

Some Observations on the Reproductive Performance of Sudanese Nubian Bucks

By

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Summary

Six, 1 year Sudanese bucks were chosen to study the effect of season on mating behavior and semen characteristics. The bucks were maintained either on Sorghum or molasses-based diet. Prior to semen collection they were trained for mounting for two months. Semen was collected by artificial vagina at monthly intervals during Summer and Winter seasons. The results indicated no seasonal effect on mating behavior and libido. The reaction time recorded was 33.8 ± 20 seconds, ejaculate volume 0.88ml, concentration 2.08×10^6 sperm/ml, mass activity 5.42, active sperm cell 93.978% and abnormal morphology 5.608 during Winter and Summer respectively.

Introduction

The Sudan is predominantly an agricultural country with the largest live stock population in Arab world. Despite this large population, there is insufficient supply of milk and milk products due to the poor genetic make-up of local breed, lack of proper feeding, poor management and diseases. In Sudan, there are four breeds of goats, Nubian, Nilotic, Dwarf and Taggari. The goats play substantial economic role in the livelihood of many Sudanese families.

For rapid genetic improvement of animals on large scale, the most important single technique that can be used is artificial insemination (A.I.). It is known that frozen semen from a single buck can impregnate many thousands of does per year (Chemineau *et al*, 1991). The objective

of this study was to investigate the influence of tropical climatic conditions of the Sudan on the reproductive capacity and sexual behavior of Nubian bucks.

Materials and Methods

Pre-weaning period: Six male kids were chosen from dams with high milk yield immediately following parturition in the flock of Animal Production Center at Kuku.

The kids were allowed to suckle their dams freely during the first three weeks. Afterwards the kids were separated from their mothers approximately for 12 hours (7pm-7am). The kids were then weaned at the age of three months.

Post-weaning period: The kids were individually weighed after overnight fast except from water. They were then divided into equal groups A and B; each comprised three kids of similar weight (7.5kg) and was accommodated in shaded pens.

Group A was offered molasses-based diet and group B Sorghum-based diet Table 1. The concentrate mixture was given *ad lib*. *Medicago sativa* (berseem) was given at the rate of 0.5kg twice weekly. At the age of 5-7 months or weight (12-15kg), the kids were closely observed (three times, morning, afternoon and evening) for change in behavior to determine attainment of sexual maturity.

Table 1. Diet composition

Component (%)	Group A (Molasses-based)	Group B (Sorghum-based)
Molasses	50	-
Sorghum fetrita	-	50
Wheat bran	36	22
Groundnut cake	-	25
Cotton seed cake	10	-
Urea*	3	-
Limestone	-	2
Salt	1	1
Total	100	100

*Fertilizer grade 46.6N

The average age of the bucks at the beginning of the semen collection was one year and body weight ranges from 18-20kg for both groups. they were sexually inexperienced. However, on repeated use (two month training) under similar conditions and copulated vigorously.

Libido was determined by recording the reaction time of the bucks which was measured in seconds from the buck presentation to doe until ejaculation into an artificial vagina (A.V).

The scrotal circumference was measured monthly by grasping the neck of the scrotum with the hand using the finger to push the testicles ventrally to eliminate any wrinkles. The measuring tape was panned around the scrotum and tightened at the greatest width of the two testicles and the circumference was measured in centimeters.

Semen quality and quantity: Collection of semen was done at monthly intervals by means of a standard artificial vagina or small ruminants. Semen production was assessed as total volume of semen delivered by the buck during semen collection. Semen quality parameters included volume, colour, consistency, mass activity, motility of ejaculates, sperm cells, concentration, percentage live and abnormalities. The volume, colour and consistency of semen were assessed directly from the graduated collection tube of the A.V. mass activity and motility of individual spermatozoa was done according to the methods of Evans and Maxwell (1987). The procedure used to determine sperm cell concentration was as follows: a drop of semen diluted in normal saline at 1:1625 was placed in the counting chamber of a haemocytometer. Five larger squares each containing sixteen smaller squares were counted under a light microscope (Olympus BH-2 8300, Germany). The concentration of spermatozoa was then determined using the following formula: $\text{Number of spermatozoa/ml sperm} = N \times 31250$

Where N was the number of spermatozoa counted in the five large squares of the haemocytometer. A semen droplet was obtained with a nigrosineosin mixture (2:1) and examined microscopically for determination of the percentage of dead and abnormal spermatozoa.

Statistical analysis: Data were analyzed for statistical significance using the general linear model program GLM (SAS, 1996).

Results and Discussion

The mean values for reaction times were compared between groups in the different seasons. In the molasses-fed animals (group A), the recorded reaction time was 34 ± 2.0 and 35 ± 2.0 seconds for Summer and Winter season, respectively (Table 2). The corresponding values for Sorghum-fed animals (group B) were comparable and were 34 ± 2.02 and 33 ± 2.9 seconds for the two seasons, respectively. The results showed that the Summer and Winter variations did not affect all parameters of the reproductive capacity of the bucks. This may be attributed to insignificant temperature fluctuations and humidity differences in the experimental area (Kuku) during the study period. The average reaction time of the Nubian bucks was 43 seconds. This value was lower than that reported by Sinha and Singh (1982) for Black Bengal (60.53) and Sannen bucks (64.40 seconds) kept in tropical climate of India and by Adam (1995) and Ahmed *et al* (1997) for Sannen bucks (61.9) reared in the Sudan. The wide variation in the reaction time between the indigenous breed and that of the exogenous breed (Sannen) under the local climatic conditions might be attributed to breed difference.

Table 2. Effect of season on reaction time

Group	Second \pm SD Summer	Second \pm SD Winter
Molasses-fed bucks	35 ± 2.1	35 ± 2.0
Sorghum-fed bucks	34 ± 2.01	33 ± 2.9

Table 3. Effect of season on semen physical characteristics of the Nubian bucks.

Season	Scrotal circumference	Volume /ml	Mass activity	Individual Motility%	Conc./ ml ¹⁰	Live %	Abnormality
Summer	23.87 ± 1.18	0.89 ± 0.041	3.42 ± 0.13	82.91 ± 1.08	2.08 ± 10	94.08 ± 0.32	5.75 ± 0.40
Winter	24.60 ± 1.13	0.88 ± 0.044	3.43 ± 0.14	82.60 ± 0.98	2.07 ± 10	93.91 ± 0.34	5.60 ± 0.45
Over all		0.885	3.425	82.785	2.08 \pm 10	93.978	5.608

There was no significant seasonal variation during Summer and Winter in scrotal circumference between the groups. Adam (1995) and

Ahmed *et al* (1997) reported a significantly higher value of scrotal circumference in Autumn than either Winter or Summer. The seasonality in male goats was reflected by a marked change in the size of the testes and concentrations of luteinizing hormone and androgen (Ritar 1991). The main seminal volume per ejaculate was 0.88ml (Table 3). There was no significant seasonal variation between individual ejaculates. Similar results were reported in Sannen bucks by Adam (1995), and in Black Bengal bucks by Sinha and Singh (1982) and Devendra and Burns (1970). The colour of ejaculate varied between bucks and within different ejaculates of the same bucks. The yellowish appearance is due to a harmless pigment called riboflavin (Campbell and Lasley 1975).

The score of average mass activity obtained in the present study was (3-4) and percentage of individual motility (73%) fell within the normal range for good quality semen (Evans and Maxwell 1987; Chemineau *et al* 1991). The average sperm cell concentration of 2.08^{10} per ml obtained in the present study corroborates the finding of Chemineau *et al* 1991) and Sinha and Singh (1982). The percentage of live sperm (93.98) and morphologically abnormal spermatozoa (5.608%) found in the present study fell within the normal range for good quality bucks (Evans and Maxwell 1987; Chemineau *et al* 1991). However, discrepancies in the values reported for this trait by different workers could be attributed to differences in the technique adopted for staining and counting as well as in the properties of stain used.

It is necessary to conclude that semen collected from Nubian bucks proved to be optimum and can be used satisfactory for breeding.

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