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Histomorphological Study on the Testes of Non-descript Male Goats (*Capra hircus*)

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ABSTRACT

The buck's testicles were suspended in the scrotum by the spermatic cords and positioned vertically, just in front of the inguinal area. Each testes had two surfaces, two borders, and two ends. The lateral surface was convex, while the medial surface was flat.The testis's caudomedial border was joined to the epididymis.Testes consisted of several important structures, including the tunica albuginea, trabeculae, mediastinum testis, seminiferous tubules, and interstitial tissue.The testes were covered by the visceral layer of the tunica vaginalis and tunica albuginea, which is mainly composed of collagen fibres.The outermost layer was the tunica albuginea, which consisted of a strong layer of connective tissue and smooth muscle fibres. The basement membrane supported the seminiferous tubules.Separate rows of spermatogenic cells were positioned from the seminiferous tubule's basement membrane towards the lumen. They were Spermatogonia, Primary spermatocytes, Secondary spermatocytes, Spermatids and Spermatozoa.

Key words: Histomorphology, Testes, Epididymis, Goat

INTRODUCTION

The testes and epididymis are very important organs in the male reproductive system. The upper end of the testis is occupied by the head of the epididymis whereas the lower end is slightly thicker and connected to the tail of the epididymis; (Sisson and Grossman ,1953) in bull, horse, sheep, and dog; (Raghavan(1964) in ox; in horse,dog and ruminant; (Getty (1975) (Yaseen *et al*. ,2010) in goat; (Pasha *et al*. ,2011) in one humped camel; (Singh ,2013) in Marwari sheep; (Pathak *et al*. ,2014) in gaddi goat; (Raji and Ajala, 2015) in west African dwarfbuck goat and Hanumant (2016) in goat. The testis serves as a paramount site for male gamete production. Detailed examination reveals that in goats, the testis shows two surfaces, two borders, and two extremities. Functioning both exocrine and endocrine, the testis not only produces spermatozoa but also harmonizes with the male hormone, testosterone (Khan *et al*., 2014). The testicular parenchyma, composed of seminiferous tubules and Leydig cells, is integral to male reproductive health. The Leydig cells, in particular, are pivotal as they secrete testosterone, a hormone deeply intertwined with male sexuality (Hafez, 2000; Dellman, 1992).

MATERIALS AND METHODS

While performing the histomorphological studies on the male genital organs, the testes were fixed separately in different fixatives like formaldehyde and bouin's solution as per the requirement. The collected samples were processed and washed in running tap water for overnight, dehydrated through a series of ascending grades of alcohol and were cleared in xylene, infiltrated in melted paraffin at 60ºC by giving three changes each for one hour duration and were embedded in paraffin. The prepared paraffin blocks were stored in refrigerator and were cut into 5-6 µm thickness on automatic rotary microtome, the sections were allowed to float in water bath at 45°C. Collected sections on albumin coated slides were dried at 37°C on hot plate for overnight and were stored for further staining (Singh and Sulochana, 1996).

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The histological study was conducted on paraffin processed sample by using following stains-

a) Eharlich's Haematoxylin and Eosin method for routine observation (Singh and Sulochana 1997).

b) Masson's Trichrome method for collagen fibers (Meshram, 2022).

c) Verhoeff's method for elastic fibers (Meshram, 2022).

d) Gomori's method for reticular fibers (Meshram, 2022). The aforesaid stained sections were examined by using the Cilika light microscope and photomicrography was performed.

RESULTS AND DISCUSSION

The outermost coat of the testis, known as the tunica albuginea, was made up of a thick layer of connective tissue and smooth muscle fibres(Fig.1). The testicular parenchyma was split into lobules by connective tissue septa, which originated from this capsule. These observations were consistent with studies conducted on mature sheep by Naik *et al.* (2023), horses by Shukla *et al.* (2013), boars by Ohanian *et al.* (1979), deer by Moonjit and Adcharatt (2007), and domestic pigs by Reddy *et al.* (2016). Within the testis, trabeculae divided the parenchyma into lobules (Fig.2).This finding in domestic animals is consistent with that of Bank (1993), Hafez (1980). The main components of the testicular parenchyma were seminiferous tubules (Fig.3). which were found in each testicular lobule in agreement with Bhosale ,(2016) in goats. The broad bases of sertoli cells, were supported by the basement membrane(Fig.4). These were long, irregularly formed cells. These cells have a unique nucleolus, which may have nuclei that are oval or pear-shaped and located in the basal plane. Comparable outcomes were observed in rams by Kishore *et al.* (2011) and domestic animals by Eurell and Frappier (2006). Spermatogenic cells were orientated in rows from the basement membrane towards the lumen. These cells included spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids, and spermatozoa (Fig.5). Primary spermatocytes were larger, rounder, and had dark spherical nuclei, in contrast to spermatogonia, which were small, spherical, and had nuclei stained darkly. Parent spermatocytes gave rise to secondary spermatocytes, which are smaller in size and occasionally found inside the parent cells. In the seminiferous tubule lumen, the elongated spermatids' oval-shaped nuclei enabled them to differentiate into mature spermatozoa, as also corroborated by the findings of Banks (1993), Eurell and Frappier (2006), and Reddy *et al*. (2016) in domestic pig. Interstitial cells, loose connective tissue, blood vessels, fibrocytes were all present in the interstitial tissue in the spaces between seminiferous tubules (Fig.6). The interstitial cells were characterized by Dellmann (1992), Fawcett *et al*.(1973), and Copenhaver *et al.* (1978) as ovoid or polygonal, with large eccentrically positioned nuclei grouped in cords or clusters. The polyhedral leydig cells feature large, spherical nuclei and eccentric nucleoli (Fig.7). Similar observations were made in Bakerwali goats by Bashir *et al*. (2012), while similar findings in domestic animals were reported by Banks (1993) and Eurell and Frappier (2006). The mediastinum testis was made up of collagen and elastic fibres that were distributed loosely and extended along the long axis of the testis (Fig.8). Similar structures were observed in rams (Schahidi and Smidt, 1980). The rete testis, which is related to the ductuli efferentes, has loose connective tissue from the mediastinum testis covering it and is lined by simple cuboidal epithelium (Fig.8), as described by Eurell and Frappier (2006). Kishore *et al.* (2006) in sheep. The testis and the epididymis were connected significantly by the ductuli efferentes (Fig.9).

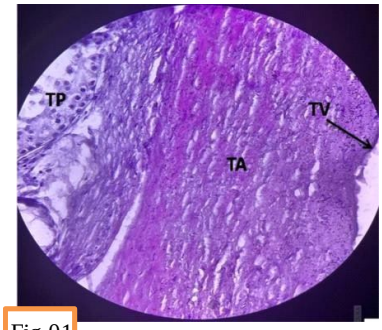

Fig.01

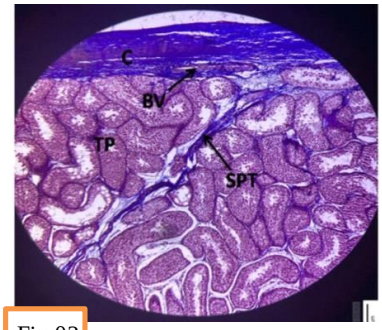

Fig.02

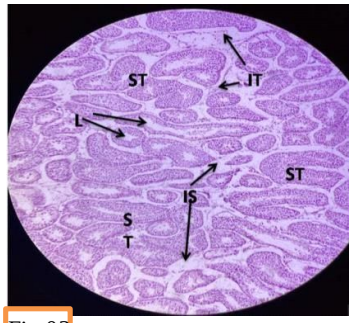

Fig.03

Fig.1- Photomicrograph showing Tunica vaginalis (TV), Tunica Albuginea (TA), and Testicular Parenchyma (TP) H&E stain 40x.,
Fig.2- Photomicrograph showing Capsule (C), Blood vessels (BV), Testicular paranchyma (TP) and Septula testis (SPT) Massonstrichom stain 10x.
Fig.3- Photomicrograph showing Interstitial space (IS), Interstitial tissue (IT), Seminiferous tubules (ST) and Lumen(L). H&E 10x.

Fig.04

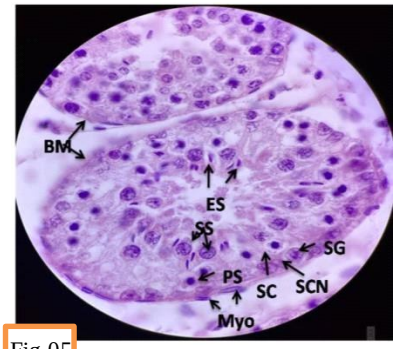

Fig.05

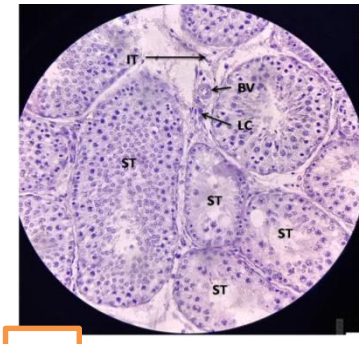

Fig.06

Fig.4- Photomicrograph showing Basement membrane (BM), Sertoli cells (SC), Sertoli cell nucleus (SCN) and Spermatozoa (SZ) H&E stain 40x,
Fig.5- Photomicrograph showing Basement membrane (BM), Myloid cells (Myo), Sertoli cell (SC), Sertoli cell nucleus (SCN), Spermatogonia (SG), Primary spermatocyte (PS), Secondary spermatocyte (SS) and Elongated spermatid (ES) H&E Stain 40x,
Fig.6- Photomicrograph showingSeminiferous tubules (ST), Blood vesseles (BV), Leydig cells (LC) and Interstistial tissue (IT).PAS stain 10x.

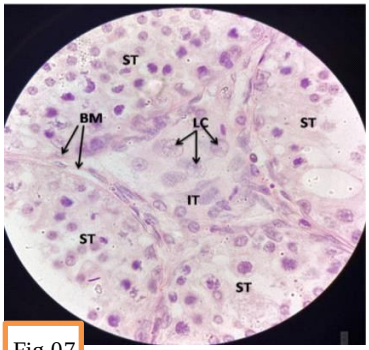

Fig.07

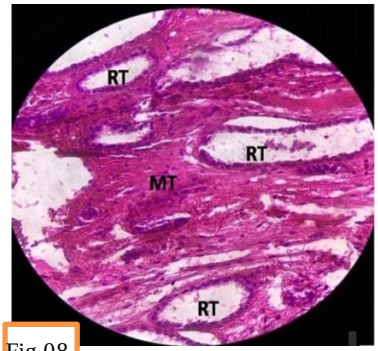

Fig.08

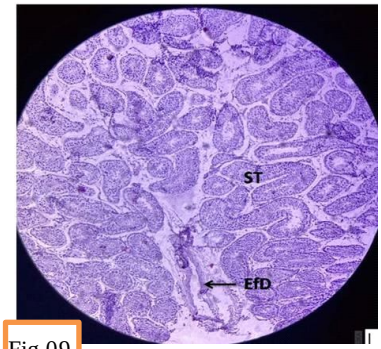

Fig.09

Fig.7- Photomicrograph showing Leydig cells (LC), Interstitial tissue (IT), Seminiferous tubules (ST) and Basement membrane (BM) H&E stain 40x,
Fig.8- Photomicrograph showing Mediastinum testis (MT), and Rete testis (RT) H&E stain 40x, **Fig.9**- Photomicrogrph showing Efferent ductule (EfD) and Seminiferous tubules (ST). PAS stain 10x.

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