscope and counted under 40× objectives. At least 100 spermatozoa from individual smear examined under 40x and recorded.

Acrosome, midpiece and tail were evaluated by using Rose Bengal stain. A one drops of buffer placed on a clean, dry glass slide. One drop of semen was added in buffer. It was spreaded by covering with another slide and it was dried in the air. The smear was stained with Rose Bengal stain for 3-5 minutes, then it was rinsed with distilled water to remove excess stain and the smear was dried in the air. The slide was placed on the stage of microscope and counted under 40×. Spermatozoa having any deformity, such as bent tail cork screw tail, coiled tail etc were considered to be abnormal. At least 100 spermatozoa from individual smear examined under 40× and recorded.

Statistics

The data collected from the experiment and the findings were entered into Microsoft Excel spread sheet. Then, the mean and standard deviation (mean ± SD) of age, ejaculate volume, sperm

motility, mass activity, and abnormal spermatozoa were figured out from the original data.

RESULTS AND DISCUSSION

The results are summarized in the Table 1. The color of collected semen of each buck was creamy white. The mean volume of fresh semen is variable: such as Dhar (2007) and Bakshi et al., (1987) demonstrated 0.90±0.2 ml and 0.95±0.03 ml, respectively. However, the present study demonstrated 0.5±0.3ml which is closely similar to Singh et al. (1985) which is about 0.46 ml. Vilar et al., (1993) stated that the average volume of semen of Apline, Anglo-Nubian and Caninde goat were 0.66 ml, 0.57 ml, 0.5 ml respectively. These differences might be due to breed, age of bucks, season and techniques of semen collection. The samples were collected from 14.9±4.1 months of age buck.

Sperm motility is the first and foremost criteria of a semen sample whether it would be selected or discarded. It is also advisable to do motility test as soon as possible. In this study, fresh sperm motility was found as which is, 80.83±3.53 (%), in agreement with Dhar, A.C. (2007). On the other hand, Chung and Kang (1976) reported that the

mean ±SD of sperm motility was 83.3%. Vilar et al. (1993) stated the sperm motility in 24 Apline, Anglo-Nubian and Caninde goat was 50.7, 56.8, and 63.2%, which is very low compared to present study and it indicates the breed differences.

Table 1
Characteristics of Black Bengal goat semen.

Parameters	Mean±SD
Ejaculate volume (ml)	0.5±0.3
Fresh sperm motility (%)	80.83±3.5
Mass activity	4
Live spermatozoa (%)	89.64±5.1
Normal spermatozoa (%)	90.84±3.97
Head abnormalities (%)	2.5±1.7
Mid piece abnormalities (%)	6.9±2.5
Tail abnormalities (%)	7.1±2.6

In the present study the mean sperm viability (%) of fresh buck semen was 89.64±5. Spermatozoa are translucent and virtually invisible by bright field microscopy. Eosin-nigrosin stain was used to determine the percentage of live spermatozoa (Figure 1). Nevertheless, controversies are not uncommon in determining sperm viability accurately by using eosin-nigrosin staining (Björndahl et al., 2004).
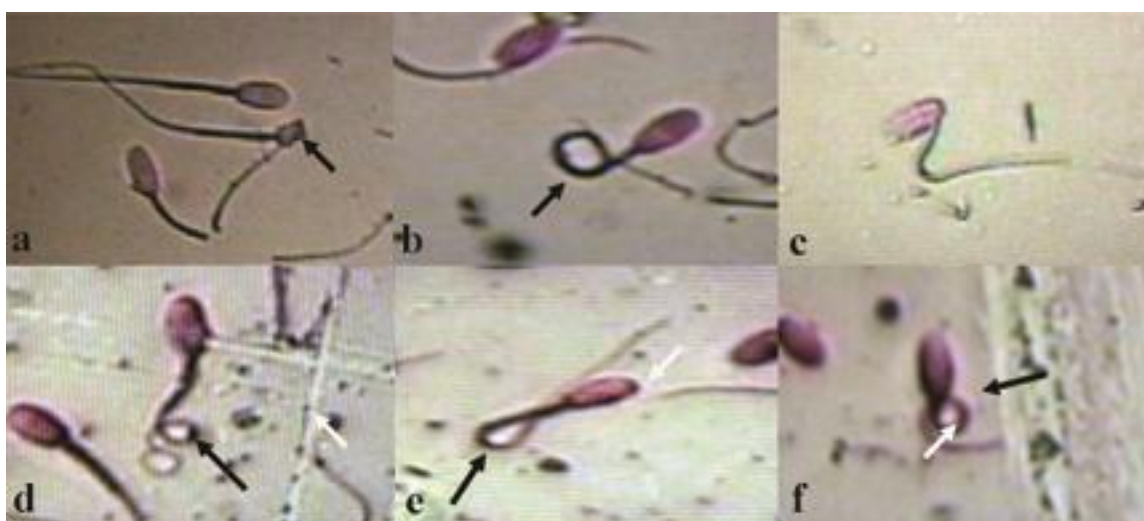

Figure 1
a) Buck sperm with reacted head b) Buck sperm with cork screw tail c) Buck sperm with broken neck d) Buck sperm with bent tail e) Buck sperm with simple bent f) Buck sperm with coiled tail.

In the present study the percentage of normal and abnormal spermatozoa present in semen is another important determinant in selected semen for natural service or AI. The proportion of morphologically abnormal spermatozoa correlates negatively with fertility (Söderquist, 1991; Shamsuddin et al., 1993). In this study about 90% normal spermatozoa were found. The increased proportion of morphologically normal spermatozoa in semen is accountable for increased fertility (Bhuiyan, 1998). On the other hand, increased proportion of abnormal spermatozoa in semen is liable for decreased fertility (Shamsuddin and Rodriguez-Martinez, 1994). Mitchell et al., (1985) described that factors that impair progressive motility of spermatozoa, such as sperm tail defects or protoplasmic droplets, impede their access to the site of fertilization in the oviduct.

Only 2.5 ± 1.7 (%) head abnormalities and 7.1 ± 2.6 (%) tail abnormalities were found in this study. It is therefore suggested that the low abnormalities of spermatozoa present in the fresh semen may be due to age, body weight and nutritional condition of the bucks.

CONCLUSIONS

A good number of viable, normal spermatozoa found in fresh semen of Black Bengal Goats in this study. Bucks which selected by maintaining the body soundness examination including deworming, balanced diet supplementation, and well maintained in a quarantine shed and vaccination against PPR and other infectious diseases gave good quality semen with a high motility, mass activity, live spermatozoa in semen. Furthermore presence of abnormal spermatozoa would be low in %.

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