

Semen production traits and freezability of spermatozoa of boer grade goats

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ABSTRACT

A total of 94 semen collections from two Boer Grade (Boer x Local) half-bred bucks were used to study the semen production traits and freezability of spermatozoa. The semen production traits recorded in the study were Ejaculate volume (0.60±0.03 ml), Mass activity (4.55±0.07) (0 to 5 scale), sperm motility (78.19±0.94 per cent), sperm concentration (3416.00±178.66 million/ml), live spermatozoa (82.16±0.92 per cent), abnormal spermatozoa (8.43±0.66 per cent), pre-freeze motility (71.94±0.78 per cent), post-thaw motility (31.67±2.16 per cent) and total doses of frozen semen per collection (14.86±1.74). Highly significant ($P \leq 0.01$) difference was noticed between bucks for sperm concentration. Live spermatozoa also exhibited significant ($P \leq 0.05$) variation between bucks.

Key words : Goat spermatozoa, semen production traits, cryopreservation

Goat stands among very few domestic animals, which have shown continuous growth in India, since it has high potential as a source of income for economically weaker farmers. However, no organized effort has been taken for genetic improvement of goats. Besides the common advantages in general, A.I. in goats has scope for genetic improvement of non-descript goats by grading with exotic breeds. For maximisation of breeding potential of exotic bucks by A.I., assessment of semen production potential is essential. Therefore, a pilot study on semen production traits of Boer Grade (Boer x Local) half-bred bucks and its potential for frozen semen production has been made.

MATERIALS AND METHODS

The study involved a total of 94 semen collections from two young and growing (> 1 year of age) Boer Grade half-bred bucks maintained as stall-fed animals. Semen collections were undertaken twice a week, each collection schedule involving a single ejaculate. The samples were evaluated for its quality macroscopically. After evaluation for Mass activity, the samples having a score of 3 and above in the scale 0 to 5, were extended with equal volumes of Tris-egg yolk-citric acid-

fructose-glycerol diluent for evaluation of progressive motility. Samples showing 60 per cent or more of progressive motile sperm were further extended at the rate of 1:4 to 1:7 times depending on initial consistency and motile spermatozoa per cent of the ejaculate. Diluted semen was equilibrated at 5°C for 4 hrs. The samples were filled in French mini straws (0.25 ml) and sealed during equilibration. The pre-freeze motility was assessed before the straws were subjected to horizontal freezing in liquid nitrogen vapour. Frozen semen straws were stored in liquid nitrogen at -196°C. After 24 hrs of storage, the samples were thawed in a water bath at 37°C for 30 sec. to assess post-thaw motility.

Representative ejaculates were used for assessment of sperm concentration, live spermatozoa and abnormal spermatozoa by conventional semen evaluation methods. The data on semen collection accrued over a period of 1½ years were used for evaluation of other semen characteristics. The semen production traits studied in this investigation were Ejaculate volume (EV) (ml), Mass activity (MA) (0 to 5 scale), Sperm concentration (SC) (million/ml), Live spermatozoa (LS) (per cent), Abnormal spermatozoa (AB) (per cent), Sperm motility (SM) (per cent), Pre-freeze motility (PFM) (per cent), Post-thaw motility (PTM) (per cent) and Total Doses of frozen semen per collection (TDFS). The data were analysed statistically to find the significance of variation.

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RESULTS AND DISCUSSION

The mean values (\pm SE) of semen production traits of Boer Grade bucks and the anova for the traits, which showed significant differences, are presented in Tables 1 and 2, respectively.

Ejaculate volume : The mean EV (ml) obtained in this study for Boer Grade bucks was comparable with those reported for other indigenous breeds of goats namely (Malabari (0.5), Pashmina (0.62), Black Bengal (0.45) by Patil and Raja (1978), Mohan *et al.* (1980), Mittal (1982) and Sinha and Singh (1982) respectively. Higher EV of 0.84 ml, 1.09 ml and 1.5 ml were reported for exotic breeds of Baladi, Angora and Nubian goats by El-Sayed *et al.* (1983), Loubser and Nickerk (1983) and Ali and Mustafa (1986) respectively. Sivaselvam (1992) also recorded higher EV for Tellicherry goats. Apart from genetic factors, age of bucks, collection frequency, season of collection would have influenced the variation in EV.

Mass activity : Mean for MA observed for Boer Grade bucks in the present investigation was more or less similar to those reported by other workers (Sinha and Singh, 1982; Singh *et al.*, 1985; Sivaselvam, 1992), Mohan *et al.* (1980); Sinha *et al.* (1982) and El-sayed *et al.* (1983) reported low scores of MA ranging from 3.06 to 4.19 in different breeds of goats. Tull and Holtz (1992) also observed MA scores ranging from 5.64 to 3.75 in different seasons in Boer goats which were lower than those appreciated for Boer Grade bucks in the present investigation. The variation might be because of buck effect.

Sperm motility : Most of the earlier workers (Patil and Raja, 1978; Mohan *et al.*, 1980; Singh *et al.*, 1982; El-sayed *et al.*, 1983) recorded lower values for SM than those obtained in the present study. The observations of Tull and Holtz (1992) for SM ranged from 68.66 to 71.23 per cent in Boer goats and these values were lower than those recorded for Boer Grade bucks in this study. However, Ali and Mustafa (1986), Joseph and Nair (1989) and Sivaselvam (1992) reported higher mean values for SM in other breeds. The variation might be because of difference in age and individuality of bucks involved in experimentation.

Sperm concentration : The mean SC (million/ml) observed in this study was 3416.00 ± 178.66 and it differed highly significantly ($P \leq 0.01$) between bucks. From the literature it was noted that SC in goat semen was highly variable ranging from values lower than 2000 million/ml (Loubser and Nickerk, 1983; Ali and Mustafa, 1986), about 2000 million/ml (Sinha and Singh, 1982; El-sayed *et al.*, 1983; Singh *et al.*, 1985; Sivaselvam, 1992) to 7490 million/ml (Patil and Raja, 1978). SC for Boer Grade goats

Table 1. Means (\pm SE) of semen production traits for Boer Grade Bucks

Buck	EV (ml)	MA (0-5 scale)	SM (per cent)	SC (million/ml)	LS (per cent)	AB (per cent)	PFM (per cent)	PTM (per cent)	TDPS
1	0.55 \pm 0.04 (47)	4.45 \pm 0.09 (47)	77.02 \pm 1.05 (47)	2956.67 \pm 271.13 (15)	80.12 \pm 1.50 (15)	8.04 \pm 0.65 (15)	70.67 \pm 1.18 (15)	26.67 \pm 3.33 (15)	11.93 \pm 1.96 (15)
2	0.65 \pm 0.05 (47)	4.66 \pm 0.09 (47)	79.36 \pm 1.56 (47)	3875.33 \pm 169.06 (15)	84.21 \pm 0.81 (15)	8.81 \pm 1.16 (15)	71.33 \pm 0.91 (15)	33.33 \pm 3.03 (15)	15.80 \pm 3.06 (15)
Over-all	0.60 \pm 0.03 (94)	4.55 \pm 0.07 (94)	78.19 \pm 0.94 (94)	3416.00 \pm 178.66 (30)	82.16 \pm 0.92 (30)	8.43 \pm 0.66 (30)	81.94 \pm 0.78 (30)	31.67 \pm 2.16 (30)	14.86 \pm 1.74 (30)

Figures in parenthesis indicate number of observations.

Table 2. ANOVA for sperm concentration and live spermatozoa of Boer Grade Bucks

Source	Traits	Sum of Square	D.F.	Mean Squares	'F' Ratio
Between bucks	SC	6329613.33	1	6329613.33	8.266**
	LS	125.38	1	125.38	5.757*
Within bucks	SC	21440506.67	28	765732.38	
	LS	609.83	28	21.78	
Total	SC	27770120.00	29		
	LS	735.20	29		

**Highly significant ($P \leq 0.01$)* Significant ($P \leq 0.05$)

observed in the present investigation was also higher than those reported by Tuli and Holtz (1992) in Boer bucks. As observed in this study, Sivaselvam (1992) also reported that SC differed significantly between bucks.

Live spermatozoa : The mean LS (per cent) obtained in this investigation was higher than those reported Patil and Raja (1978) and Mohan *et al.* (1980) in Malabari and Jamnapari bucks respectively. Sinha and Singh (1982) recorded higher LS in Black Bengal bucks. The LS values observed by Singh *et al.* (1982) in Barbari and Sivaselvam (1992) in Tellicherry bucks were similar to those obtained in the present study for Boer Grade bucks. The variation might be because of difference in genetic groups and age of bucks involved in the studies.

Abnormal spermatozoa : Most of the AB (per cent) values reported by various workers (Patil and Raja, 1978; Saxena and Tripathi, 1980; Singh *et al.*, 1985; Sivaselvam, 1992) were lower than those obtained in the present study. However, Vinha and Megale (1974) and Bordoloi and Sharma (1982) recorded much higher AB than those observed in this investigation.

Pre-freeze motility : In the present study, the mean PFM (per cent) was found to be 71.94 ± 0.78 , which was higher than those obtained by Tuli and Holtz (1995) in Boer bucks in different seasons of semen collection. On the contrary, Sivaselvam (1992) recorded higher PFM for Tellicherry bucks.

Post-thaw motility : The PTM observed in this study ranged from 10 to 60 per cent. Therefore, the mean PFM appeared moderate. However, considerable samples with high PTM were obtained in later stages of the experiment as the semen production started establishing in young, growing bucks. The mean PTM recorded for Boer Grade bucks in the present study was similar to those reported by Tuli and Holtz (1995) for Boer goat. Higher PTM obtained by Deka and Rao (1987) and Sivaselvam (1992) might be because of breed difference, season of collection and age of the bucks involved in the study.

Total doses of frozen semen per collection : The mean TDFS was found to be 14 as per the results of present investigation. No literature could be traced to compare the frozen production potential of goat semen, pertaining to this trait.

From this study, it was observed that the mean values for most of the semen production traits for Boer Grade bucks were similar to other breeds as evidenced by reports of other workers. The semen production traits of Boer Grade bucks were found to be as good as purebred Boer goats as reported in literature. Variation in lesser magnitude obtained for different semen production traits in this study might be because of different

genetic groups of bucks involved in different studies, age of bucks, semen collection frequency, season of collection etc. The results of the freezability study of spermatozoa also indicate that spermatozoa of Boer Grade goats can be successfully frozen and cryopreserved.

REFERENCES

- Ali, B.H. and Mustafa, A.I. (1986). Semen characteristics of Nubian goats in Sudan. *Indian J. Anim. Reprod. Sci.*, **12**: 63-68.
- Bordoloi, R.K. and Sharma, P.K. (1982). Abnormalities and live spermatozoa in goat. *J. Res. Assam Agri. Univ.*, **3**: 102-103.
- El-sayed, M.A.I., Seida, A.A. and Ghallale, A.M. (1983). Some semen characteristics of Baladi male goats. *Assiut. Vet. Med. J.*, **10**: 167-171.
- Joseph, M. and Nair, K.P. (1989). Effect of frequency of ejaculation on semen characteristics, libido and fertility in crossbred bucks. *Indian J. Anim. Reprod.*, **10**: 127-133.
- Loubser, P.G. and Van Niekerk, C.H. (1983). Seasonal changes in sexual activity and semen quality in the Angora. 2. Semen volume, quality and freezability. *S. Afr. Anim. Sci.*, **13**: 161-163.
- Mohan, G. and Mazumder, N.K. and Goswami, K.K. (1980). Note on semen characteristics of Pashmina goats. *Indian J. Anim. Sci.*, **50**: 898-900.
- Patil, R.V. and Raja, C.K.S.V. (1978). Effect of season on the semen characteristics of Malabari bucks. *Indian Vet. J.*, **55**: 761-766.
- Saxena, V.B. and Tripathi, S.S. (1980). Note on the physico-chemical and morphological attributes of semen of Jamnapari bucks. *Indian J. Anim. Sci.*, **50**: 775-777.
- Singh, D.K., Sinha, M.P., Singh, R.A., Singh, C.S.P. and Singh, K.K. (1985). Comparative studies on semen quality of pure and crossbred bucks. *Indian Vet. Med. J.*, **9**: 56-58.
- Sinha, M.P. and Singh, B.H. (1982). Studies on semen characteristics of Black Bengal and Sannen bucks. *Indian Vet. J.*, **60**: 253-257.
- Sivaselvam, S.N. (1992). Studies on cryopreservation of buck semen. Ph.D. thesis submitted to Tamil Nadu Veterinary and Animal Sciences University.
- Tuli, R.K. and Holtz, W. (1992). Seminal characteristics of Boer goat bucks as affected by months and seasons of the year. 5th International Conference on goats. New Delhi March 2-8, Contributory paper, Vol. I: 311.
- Tuli, R.K. and Holtz, W. (1995). Effect of season on the freezability of Boer goat semen in the northern temperate zone. *Theriogenology*, **45**: 1359-1363.
- Vinha, N.A. and Megale (1974). Physical and morphological aspects of goat semen. *Arch. Esc. Vet. Univ. Fed. Minas Gerais*, **26**: 299-305.

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