



Testosterone in yak (*Poephagus grunniens* L.) bull seminal plasma and its correlation with physical characteristics of semen

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Received: 14 January 2012; Accepted: 13 April 2012

Key words: Correlation, Radioimmunoassay (RIA), Semen, Testosterone, Yak

Reproduction plays a vital role in augmenting production and productivity of yak (*Poephagus grunniens* L.), a unique multipurpose bovid, living on and above 3000 m of mean sea level. The role of testosterone is important for spermatogenesis and also essential for spermatozoa maturation and survival in the male reproductive tract. Seasonal influences on seminal output and circulating testosterone concentration was earlier reported by Sarkar *et al.* (2009). The present study was undertaken to estimate testosterone concentration in the seminal plasma and its correlation with certain physical characteristics of semen.

A total of 30 ejaculates comprising 6 ejaculates from each of 5 clinically healthy yak bulls were used for the study. The yak bulls were maintained at Nyukmadung yak farm, National Research Center on Yak, ICAR, Dirang, Arunachal Pradesh under identical standard nutritional and managemental conditions in semi-range system. The yak farm is located at 2750 m above mean sea level (91°40'E longitude and 27°0'N latitude). Semen samples were collected twice in a week using standard artificial vagina during winter season (November to February). The collected semen samples were subjected to further analysis.

The colour of the semen sample was observed in collection tube against light. Volume was measured in collection tube having graduation mark from 0.1 to 10 ml. Initial sperm motility, live sperm count and sperm concentration was determined using standard methods. The pH of the semen sample was recorded using standard pH meter. The seminal plasma was separated by centrifugation at 3000 rpm for 10

min and stored at –20°C till estimation of testosterone. The testosterone concentration in seminal plasma was estimated by Radioimmunoassay (RIA) using I^{125} as tracer with the kits. The intra-assay and inter-assay coefficient variations were found to be 14.8% and 15%, respectively. The concentration of testosterone was expressed in ng/ml. Data were expressed in mean $\pm$ SE and analyzed as per Snedecor and Cochran (1994). Correlation between testosterone concentration and seminal characteristics were determined.

In the present study the colour of semen was found milky white to creamy, but majority of seminal ejaculates irrespective of animal was observed to be creamy in colour. Similar observations were also reported in yak semen by Chakravarty *et al.* (2009). The mean values of ejaculate volume, initial sperm motility, sperm concentration and live sperm count of semen sample irrespective of animals were found to be 2.83 ± 0.08 ml, $71.5 \pm 0.57\%$, 1182.5 ± 3.23 million/ml and $80.05 \pm 0.74\%$, respectively. The present findings were within the range reported earlier by Sarkar *et al.* (2009). However, Lu (2000) reported a lower mean value (63%) for initial sperm motility in Chinese yak bull semen. This might be due to the age of the animals, season of semen collection, endocrine profile of the animals etc. The mean pH in the present study was found to be 6.34 ± 0.02 , which falls within the range reported earlier by Zhang (2000). However, Lu (2000) recorded a slightly higher value of pH (6.6). The variation in pH among the bulls might be due to slight variation in the biochemical composition, sperm concentration and % of motile sperm present in the semen. Sarkar *et al.* (2009) concluded that the variation of seminal characteristics of different individual bulls may be due to age of the animals, seasonal variation, frequency of collection and secretory pattern from the accessory sex glands. In the present study, the values obtained for testosterone content irrespective of animal was 1.82 ± 0.08 ng/ml. The level of testosterone in bull seminal plasma varied with factors like age and level of sexual stimulation (Salisbury *et al.* 1978, Faulkner and Pineda, 1980). Sarkar *et al.* (2009) recorded the mean seminal plasma testosterone level in yak was 1.03

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Table 1. Correlation between testosterone with physical characteristics

	Ejaculate volume	Initial sperm motility	Sperm concentration	Live sperm	Testosterone
Ejaculate volume	1				
Initial sperm motility	0.09	1			
Sperm concentration	-0.03	0.07	1		
Live sperm	0.09	0.77*	-0.08	1	
Testosterone	-0.02	0.77*	-0.04	0.53*	1

*($P < 0.01$).

± 0.25 ng/ml, reached highest (1.73 ± 0.15 ng/ml) at the winter season and this finding was comparable to the present study. The correlation of testosterone with seminal parameters were presented in Table 1. Statistical analysis revealed a significant ($P < 0.01$) positive correlation with initial sperm motility and live sperm count; however, a non-significant negative correlation with ejaculate volume and sperm concentration was also observed. Sarkar *et al.* (2009) reported that semen quality of yak bulls reached its maximum level when testosterone concentrations were relatively higher in blood plasma.

SUMMARY

Studies were conducted to estimate testosterone concentration in seminal plasma and its correlation with some seminal characteristics of yak semen. The colour of semen varied from milky white to creamy. The average mean values for ejaculate volume, initial sperm motility, sperm concentration, pH, live sperm and testosterone were 2.83 ± 0.08 ml, $71.5 \pm 0.57\%$, 1182.5 ± 3.23 million/ml, 6.34 ± 0.02 , $80.05 \pm 0.74\%$ and 1.82 ± 0.08 ng/ml respectively.

Significant ($P < 0.01$) positive correlation existed between testosterone concentration in seminal plasma with initial sperm motility and live sperm count. The present study revealed that an increase in the levels of testosterone in seminal plasma enhanced certain qualitative parameters (initial sperm motility and live sperm) of yak semen during winter season.

ACKNOWLEDGEMENTS

The authors are thankful to the Director, National Research Centre on Yak (ICAR), Dirang, Arunachal Pradesh for providing necessary facilities to carry out the work.

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