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Testis Morpho-biometrical studies of the adult Ram and Buck in AL-Najaf AL-Ashraf Province

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Abstract

This study designed to assess the testis morphological features and biometrical parameters of the adult local rams and bucks. The samples were collected from a ten healthy adult rams and bucks that slaughtered in the AL-Najaf AL-Ashraf province abattoir. The testis position, shape, structures, dimensions and its relation with other parts of the region were recorded for each animal. The testis lies in the inguinal region between the cranial surfaces of the thighs. The long testis axis almost matches that of the trunk. The testis outer shape in both ram and buck revealed the oval shape. The means of the weight, length, circumference, diameter, volume, and density for the left testicular of the ram and buck were (150.2 ± 33.8 gm and 140.9 ± 88.4 gm), (10.7 ± 1.90 cm and 9.8 ± 2.5 cm), (15.07 ± 1.22 cm and 9.05 ± 0.78 cm), (1.9 ± 0.4 cm and 1.9 ± 0.18 cm), (133.1 ± 15.9 ml and 125.9 ± 20.4 ml) and (1.13 ± 0.05 g/cm3 and 1.12 ± 12.3 g/cm3) respectively. While the means of the weight, length, circumference, diameter, volume, and density for the right testicular of the ram and buck were (154.1 ± 3.2 gm and 145.3 ± 14.3 gm), (10.13 ± 0.90 cm and 8.3 ± 1.9 cm), (16.09 ± 2.8 cm and 8.09 ± 1.5 cm), (2.2 ± 0.33 cm and 1.5 ± 1.22 cm), (121.89 ± 11.65 ml and 116.9 ± 16.37 ml) and (121.89 ± 11.65 ml and 116.9 ± 16.37 ml) respectively. Significant differences ($p \leq 0.05$) between the two species were observed in the means of weight, length circumference, diameter, volume, and density of testicles. However, no significant difference was seen in the biometric measurements of the left and right testicle of the ram. Meanwhile, testis volume and density were revealed a significant differences ($P \leq 0.05$). The Tunica vaginalis (a serous membrane) was covered the most testis beneath a strong capsule that called the tunica albuginea. These layers were soft and grayish red in ram, but were darker in buck. The mediastinum layer of the testis revealed jellylike in both animals. In conclusion, the results of this study approved some differences and similarities in the testis morphological and biometrical measurements of the local adult rams and bucks.

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Introduction

Reproductive organs are the most dynamic organs in all animals. (Robinson & Karsch, 1987). The morphology and histology of ram testis are little studied compared to other farm animals (Barenton *et al.,* 1982). There is some variation in the reproductive systems of different species. Moreover, the testis dissimilarly somewhat between species in shape, size and position. In the horse and dog, the long axis of each testicle is almost horizontal, and it is mounted near the abdominal wall near the superficial inguinal ring. The testis of bull and small ruminants are close to vertical. While, it lies obliquely with its long axis running cranio-ventrally in one-humped Camel bull (Mahmud *et al.,* 2015; Dyce *et al.,* 2010; Aspinall and ´Reilly, 2005). The testes are a large organ that has a soft texture. Their long axis is oblique and its free border being posterior in boar, (Ohanian *et al.,* 1979) while, testicular size of adult bull is changeable but averages between 10–12 cm in length and 6–8 cm in diameter(Ball and Peters, 2004). The testis of some animals (horse, dog, tomcat, and one-humped Camel bull) revealed the form of elliptically shaped that compact two-sided significantly and a convex and smooth flattened the lateral side by contact with the septum. The ventral and dorsal surfaces were convex and almost straight respectively. The anterior and posterior extremities were rounded (Mahmud *et al.,* 2015; Aspinall and ´Reilly, 2005; Budras and Röck, 2009). Each testis surrounded by the tunica vaginalis which consists of the external layer lines the internal side of the scrotum and the internal layer that cover the testis spermatic cord and epididymis.
Review of literature revealed a shortage in the publications regarding morphology and biometrical measurements of the testis of the adult local rams and bucks. Therefore, this study designed to assess the morphological features and biometrical parameters of the testis of adult local ram and buck.

Materials and Methods

Ten healthy adult rams and bucks were utilized for this study. These animals were presented for the AL-Najaf AL-Ashraf province abattoir. The age of each animal was determined based on the records from the breeders and the dentition. After orchiectomy, the testis shape, biometrics and its relation to the organs of the region were measured using the instruments (ruler, vernier, and amplifier lens X6 and X12). All measurements were recorded, for both left and right testis and included the following:
1- The mean testicular weight (Using highly sensitive balance).
2- The mean testicular length without epididymis (Using a ruler).
3- The mean testicular circumference (Using a piece of thread placed at the wider diameter and measured on a ruler (Ibrahim *et al.,* 2012)
4- The mean testicular diameter (Using a ruler in the wider part of testis).
5- The mean testicular volume. (The water displacement according to Archimedes principle).

6- The mean testicular density (Calculated as Testes density = Testes weight (g)/Testes volume (cc) (according to the method described previously by Ibrahim *et al.*, 2012).
Statistical Package (SPSS) was used to analyze all collected data. The Student's t-test and the one-way analysis of variance (ANOVA) were used and the level of significant difference in the mean values between left and right testes of each species and between the two species were determined. The values of ($P \leq 0.05$) were considered significant (Steel and Torry, 1996).

Results

Anatomically, the testis of adult ram and buck lie in the inguinal region between the cranial surfaces of the thighs with a long vertical axis. The testis outer shape in both examined species (ram and buck) were elliptical-shape (Fig 1). Moreover, convex and flattened appearance was noticed on the medial and lateral surfaces respectively, accompanied with a communication of lateral surfaces with the septum of the scrotum. The testes free borders were nearly convex, while epididymis border was nearly straight. The means of the weight, length, circumference, diameter, volume, and density of the left testicular of the ram and buck were (150.2 ± 33.8 gm and 140.9 ± 88.4 gm), (10.7 ± 1.90 cm and 9.8 ± 2.5 cm), (15.07 ± 1.22 cm and 9.05 ± 0.78 cm), (1.9 ± 0.4 cm and 1.9 ± 0.18 cm), (133.1 ± 15.9 ml) and (125.9 ± 20.4 ml) and (1.13 ± 0.05 g/cm3) and (1.12 ± 12.3 g/cm3) respectively.
While the means of the weight, length, circumference, diameter, volume, and density of right testicular ram and buck were (154.1 ± 3.2 gm and 145.3 ± 14.3 gm), (10.13 ± 0.90 cm and 8.3 ± 1.9 cm), (16.09 ± 2.8 cm and 8.09 ± 1.5 cm), (2.2 ± 0.33 cm and 1.5 ± 1.22 cm), (121.89 ± 11.65 ml and 116.9 ± 16.37 ml) and (121.89 ± 11.65 ml and 116.9 ± 16.37 ml) respectively (Table I, 2). Significant differences ($P \leq 0.05$) were seen in the morphometric values of the left and right testicular weight, length, circumference and volume. However, no significant differences ($P \leq 0.05$) were observed in the biometrical values of left testicular diameter and density (Table I, 2). The comparison values of the left and right testes revealed significantly different ($P \leq 0.05$) in the ram testicular density and volume, but there was no significant ($P \leq 0.05$) for other parameters values. Nonetheless, the diameter and the volume of the testis in bucks were differed significantly ($P \leq 0.05$), while the other value was no significant ($P \leq 0.05$) (Table 1, 2).
Epididymis was adherent to the attached border of the testis and appeared to overlaps somewhat the lateral surface. The enlarged anterior end termed head and it attached closely to the testis by connective tissue, and serous membrane (Fig 1, 2). Slightly enlarged posterior end called the tail and connected to the body which appeared as narrow part between them and it was less closely attached by the tiny serous membrane. Moreover, it forms a pocket laterally under the epididymis and named sinus of epididymis (Fig.2). The tail continued as a ductus deferens and attached to the posterior extremity of the testis by a short ligament that originated from a thick fold of the tunica vaginalis (Fig 1, 2). The greater part of the testis surface covered by the serous membrane, the tunica vaginalis, which was the visceral layer of the capsule that was reflected from the attached border of the testis, and leaving an uncovered area, where the vessels and nerves in the spermatic cord reach the testis (Fig. 2, 3).

Beneath this serous a covering was the tunica albuginea. The testis parenchyma was soft and grayish red color in ram, but it was darker in a buck (Fig.3). The testicular mediastinum occurred as a jellylike in both animals (Fig 1, 2), and its attached border was the deep and faced the tunica albuginea trabeculae. The septa of connective tissue passed through the gland, and subdivide the parenchyma into lobules. The largest trabeculae radiate from the attached border into the middle part of the gland a distinct mediastinum testis.

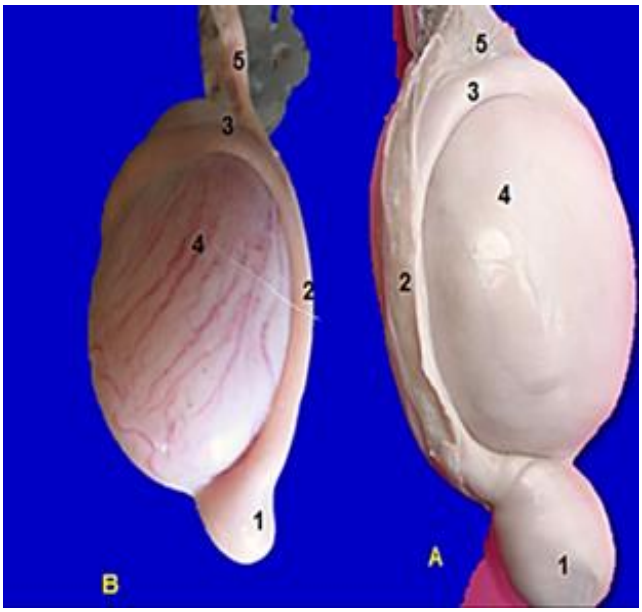

Figure.1: Shows A- the testis of Ram. B- the testis of a buck.1. the Tail of epididymis 2- Body of the epididymis. 3- Head of the epididymis. 4. Parenchyma of the testis. 5- Spermatic cord. 6- Testicular artery

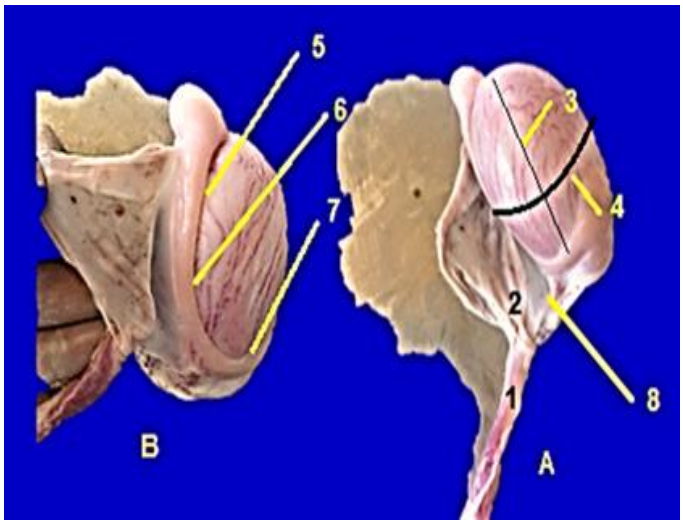

Figure. 2: Shows the A- testis of Ram. B- testis of a buck. 1- Spermatic cord .2- Pampiniform plexus.3- Longitudinal length.4- Circumference. 5- Ligament of tail

epididymis .6- Testicular pouch (bursa) .7- ligament of head epididymis .8- vas deferens (ductus deference). 9- Mesoductus deferens.

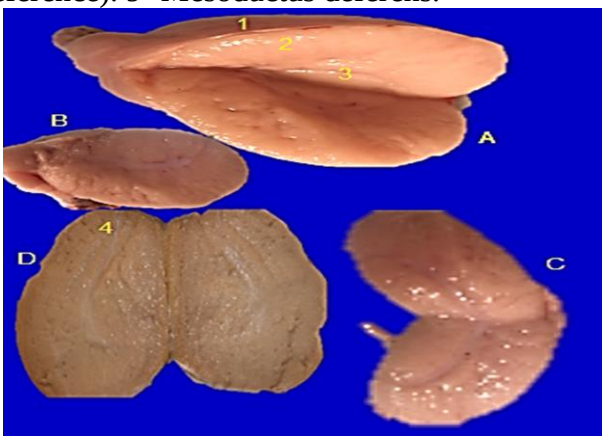

Figure. 3: Shows the testis of : A &B Ram , C- a buck (parenchymal view).
D- of ram shows: 1- Tunica vaginalis 2- Testicular parenchyma 3- 4 Mediastinum

Table. 1: The Biometric characteristics of the left Testis in adult Ram and Buck (Mean ± SD)

Measurements	Ram	Buck
Testicular weight (g)	150.2 ± 33.8^{a}	140.9 ± 88.4^{b}
Testicular length (cm)	10.7 ± 1.90^{a}	9.8 ± 2.5^{b}
Testicular circumference (cm)	15.07 ± 1.22^{a}	9.05 ± 0.78^{b}
Testicular diameter (cm)	1.9 ± 0.4^{b}	1.9 ± 0.18^{b}
Testicular volume (ml)	133.1 ± 15.9^{a}	125.9 ± 20.4^{b}
Testicular density (g/cm^3)	1.13 ± 0.05^{b}	1.12 ± 12.3^{b}
a and b Mean on the same row with different superscript differ significantly (P≤0.05).		

Table 2. The Biometric characteristics of the right Testis in adult Ram and Buck (Mean ± SD)

Measurements	Ram	Buck
Testicular weight (g)	154.1 ± 3.2[a]	145.3 ± 14.3[b]
Testicular length (cm)	10.13 ± 0.90[a]	8.3 ± 1.9[b]
Testicular circumference (cm)	16.09 ± 2.8[a]	8.09 ± 1.5[b]
Testicular diameter (cm)	2.2 ± 0.33[a]	1.5 ± 1.22[b]
Testicular volume (ml)	121.89 ± 11.65[a]	116.9 ± 16.37[b]
Testicular density (g/cm^3)	1.3 ± 0.15[b]	1.25 ± 12.3[b]
a and b Mean on the same row with different superscript differ significantly (P≤0.05).		

Discussion

The ram and buck are the utmost valuable member of the herd and contribute in the half of the genetics to the flock, and their success as a breeder will reflect on the profitable lamb and fawns yield. The male reproductive cell is sperm, and its production needs about 49 days (7 weeks). The testicle morphology is considered a good indication of a ram's sperm-producing ability. The palpation of the epididymis is a useful guide for determining sperm reserves. Moreover, a large, firm tail is indicative of good reserves whereas a small, soft tail would indicate the opposite.

The current study described the morphological features and the biometrical parameters of the testis in ram and buck. The results determined the external view and location of the adult ram and buck testis. The result also showed that the testis of the local adult rum was larger than an adult local buck. This result is compatible with results that reported previously (Mahmud *et al.,* 2015). Biometric parameters of the local adult rams appeared to be small than an Uda and Balami ram. However, the current biometric parameters are larger than Yankasa Ram. Moreover, the present biometric parameters values of the local buck appeared higher than the Red Sokoto buck and Borno White buck that reported previously (Mahmud *et al.,* 2015, Ajani *et al.,* 2015 and Raji *et al.,* 2008). The result of the mean testis weight that reported in the current study, is incompatible with previous studies (Ahemen & Bitto, 2007 and Ragi *et al.,* 2016). Ahemen & Bitto, (2007) and Ragi *et al.,* (2016) found that the testis mean weight of the West African dwarf rams and the buck was (134. 48 ± 2.28 g) and 134. 48 ± 2.28 g) respectively. Nevertheless, the values of testicular weight and volume reported in the present study were lower (P≤0.05) than values that recorded previously in Doper rams of South Africa (406 ± 40 g and 378 ± 44 mm3) respectively. Additionally, the results of the present study showed that all parameters of the adult local buck were more (P≤0.05) than parameters reported by the others (WGemeda and Workalemahu, 2017). These variations occurred due to the differences in genotype. Therefore, the assessment of the animal sexual viability depends on the testis biometrics. Brito *et al.,* (2004) found that the heavier testicles produce more sperm than the lighter one. Consequently, possessed a high number of Sustentocytes that were heavier and created too many sperms in compare to the testes that possessed few Sustentocytes (Sarma, 2012). The ram testis weight values reported in this study was

higher than the buck. This result approved that the ram testes contain a lot of seminiferous tubules, endocrine cells and sustentocytes and consequently more sperm. This result is compatible with the previous study that found more ram sperms than bucks (Ibrahim *et al.*, 2012).

Also, the result of this study found that the mean volume of the testicular rams was higher significantly ($P \leq 0.05$) than the buck. The difference in the internal and external size of the reproductive system is considered as a good indicator for the production amounts of sperms per ejaculate and depend on the capability for sperm production (Riviers and Williams, 1984). The results of the current studies showed that the ram and buck testis were larger than the peripubertal Holstein Friesian, Karan Fries, and Tharparkar bulls (Tripathi *et al.*, 2015). However, these parameters are in contrarily from adult zebu bulls at age 7.2 years that reported by other researcher (Andreussi *et al.*, 2014). Akpa *et al.*, (2012) and Etim, (2015), who reported that any quantifiable physical parameters were directly related to the fertilization capacity of semen which, can be used as a measurement of semen quality. The production of sperm and the quality of animals can be affected by the size of the organ reproduction and the physiological status of the animal. Information on body measurement helps improve the overall fertility of animals.

In conclusion, the current study reported essential values for the morphological and biometrical parameters for adult local ram and buck with some variations and similarities in these values between ram and buck.

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