



## Libido parameters and their correlation with seminal characteristics in Jakhrana bucks maintained under different systems

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### ABSTRACT

Jakhrana bucks (24) of the same body weight (BW, 30±2 kg) and age (12±0.5 month) were selected to study libido parameters and their correlation with seminal characteristics. The bucks were randomly allotted into group 1 (intensive system, 12 bucks) and group 2 (semi-intensive system, 12 bucks) under group feeding management conditions. Ejaculates (336; 168 from each group) were collected twice weekly and evaluated for various seminal characteristics (volume, pH, mass motility, progressive motility, concentration, viability, hypo-osmotic swelling (HOS) response and acrosomal integrity). The libido parameters (reaction time, refractory period, mounting enthusiasm, erection status of penis and fixing strength of male) were recorded from each group and it was synchronized with semen collection. No significant correlation was observed between libido parameters and semen characteristics. However, significant negative correlation was observed between semen volume with reaction time and refractory period, respectively. Moreover, libido parameters between groups 1 and 2 did not show a significant difference. It may be concluded that there is no correlation between libido parameters and seminal characteristics (except semen volume), so it may be possible to obtain good semen samples from bucks with low libido.

**Key words:** Jakhrana, Libido, Management systems, Seminal characteristics

The main constraint in any livestock production, including goat is the scarcity of good breeding stock, which is important to propagate the particular species. The high level of fertility and prolificacy of goat depends on reproductive performance of both doe and buck. Moreover, male fertility is an important factor in caprine reproduction since numerous does are generally bred to a single buck. Hence, for achieving breeding success, assessing male fertility prior to breeding is of utmost importance. Libido is an integral part of breeding sound evaluation (BSE) and it can strongly influence overall flock fertility (Matos and Thomas 1991). Libido refers to sexual motivation, revealed through behaviors such as mate seeking, courtship, mating (also referred to as servicing or serving), and “fertility” means the ability to produce progeny (Parkinson 2004). Libido is typically measured by using reaction time defined as the elapsed time between exposure to stimuli and first service (Chenoweth 1999). As libido is critical for fertility, there appear to be a need for the development of a predictive, standardized libido test. However, such tests are still rare

for small ruminants in developing countries like India. In artificial insemination programs, evaluation of semen was used as a criteria for the fertility of bucks. Therefore, for determining fertility in the herd, sexual desire and its relation to fertility can be valuable. No study has been conducted regarding the libido parameters and their correlation with seminal characteristics in bucks. So, the present study was designed to investigate various libido parameters and their correlation with seminal characteristics in Jakhrana bucks managed under different systems.

### MATERIALS AND METHODS

*Experimental animals:* Jakhrana bucks (24) of same body weight (average BW: 30±2 kg) and age (12±0.5 month) were randomly allotted into 2 groups viz. group 1 (intensive system, 12 bucks) and group 2 (semi-intensive system, 12 bucks). These bucks were maintained into 2 different systems since weaning. All the animals were healthy and free from external parasites. These 2 groups were statistically tested for their homogeneity with respect to age and body weight.

*Feeding and other managemental procedures:* The bucks under group 1 were maintained under stall feeding conditions in the shed itself and they were offered 500g/head/day pelleted concentration mixture (CP:18–19%; TDN:65–70%) and 700g/head/day green fodder comprising *lobia*, *bajra* and *jowar*, besides available dry fodder *ad lib*.

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The bucks under group 2 were grazed for 4–6 h daily on the available grazing area in the institute farm and supplemented with pelleted concentrate mixture (CP:18–19%; TDN:65–70%) @ 400g/head/day.

**Semen collection:** The bucks were trained to ejaculate in artificial vagina (AV). Semen was collected between 8.00 AM to 9.00 AM, twice a week from each buck under hygienic condition. Ejaculates (336; 168 ejaculates/group and 14 ejaculates/buck) were collected.

**Semen evaluation:** Immediately after semen collection, the volume of each ejaculate was measured directly from the reading of the graduated collection vial in millimeter. The pH of each ejaculate was recorded. For evaluation of mass motility (0–5 scale), a drop of freshly collected semen was put over a clean grease free slide maintained at 37°C and examined under low power (10×) of the microscope. For evaluation of progressive motility, a drop (10 µl) of diluted semen was placed on a clean hyphenated: grease-free slide maintained at 37°C covered with a cover slip and examined under phase contrast microscope at 40× magnification. Sperm motility was assessed in 4 different fields for each sample and the mean was recorded. Sperm concentration was enumerated as per Chemineau *et al.* (1991). The sperm viability and abnormality were estimated by differential staining technique using Eosin-Nigrosin stain (Campbell *et al.* 1953). Hypo-osmotic swelling (HOS) response was assessed as described by Selvaraju *et al.* (2011). Fifty microliters of semen sample was added to 1ml of HOST solution (150 mOsm), mixed well and incubated at 37°C for 1h. After incubation, 1 drop was put on a warm glass slide then covered with cover-slip and examined under 40×. The spermatozoa expressing different tail coiling patterns were counted as HOS responsive. Acrosomal integrity was assessed by Giemsa stain (Watson 1975).

**Assessment of libido:** The libido test was assessed twice a week for 6 months and it was synchronized with semen collection. The testing of sexual urge was based on the time taken by a buck to react sexually to a receptive doe. A camera was used to record various libido parameters. Reaction time (RT) was measured as the period of time between the first contact with the teaser doe and the first

false mount with the penis erected (Hoflack *et al.* 2006). Refractory period (RP) was measured as the time taken between first ejaculate till the second false mounting (Prado *et al.* 2002). Mounting enthusiasm (ME) was scored from – 2 to + 2 (–2, buck does not mount; –1, buck mounts by sliding; 0, mounting between sliding and jumping; +1, buck mounts by jumping; and +2, buck jumps with great enthusiasm) (Ford *et al.* 2009). Fixing strength (FS) was the score of hind legs to fix the semi-membranous muscle of female teaser during ejaculation process (3, strong fixing; 2, medium fixing; 1, weak or no fixing the teaser). Erection status (ES) of penis was appearance of penis during erection (3, penis colour bright red with or without seminal plasma secretion; 2, penis colour pink to pale red; and 1, penis not out from prepuce).

**Statistical analysis:** The mean and standard error of different parameters were calculated by standard statistical procedures (Snedecor and Cochran 1994). Data of libido parameters and seminal characteristics of both groups were compared by Independent t-test using SPSS software (SPSS 20.0 Version). Pearson correlation coefficient was calculated to evaluate the relationship between seminal characteristics and libido parameters.

## RESULTS AND DISCUSSION

Seminal characteristics and libido parameters in both groups are presented in Tables 1 and 2 respectively. Mean value of RT, RP were higher in group 2 but statistically, they were non-significant ( $P < 0.05$ ) within groups. The mean values of fixing strength, erection status of penis and mounting enthusiasm were also non-significant ( $P < 0.05$ ) between groups; however, their values were higher in group 1. The mean values of RT of groups 1 and 2 were lower than reported by Patel *et al.* (2005) in ram and Suyadi (2012) in Boer bucks. The mean value of RP of both groups was lower than Moghaddam *et al.* (2012) in crossbred ram. FS expresses the straightness of male to fix the female, whereas ES, indicated strength of penis and volume of blood flow in the penis veins, which can be used to evaluate the libido of male when introduced to a female. The mean value of ES and FS was almost similar to the finding of Suyadi

Table 1. Mean  $\pm$  SE of seminal characteristics of groups 1 and 2 Jakhra bucks

Seminal characteristics	N	Group 1 (Intensive system)			Group 2 (Semi-intensive system)		
		Mean $\pm$ SE	Min.	Max.	Mean $\pm$ SE	Min.	Max.
Volume (ml)	168	0.84 $\pm$ 0.02 <sup>a</sup>	0.30	1.40	0.75 $\pm$ 0.03 <sup>b</sup>	0.20	1.35
Semen pH	168	6.79 $\pm$ 0.01	6.30	7.40	6.74 $\pm$ 0.04	6.10	7.30
Mass motility (0–5)	168	3.62 $\pm$ 0.09 <sup>b</sup>	2	5	3.91 $\pm$ 0.08 <sup>a</sup>	2	5
Progressive motility (%)	168	75.03 $\pm$ 1.13 <sup>b</sup>	50	85	78.21 $\pm$ 1.02 <sup>a</sup>	50	90
Concentration (billion)	168	2.76 $\pm$ 0.05 <sup>B</sup>	1.6	4.3	3.25 $\pm$ 0.05 <sup>A</sup>	1.9	4.5
Viability (%)	168	75.25 $\pm$ 1.05 <sup>B</sup>	55	91	80.24 $\pm$ 0.92 <sup>A</sup>	58	93
Abnormality (%)	168	7.65 $\pm$ 0.18 <sup>A</sup>	3	21	4.33 $\pm$ 0.13 <sup>B</sup>	2	13
HOS response (%)	168	71.19 $\pm$ 0.93	46	89	73.38 $\pm$ 0.83	51	92
Acrosomal integrity (%)	168	80.73 $\pm$ 0.59 <sup>B</sup>	68	92	85.28 $\pm$ 0.65 <sup>A</sup>	71	96

Means having different superscript in lower case letters (<sup>a, b</sup>) in the row differs significantly ( $P < 0.05$ ). N, total no. of ejaculates from each group. Means having different superscript in upper case letters (<sup>A, B</sup>) in the row differs significantly ( $P < 0.01$ ).

Table 2. Mean  $\pm$  SE of libido parameters of groups 1 and 2 Jakhrana bucks

Libido parameter	N	Group 1 (Intensive system)			Group 2 (Semi-intensive system)		
		Mean $\pm$ SE	Min.	Max.	Mean $\pm$ SE	Min.	Max.
Reaction time (sec)	168	41.56 $\pm$ 0.94	13.56	73.95	43.25 $\pm$ 0.88	14.72	76.90
Refractory period (sec)	168	188.77 $\pm$ 7.70	65	388	202.26 $\pm$ 6.23	57	402
FS score (1–3)	168	2.73 $\pm$ 0.03	1	3	2.61 $\pm$ 0.04	1	3
ES score (1–3)	168	2.67 $\pm$ 0.04	1	3	2.63 $\pm$ 0.04	1	3
ME score (–2 to+2)	168	1.71 $\pm$ 0.09	–2	+2	1.60 $\pm$ 0.09	–2	+2

FS, Fixing strength of male; ES, erection status of penis; ME, mounting enthusiasm.

Table 3. Correlation coefficient (r) between libido parameters and seminal characteristics of groups 1 and 2 Jakhrana bucks

	Volume	pH	MM	PM	Conc	Via	Abnm	HOS response	AI	RP	FS	ES
RT	–0.218**	–0.022	0.086	0.069	–0.013	0.068	–0.084	0.085	0.112	0.12*	0.012	–0.007
RP	–0.13*	–0.006	0.029	0.03	0.034	0.026	–0.06	–0.013	0.066		0.018	–0.029
FS	0.084	0.011	–0.005	0.015	–0.03	0.001	0.015	0.011	0.052			0.217**
ES	0.042	0.097	0.027	0.067	–0.078	0.093	0.049	0.105	0.02			

\* (P<0.05) and \*\* (P<0.01) showed significant correlation. RT, Reaction time; RP, refractory period; FS, fixing strength of male; ES, erection status of penis; MM, mass motility; Conc, concentration, Via, viability; Abnm, abnormality; HOS, hypo-osmotic swelling; AI, acrosomal integrity.

(2012) in Boer bucks. The ME score was non-significant (P<0.05) between groups. Correlation coefficient (r) between libido parameters and seminal characteristics of Jakhrana bucks are presented in Table 3. No significant correlation was observed between reaction time with all seminal characteristics (pH, mass motility, progressive motility, live, HOS response, and acrosomal integrity) except for semen volume where a significantly negative correlation (P<0.01; r=–0.218) was recorded. The same trend was recorded between refractory period (RP) and seminal characteristics except for semen volume where a significantly negative correlation (P<0.05, r= –0.13) was recorded. No significant correlation was observed between seminal characteristics with fixing strength and erection status respectively. Correlation coefficient (r) among libido parameters (RT, RP, FS and ES) demonstrated that buck with small RT had shorter RP which shows that there was significant and positive correlation (P<0.05, r=0.12) between RT and RP but there was no significant correlation between RT or RP with FS and ES. Thus, reaction time may be a factor for estimating refractory period of the bucks. This coincides with finding of Moghaddam *et al.* (2012) in crossbred rams. The present results are in agreement with Moghaddam *et al.* (2012) who reported that reaction time and refractory period had a negative and significant correlation with semen volume, however, inconsistent with their other findings, in which refractory period showed a significant correlation with all seminal traits except for total sperm per ejaculate (TSE). Present findings are also inconsistent with the results of Quirino *et al.* (2004) that used scoring system from 0 (no sexual interest) to 10 (two services followed by sexual interest, including mounts, mounting attempts or further services) for assaying sexual

activity. But the results of Galina *et al.* (2007) showed that libido is not related to semen quality, which supported our finding. Albeit, several Brazilian reports indicate no correlation between libido and seminal traits in Nellore bulls (Pineda *et al.* 1997). Chenoweth (1986) suggested that there was no correlation between the components of breeding soundness examinations and libido. Thus, the morphological characteristics of spermatozoa and physical semen traits would not be used to predict the libido of the bulls. Anzar *et al.* (1993) reported that semen production was correlated with sexual behavior only in case of fair and poor categories of buffalo bulls. Galal *et al.* (1978) also revealed that relationship between semen quality and libido is not clear across breeding groups of Merino, Ossimi and their crosses. These different results of different researchers may be due to various methods of testing libido, such as the latency for males to copulate, or reaction time (Chenoweth 1981, Landaeta-Hernandez *et al.* 2001) counts and durations of interest, such as sniffing at the vulva and time spent with females, the number of mounts and/or serves during a specified period of time (Bertram *et al.* 2002) and scores assigned according to various combinations of these measures (Landaeta- Hernandez *et al.* 2001).

The results of seminal characteristics and libido parameters of Jakhrana bucks did not show significant correlation except semen volume, which was significant and negative correlated with reaction time (RT) and refractory period (RP). Significantly positive correlation between RT and RP indicated that reaction time may be used as a factor for estimating refractory period. Bucks under both management systems did not show a significant difference in expression of libido level. Thus, physico-morphological characteristics of semen could not be used

to predict the libido of buck. So, it may be possible to obtain good semen samples from bucks with low libido. Therefore, there is a need for a standard fertility testing in all breeding and commercial flocks to remove the bucks with poor performance before serving does.

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