Original Research

Study on Testicular Biometric Parameters and Their Correlation in Non-Descript Breeds of Goat

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Rec. Date:	Aug 01, 2019 10:28
Accept Date:	Aug 28, 2019 17:36
DOI	10.5455/ijlr.20190801102843

Abstract

The study was conducted to compare the testicular morphometry parameters of right and left testis as well as their correlation in non-descript breed of goats. A total 16 mature testicles were collected from the Government approved slaughter house, in air-tight sterile cryobox (4-5°C) and brought to the laboratory within 2-4 hours after slaughtering the buck. The epididymis was carefully separated from each testis then testicular measurements were recorded. The mean epididymal length of right and left testes were observed as 12.01±1.33 cm and 12.36±1.44 cm; epididymal weight as 09.30±1.80 gm and 09.65±1.87 gm; testicular length as 05.91±0.91cm and 06.23±0.89 cm; testicular weight as 58.29±3.80 gm and 63.77±4.01 gm; testicular diameter as 04.19±0.59 cm and 04.44±0.69 cm; testicular volume as 54.38±4.39 ml and 62.50±4.46 ml and the testicular density as 01.11±0.41 gm/ml and 01.04±0.31 gm/ml, respectively. The correlation coefficient of various biometrical parameters of right and left testicles were significantly ($p<0.01$) positive correlated as: the epididymal length with epididymal weight; the testicular length with testicular weight; the testicular weight with testicular diameter; the testicular diameter with testicular volume ($p<0.05$) in right and ($p<0.01$) in left testicles but these testicular parameters were negatively correlated with testicular density in right and left testicles. It can be concluded that the non-significance ($p>0.05$) difference was observed between the right and left testes as regard to various testicular biometrics parameters.

Key words: Buck, Correlation, Testes, Testicular Biometrics Parameters

How to cite: Kargwal, A., Khasatiya, C., Chaudhary, L., Patel, C., Yede, A., & Modi, L. (2019). Study on Testicular Biometric Parameters and their Correlation in Non-Descript Breeds of Goat. International Journal of Livestock Research, 9(9), 143-148. doi: 10.5455/ijlr.20190801102843

Introduction

Goats are the first farm animals to be domesticated. Goats have been used for their milk, meat, hair and skins (Coffey *et al.*, 2004). Currently goats sector become important for the national economies, particularly for rural areas. Now a day's goats face serious environmental challenges (degradation of rangelands,

competition for land use, less water availability etc.). Climatic changes create additional difficulties on the small ruminant farming (Marino *et at.*, 2016). As per 19th Livestock Census India, the goat population has declined by 3.82% over the previous census (140.53 million numbers in 2007) and the total goat in the country was 135.17 million numbers in 2012 having prominent indigenous breeds (45.5million) and non-descript breeds (82.81 million).

However, to increase and improve the goat production, the study on testicular and epididymal morphometry is essential for a maximum and rational utilization of the breeding stock. A good measurement of testes circumference, length, width etc. would be a reliable predictor of sperm producing capacity of bucks (Datta *et al.*, 2009). The scrotal size and testicular measurements have been used for improved sperm production in breeding males (Keith *et al.*, 2009). The semen volume and sperm concentration were highly significantly (p<0.05) and positively correlated with testicular measurements (Ashutosh, 2014).

The study was therefore designed to determine testicular and epididymal morphometry and their correlation in non-descriptive breed of bucks in South Gujarat.

Materials and Methods

The investigation was conducted at Department of Veterinary Gynaecology and Obstetrics, Vanbandhu College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari, Gujarat, India. Navsari is located geographically on Arabian coast line at southern border of Gujarat state at 20°57' to 20°95' North latitude and 72°56' to 72°93' East longitude at an elevation of 9 m above the mean sea level. The climate of the region is humid tropically with heavy rainfall area. A total 16 mature testicles (8 pair) of bucks were collected from the Government approved slaughter house, in a sterile plastic bag with utmost care in air-tight sterile cryobox (4-5°C) brought to the laboratory within 2-4 hours after slaughtering of 10-12 months old age group buck and selected for study based on the semen which had a >70% motility of spermatozoa from collected testis. The collected testes were processed after proper washing and cleaning with cold phosphate buffer saline (PBS, pH-7.4) and tunica albuginea covering of the testes was removed mechanically with extreme care to prevent the unnecessary damage to the epididymis. The epididymis was carefully separated from each testis using the sterile BP blade and thumb forceps leaving behind the testicular mass and various measurements were recorded.

Testicular and epididymal length (TL & EL) were measured separately in cm along the longitudinal axis of the testis and epididymis beginning from their one pole to the other pole with thread followed by flexible tape. Testicular diameter (TD_l) was measured in cm by Vernier caliper around the widest point of the testis. Testicular and epididymal weight (TW & EW) were measured separately in gram by putting each testis and epididymis on a sensitive electronic weighing scale. Testicular volume (TV) was measured volumetrically using the Archimedes principles of water displacement in a measuring cylinder and result was recorded in

 DOI 10.5455/ijlr.20190801102843

ml. Testicular density (TD_E) was obtained in gm/ml by dividing the testicular weight with testicular volume as per Adjibode *et al*., 2016.

Statistical Analysis

The comparison of mean testicular biometrical parameters between right and left testicles were carried out with two sample "t" test ($p<0.05$) and the correlation coefficient among testicular biometry parameters were carried out by MS excel office.

Results and Discussion

In present study, the most of testicular biometry parameters of left side testes revealed non-significantly ($p>0.05$) higher value as compared to right side testes. Similar to present finding, greater size of left testis than the right testis was reported by Yaseen *et al*. (2010) in Marwari goats and Kabiraj *et al.* (2011) in black Bengal bucks (*Capra hircus*) of the same individual of different age groups in Bangladesh.

In the study average mean epididymis length was 12.19±1.37 cm (Table 1) whereas, little bit higher mean epididymal length was observed 13.06±0.35 cm and lower mean epididymal length was observed as 8.00±1.00 cm by Mahmud *et al*. (2015) and Ajani *et al.* (2015), respectively in the Red Sokoto buck (RSB) in Nigeria. The average mean epididymis weight and testicular length was 9.47±1.80 gm and 6.07±0.89 cm, respectively (Table 1) whereas, lower mean epididymal weight and testicular length as 9.09±1.88 gm and 4.97±0.79 cm, respectively was reported by Gemeda and Workalemahu (2017) in three indigenous breeds of buck in arid and semiarid Agro-ecologies in Ethiopia. The average mean testicular weight and testicular diameter were 61.03±3.88gm and 4.31±0.65 cm, respectively (Table 1).

Table 1: Left and right-side testicular biometry (Mean±SE) of slaughtered buck testes collected from slaughter house (n=8)

S. No.	Testicular Biometry	Left Testicles (n=8)	Right Testicles (n=8)	Average (n=8)	P value
1	Epididymal Length (cm)	12.36±1.44	12.01±1.33	12.19±1.37	0.72
2	Epididymal Weight (gm)	09.65±1.87	09.30±1.80	09.47±1.80	0.84
3	Testicular Length (cm)	06.23±0.89	05.91±0.91	06.07±0.89	0.45
4	Testicular Weight (gm)	63.77±4.01	58.29±3.80	61.03±3.88	0.49
5	Testicular Diameter (cm)	04.44±0.69	04.19±0.59	04.31±0.65	0.25
6	Testicular Volume (ml)	62.50±4.46	54.38±4.39	58.44±4.40	0.42
7	Testicular Density (gm/ml)	01.04±0.31	01.11±0.41	01.08±0.37	0.28

As compared to present finding, lower mean testicular weight and higher testicular diameter as 52.3±9.90 gm and 10.90±9.90 cm, respectively were observed by Ajani *et al.* (2015) in the Red Sokoto buck (RSB) in Nigeria. The average mean testicular volume was 58.44±4.40 ml (Table 1) which was lower than mean

 DOI 10.5455/ijlr.20190801102843

testicular volume 68.1±6.18 ml reported by Gemeda and Workalemahu (2017) in three indigenous breeds of buck. The mean testicular density was observed non-significant higher ($p>0.05$) in right testicles as compared to left one in the study, due to the testicular density was calculated that solely depend on testicular weight by volume.

The epididymal length of right and left testicular biometry were positively correlated ($p<0.01$) with epididymal weight. The testicular length of right and left testicular biometry were positively correlated with testicular weight ($r = 0.94$, $p<0.01$) and ($r = 0.93$, $p<0.01$), testicular diameter ($r = 0.84$, $p<0.01$) and ($r = 0.92$, $p<0.01$), respectively (Table 2).

Table 2: Correlation coefficient (r) among various biometrical parameters of left and right-side buck testicles collected from slaughter house

Testicular Biometry		Right Testis (n=8)						
		EL (cm)	**EW (gm)**	**TL (cm)**	**TW (gm)**	**TD_I (cm)**	**TV (ml)**	**TD_E (gm/ml)**
Left Testis (n=8)	EL (cm)	--	0.86**	0.65	0.4	0.29	0.57	-0.5
	EW (gm)	0.88**	--	0.82*	0.67	0.61	0.7	-0.45
	TL (cm)	0.90**	0.97**	--	0.94**	0.84**	0.94**	-0.62
	TW (gm)	0.76*	0.91**	0.93**	--	0.84**	0.93**	-0.58
	TD_I (cm)	0.82*	0.87**	0.92**	0.91**	--	0.74*	-0.4
	TV (ml)	0.85**	0.86**	0.92**	0.95**	0.95**	--	-0.82*
	TD_E (gm/ml)	-0.64	-0.35	-0.5	-0.44	-0.65	-0.7	--

*Correlation is significant at 5% level *p<0.05; Correlation is significant at 1% level **p<0.01; EL=epididymis length; EW= epididymis weight; TL=testicular length; TW=testicular weight; TD_I= testicular diameter; TV=testicular volume and TD_E=testicular density*

As in the study, testicular length had positive correlation with the testicular weight ($r = 0.760$, $p<0.01$) in the right testes and testicular length had positive correlation with the testicular weight and testicular diameter ($r = 0.740$, $p<0.01$) and ($r = 0.704$, $p<0.01$), respectively in the left testes suggested by Oyeyemi *et al*. (2012). Moreover, it was observed that testicular density of right and left testicular biometry was negatively correlated with epididymis length, epididymis weight, testicular length, testicular weight, testicular diameter and testicular volume (Table 2).

The epididymal length of combined (Right Plus Left) buck testicles was positively correlated with epididymal weight ($r = 0.87$, $p<0.01$) corroborated with correlation study of Ibrahim *et al*. (2012), who also reported positive correlation of epididymal length with epididymal weight ($r = 0.766$) (Table 3). The testicular length was positively correlated ($p<0.01$) with testicular weight ($r = 0.94$), testicular diameter ($r = 0.93$) and testicular volume ($r = 0.93$) in the present study (Table 3). Similar findings were reported by Gemeda and Workalemahu (2017) in Afar bucks.

DOI 10.5455/ijlr.20190801102843

Table 3: Correlation coefficient (r) among various biometrical parameters of combined (Right Plus Left) buck testicles collected from slaughter house

Testicular Biometry	EL (cm)	EW (gm)	TL (cm)	TW (gm)	TD_I (cm)	TV (ml)
EL (cm)	1					
EW (gm)	0.87**	1				
TL (cm)	0.80*	0.92**	1			
TW (gm)	0.61	0.82*	0.94**	1		
TD_I (cm)	0.63	0.80*	0.93**	0.90**	1	
TV (ml)	0.73*	0.79*	0.93**	0.94**	0.88**	1
TD_E (gm/ml)	-0.58	-0.43	-0.6	-0.58	-0.6	-0.81*

*Correlation is significant at 5% level *p<0.05; Correlation is significant at 1% level **p<0.01; EL=epididymis length; EW= epididymis weight; TL=testicular length; TW=testicular weight; TD_I=testicular diameter; TV=testicular volume and TD_E=testicular density*

It was observed that testicular density was negatively correlated with epididymis length (r = -0.58) and also with other testicular biometry parameter like epididymis weight, testicular length, testicular weight, testicular diameter and testicular volume (Table 3). In accordance finding, where testes density negatively correlated with the testicular length was reported by Ibrahim *et al*. (2012) and Abdullahi *et al*. (2012). Whereas, mean testis volume (r = -0.353) was similar to the present findings noticed by Abdullahi *et al*. (2012).

Conclusion

In conclusion, the data on testicular biometrics parameters indicated that non-significance (p>0.05) difference between the right and left testes. The epididymal length was significant (p<0.01) positively correlated with epididymal weight and the testicular length was also significant (p<0.01) positively correlated with testicular weight, testicular diameter and testicular volume. The testicular biometry parameters might have a direct correlation with the testicular maturity and testicular volume of semen in buck. However, either left or right testis has not having effect on testicular biometry and testicular volume.

Acknowledgements

We thank Principal and Dean, veterinary college; Head, Department of Veterinary Gynaecology and Obstetrics, NAU, Navsari and their staff for kind permission, help and co-operation for taking up this work.

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DOI 10.5455/ijlr.20190801102843