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Research Article

STUDY OF TESTICULAR BIOMETRY AND ITS CORRELATION WITH CAUDA EPIDIDYMAL BUCK SEMINAL ATTRIBUTES

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ABSTRACT

The present study was carried out on ten pairs of testis from mature non-descript buck irrespective of breed presented for slaughter at government approved slaughter house to evaluate the testicular parameters vis-a-vis semen quality obtained from cauda epididymis of bucks. All the testicular and epididymal parameters were differed non-significantly between left and right testis. Further, the correlation coefficients among paired testicular, epididymal and cauda epididymal buck spermatozoa parameters revealed that, testicular length had significant ($p<0.001$) positive correlation with testicular diameter, testicular weight, testicular volume, epididymal weight, epididymal length and dead count while negative correlation with live count. The testicular diameter had significant ($p<0.01$) positive correlation with testicular weight, testicular volume, epididymal weight and epididymal length. The testicular weight had significant ($p<0.001$) positive correlation with testicular volume, epididymal weight and epididymal length. The testicular volume had significant ($p<0.05$) positive correlation with epididymal weight and epididymal length. The epididymal weight had significant ($p<0.001$) positive correlation with epididymal length. The epididymal length had significant ($p<0.05$) positive correlation with dead count and negative correlation with live count.

Keywords: Biometry, Buck, Correlation, Epididymal, Testicular parameters

Generally, body size and testicular measurements are important parameters utilized in breeding soundness evaluations. Live body weight and testicular size has been found to generally indicate the production of viable spermatozoa by the male. The potential of testicular measurements as selection criteria for improving male fertility has already been indicated in cattle (Morris and Cullen, 1994), sheep (Rege *et al.*, 2000) and goats (Bongso *et al.*, 1982). Testicular size in sheep has also been found to be correlated to semen production and the immediate phenotypic response in lambing rate (AL-Nakib *et al.*, 1986). Testicular biometry is also helpful for diagnosis, control and treatment of sub-fertility and infertility. It also gives an indication about sperm concentration in the ejaculate of mature males. Egbunike *et al.* (1976) reported that morphometric analysis on the testes of any species or breed is necessary in assessing and estimating qualitative changes in testicular components and spermatogenic functions. Its function includes storage, maturation and absorption of sperm cells.

Testicular parameters would suggest the level of sexual activity and semen production from the daily sperm production potential in buck (Leal *et al.*, 2004). Therefore, this study was designed to evaluate the testicular biometry and its correlation with cauda epididymal buck seminal attributes.

MATERIALS AND METHODS

The present study was carried out in mature non-descript buck irrespective of breed presented for slaughter at government approved slaughter house. Apparently healthy animals with good body condition at the time of slaughter were selected. Ten pairs (n=20 testes) of testicles were collected immediately after slaughter under strict hygienic conditions and transferred to the laboratory in ice packs as early as possible. The laboratory processing of testes was carried out immediately reaching the laboratory. Testes were washed and cleaned with saline solution. Fascia, blood vessels and sheath of testes were removed with the help of BP blade and thumb forceps. Care was taken to prevent the damage to the epididymis.

The epididymides were carefully separated from each testis using the sterile BP blade and various testicular and epididymal parameters were measured for right and left testicles separately. Testicular Length (TL), Testicular diameter (TD) and Epididymal Length (EL) were measured by scrotal tape. Testicular Weight (TW) and Epididymal Weight (EW) were measured using sensitive electronic weighing scale. Testicular volume (TV) was measured by water displacement technique described by Endale *et al.* (2009). Testicular density (TDEN) was obtained by dividing the TW by TV (Adjibode *et al.*, 2016).

Spermatozoa were retrieved separately from the right and left cauda epididymis at room temperature by the incision method. Several small incisions were made on the cauda of epididymides to enable spermatozoa swim out in to 5 ml pre warmed (37 ºC) tris egg yolk citrate (TEYC) diluter in a Petri dish. TRIS-citric acid-fructose buffer was prepared using Tris (2.42 g), Sodium citrate (1.36 g), Fructose (1g), Streptomycin (0.1g), Penicillin (1 lakh IU)

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in 100 ml of Milli Q water. Finally, the TEYC dilutor was prepared by adding 20% egg yolk in Tris-citric acid-fructose buffer.

Retrieved individual cauda epididymal sperm samples were extended with TEYC diluter to make a final volume of 20 ml and were examined at 37 ºC temperature in a microscope for various parameters viz. sperm motility (%), live-dead sperm count (%), abnormal and normal sperm count (%), HOS reacted sperm count (%).

The data pertaining to various aspects were tabulated and analysed using R-3.3.2 software. The differences among the parameter means were carried out using appropriate statistical methods, viz. ANOVA, DNMRT (Duncan's New Multiple Range Test). The mean differences were considered significant at $p<0.05$, $p<0.01$ and $p<0.001$. Correlation coefficients (r) were worked out between testicular and epididymal biometry as well as cauda epididymal semen parameters.

RESULTS AND DISCUSSION

Testicular and epididymal parameters of all the testicles were measured and presented in Table 1. All the testicular and epididymal parameters were differed non-significantly between left and right testis. Similar results were reported by Oyeyemi *et al.* (2012) in Sahel bucks, Bhattacharyya *et al.* (2010) in local sheep of Kashmir valley, AL-Mahmodi *et al.* (2017) in rams and bucks and Saurabh *et al.* (2018) in buffalo bull.

In present study, the mean value of TD was found non-significantly higher in left as compared to right testis. In accordance to the present study, Oyeyemi *et al.* (2012) in Sahel bucks, AL-Mahmodi *et al.* (2017) in rams, and Saurabh *et al.* (2018) in buffalo bull also found non-significantly higher TD in left as compared to right testis. However, opposing to the present findings AL-Mahmodi *et al.* (2017) reported significantly higher testicular diameter in left as compared to right testis in bucks. The mean value of TW found in present study was non-significantly higher in left as compared to right testis. Similarly, Oyeyemi *et al.* (2012) in Sahel bucks, Saurabh *et al.* (2018) in buffalo bull and Bhattacharyya *et al.* (2010) in local sheep of Kashmir valley reported non-significantly higher value of TW in left as compared to right testis. However, contrary to the findings of present study, AL-Mahmodi *et al.* (2017) in rams and bucks and Abdullahi *et al.* (2012) in camel found non-significantly higher TW in right as compared to left testis.

In present study, the mean value of TV found was non-significantly higher in right as compared to left testis. Similar outcome was observed by Abdullahi *et al.* (2012) in camel. However, opposing to the present findings, AL-Mahmodi *et al.* (2017) found significant difference between testicular volume of left and right testis in rams and bucks. The mean value of TDEN was found non-significantly higher in left as compared to right testis which was in accordance with the findings of Abdullahi *et al.* (2012) in camel.

In present study, the mean value of EL was observed non-significantly higher in left as compared to right epididymis. Similar results were also reported by Oyeyemi *et al.* (2012) in Sahel bucks, Saurabh *et al.* (2018) in buffalo bull, Abdullahi *et al.* (2012) in camel and Bhattacharyya *et al.* (2010) in local sheep of Kashmir valley. The mean value of EW found in present study was

Table 1

Testicular and epididymal parameters of right and left testis with paired cauda epididymal buck spermatozoa parameters in buck (Mean ± SE)

Groups (n=10)	Testicular and epididymal parameters						
	TL (cm)	TD (cm)	TW (gm)	TV (ml)	TDEN (gm/cm^3)	EW (gram)	EL (cm)
LT	7.04±1.03	4.79±0.72	79.03±6.00	86.1±5.66	0.90±0.47	11.35±2.17	12.83±1.56
RT	6.83±0.90	4.78±0.84	75.87±6.05	88.9±6.10	0.88±0.45	11.41±2.07	12.29±1.56
F value	0.25	0.001	0.04	0.03	0.03	0.01	0.25
P value	0.62	0.97	0.85	0.86	0.86	0.92	0.63

Paired cauda epididymal buck spermatozoa parameters (Ten pairs)						
Parameters (%)	Motility	Live count	Dead Count	HOS reacted Count	Abnormal Sperm Count	Normal Sperm Count
Value	74.00±1.96	87.70±1.64	12.30±1.64	76.25±2.73	9.60±2.34	90.40±2.35

(LT-Left testis, RT-Right testis, TL-Testicular length, TD-Testicular diameter, TW-Testicular weight, TV-Testicular volume, TDEN-Testicular density, EW-Epididymal weight, EL-Epididymal length)

non-significantly higher in right as compared to left epididymis. Contrary to the present findings, Saurabh *et al.* (2018) in buffalo bull and Abdullahi *et al.* (2012) in camel found non-significantly ($p<0.05$) higher values of epididymal weight in left as compared to right epididymis.

The percentage of motility, live sperm count, dead sperm count, Host reacted sperm count, abnormal sperm count and normal sperm count for paired cauda epididymal spermatozoa found in present study were 74.00±1.96, 87.70±1.64, 12.30±1.64, 76.25±2.73, 9.60±2.34 and 90.40±2.35 %, respectively.

Correlation coefficients (r) among testicular as well as epididymal parameters and cauda epididymal buck spermatozoa parameters (Table 2) for paired testes revealed that TL had significant ($p<0.001$) positive correlation with TD (0.839), TW (0.946), TV (0.750), EW (0.882), EL (0.901) and DC (0.593) while negative correlation with LC (-0.593). Further, the TD had also a significant ($p<0.001$) positive correlation with TW (0.805), TV (0.649), EW (0.723) and EL (0.691). Similarly, TW also showed the significant ($p<0.001$) positive correlation with TV (0.780), EW (0.958), EL (0.925) and DC (0.548) while negative correlation with LC (-0.548) and HOS reacted SC (-0.453). Same way, the TV had also a significant ($p<0.001$) positive correlation with EW (0.730), EL (0.677) and DC (0.601) whereas negative correlation with LC (-0.601). Likewise, a significant ($p<0.001$) positive correlation was also found between TD and EL (0.457), EW and EL (0.911), EW and DC (0.458) whereas negative correlation between EW and LC (-0.458) as well as EW and HOS reacted SW (-0.468). Moreover, the EL had significant ($p<0.01$) positive correlation with DC (0.567) though negative correlation with LC (-0.567).

The findings of present study were in close agreement with the reports of Gemeda and Workalemahu (2017) who have also reported a highly significant ($p<0.01$) positive correlation for TL and TD, TL and TW, TD and TW, TD and EW, TL and EW, TV and TW, TV and TL, TV and TD, TW and EW and TV and EW in bucks. Same way, Abdou *et al.* (1978) also observed highly significant positive correlation ($p<0.001$) between paired testicular volume and paired testicular weight as well as paired testicular weight and epididymal weight in rams. Further, Agga *et al.* (2011) also found a significant positive correlation for TV and TW followed by TD and TV, TD and TW, TL and TW, TL and TV, TW and EW, TV and EW, TD and TL, TD and EW and TL and EW.

Likewise, Abdullahi *et al.* (2012) also found that, paired testis weight had significant positive correlation with epididymal weight, testicular volume and epididymal length and non-significant positive correlation with testicular density. They also found significant positive correlation between paired epididymal weight and testicular volume, epididymal weight and epididymal length as well as non-significant positive correlation among paired epididymal weight and testicular density. Further, they reported significant positive correlation between testicular volume and epididymal length whereas non-significant negative correlation between testicular volume and testicular density in camels. However, contrary to the findings of present study they observed non-significant negative correlation between mean

Table 2

Correlation coefficients (r) among paired testicular, epididymal and cauda epididymal buck spermatozoa parameters (Ten pairs)

Traits	TL	TD	TW	TV	TDEN	EW	EL	MOT	LC	DC	HR	AB	NOR
TL	-												
TD	0.839***	-											
TW	0.946***	0.805***	-										
TV	0.750***	0.649**	0.780***	-									
TDEN	0.400	0.336	0.386	-0.244	-								
EW	0.882***	0.723***	0.958***	0.730***	0.382	-							
EL	0.901***	0.691***	0.925***	0.677***	0.457*	0.911***	-						
MOT	-0.249	-0.200	-0.247	-0.140	-0.182	-0.113	-0.214	-					
LC	-0.593**	-0.432	-0.548*	-0.601**	-0.068	-0.458*	-0.567**	0.246	-				
DC	0.593**	0.432	0.548*	0.601**	0.068	0.458*	0.567**	-0.246	-1.0***	-			
HR	-0.399	-0.196	-0.453*	-0.275	-0.278	-0.468*	-0.318	0.165	0.157	-0.157	-		
AB	-0.302	-0.357	-0.224	-0.271	0.123	-0.147	-0.183	-0.102	0.210	-0.210	-0.240	-	
NOR	0.302	0.357	0.224	0.271	-0.123	0.147	0.183	0.102	-0.210	0.210	0.240	-1.0***	-

*** Significant at $p<0.001$; ** Significant at $p<0.01$; * Significant at $p<0.05$.
(TL-Testicular length, TD-Testicular diameter, TW-Testicular weight, TV-Testicular volume, TDEN-Testicular density, EW-Epididymal weight, EL-Epididymal length, MOT- Motility, LC-Live count, DC-Dead count, HR- HOS Reacted, ABN-Abnormal, NOR-Normal)

testicular density and epididymal length in camels.

Moreover, Ibrahim *et al.* (2012) also reported a significant ($p<0.001$) positive correlations for TW and TV (r=0.998), TW and EW (r=0.919), EW and TV (r=0.906), TV and TL (r=0.862) and TW and TL (r=0.828) in rams but non-significant positive correlations for TW and EL (r=0.781), EW and EL (r=0.766), EL and TV (r=0.749), EW and TL (r=0.670) and EL and TL (r=0.362). However, contrary to the results of present study they found negative correlations between EL and TD (r=-0.478), EW and TD (r=-0.521), TW and TD (r=-0.615), TV and TD (r=-0.639) and TD and TL (r=-0.747).

Contrary to the present findings Bukar *et al.* (2017) found that, testicular weight, testicular length, testicular volume and epididymal weight showed non-significant positive correlation with epididymal sperm motility in bucks. However, they reported non-significant negative correlation between epididymal length and epididymal sperm motility which was in accordance to the present results. Further, Ajani *et al.* (2015) reported non-significant negative correlation of extra-gonadal sperm motility with testicular weight, testicular diameter, testicular length and epididymal length which supports the findings of present study.

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