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Morphological and Histological Study of Testis in Hooepoe Bird (Upupa, Epops)

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Abstract | The current study aimed to explore the morphological and histological characteristics of the testis in adult Hoopoe total of five birds, individuals from the local breed available at the Babel market. we found that the right testis was heavier than the left, and the average length of the right testis also exceeded that of the left. Morphologically, the testes were positioned in the abdomen on both sides of the midline, with Their cranial poles located caudal to the lungs and their caudal poles associated with the abdominal sac. The dorsal surfaces were oriented ventrally towards the right and left kidneys. The testes exhibited a shiny white, milky appearance and were oval to round in shape. Notably, there was a size difference between the left and right testes, with the right being larger. The findings indicated that the convoluted and straight seminiferous tubules were continuous (tubuli recti), and the germinal epithelium lining the seminiferous tubules contained cells of varying sizes and shapes. Additionally, the interstitial tissue had Leydig cells, along with Sertoli cells present within the seminiferous tubules.

Keywords | Babel market, Birds, Kidneys, morphological and histological characteristics, Testis, Interstitial tissue

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INTRODUCTION

The hoopoe, Upupa, Epops and Hudhud, respectively are its Latin, Ancient Greek and Arabic names, it named after the sound whichh it produces as they are known to be vocal birds Birds possess two testes, positioned on each side of the body's midline (Mustafa and Elhanbly, 2021). The testis functions as a compound tubular gland with both exocrine and endocrine roles. Its exocrine function involves the production of spermatozoa by the lining epithelium of seminiferous tubules, while the endocrine function is responsible for producing the male sex hormone, testosterone, via specific interstitial (Leydig) cells found in the intertubular connective tissue. Testes are typically elliptical and have a light yellow hue. The tissue within the testicles is cuboidal. The testis is enveloped by two layers of tunica vaginalis (the parietal and visceral layers) and a singular layer of tunica albuginea (the testis capsule), which comprises dense irregular connective tissue mainly consisting of collagen fibers with fewer elastic fibers. The deeper regions are rich in branched testicular blood vessels (Kareem *et al.*, 2020). The tunica albuginea interfaces with testicular septa (spatula testis), partitioning the testis into approximately 250 lobes, each housing 1-4 U-shaped,

double-ended seminiferous tubules. Tunica vasculosa, abundant in blood vessels, is also noted. According to Pandey and Mohanty (2023), the epithelium within the convoluted seminiferous tubules contains supporting and spermatogenic cells, with the supporting cells being Sertoli cells. At the distal ends, the seminiferous tubules connect through a transitional zone lined by sustentacular cells to straight tubules (tubuli recti), which seamlessly connect to a network of interconnecting channels forming the rete testis. The rete testis features a simple squamous epithelium (Shil *et al*., 2015).

MATERIALS AND METHODS

Ethical approval

The institutional animal ethics committee granted permission for the experimental procedures, which were carried out at the Veterinary Medicine College of Al-Qasim Green University in Iraq. This research aimed to outline the morphological and histological characteristics of the testes in adult local Iraqi Hoopeop birds. A total of five adult Hoopeop birds were collected during the breeding season, specifically between the fifth and sixth months, from the Babel market, known for bird sales, and subsequently transported to the laboratory of anatomy and histology at the College of Veterinary Medicine at Qasim Green University. The experimental birds underwent anesthesia through chloroform inhalation in enclosed chambers before necropsy was performed to extract the testes. The anatomical parameters were recorded, and the samples were placed in an appropriate fixative for histological processing for anatomical: The testes were extracted, and sanalysis samples were collected directly taken from them. The following parameters were recorded Measuring the weight, thickness, location, and shape of the testes. The samples Thereafter preserved in formalin at a concentration of 10% (1:9 ratio) of the sample volume and left if for two days for histological examination tissue samples were obtained immediately after the deceased animals and fixed in 10% formalin for 72 hours. Once fixation was complete, the tissues were trimmed, and the specimens were rinsed under tap water for 3-4 hours to eliminate any residual formalin solution. The samples then underwent several steps: dehydration, clearing, embedding, and finally, sectioning and staining using a rotary microtome. They were routinely stained with Hematoxylin and Eosin (Suvranan *et al*., 2018). Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 15, and microscopic evaluations were executed on representative stained sections of the testes with a Leica microscope (Scope Image 9.0, China) to measure the testicular wall.

RESULT AND DISCUSSION

Weight and dimensions of testis

The observations presented in the Tables; it is showed Standard deviation to mean weight of the bird of about (78.71± 0.05gm) and Mean weight of the right testis of the bird a (was 6.99±0.03gm) a the mean weight of the left testis of the bird was about (5.14±0.055gm) appeared that right testis is heavier in weight than the left testis and the mean length of the bird was about (27.5±0.03cm) and mean length of the right testis was about (2.96±0.033cm) while the left testis was about (1.98±0.05cm) (as shown in Table 1 and 2). The result appeared that the length and weight of the left testis is heavier and taller from right than the right testis.

Table 1: The weight of right testis and left testis (M±SE).

Anatomical parameters	Mean ± SE
Mean weight the birds	78.71±0.05
Mean weight the right testis	6.99±0.03
Mean weight the left testis	5.14±0.055

Table 2: The longht of right testis and left testis (M±SE).

Mean length the birds	27.5±0.03
Mean length the right testis	2.96±0.033
Mean length the left testis	1.98±0.05

Morphological description of testis

The male reproductive system of the Hoopoe bird includes the testes, epididymis, ductus deferens, ejaculatory region, and mating organ in adult individuals. The testes are compound glands located in the abdominal cavity, positioned on both the left and right sides of the midline. Their cranial poles sit caudally to the lungs, while their caudal poles connect to the abdominal sac. The dorsal surfaces face ventrally towards the right and left kidneys, and the visceral surfaces are situated on the proventriculus.

The morphology ofthe testes showed shining white milky colour with oval to round shape .the testis of hoopoe bird different in size between the left and right testis the right testis appear larger from left its appear smaller (Figure 1). Abdul-Rahman *et al*. (2018) in brown rooster who mention relative to the left, the right testis is larger. Previous work confirms the asymmetry of testicular size in the current has been confirmed by previous studies and (Krietsch *et al*., 2022; Razi *et al*., 2010). Where they have found that the adulthood of some bird's species has same position of the testes.

Histological descrption of testis in hooepo bird

Capsule: The hoopoe testis's histological analysis revealed

that the testicular capsule's thickness was 1.98±0.021γm. The thickness of the testicular capsule in quail (91 mm) and Japanese quail (91.7 mm) differs from Avidor, according to Al-Tememy (2010). Avidor-Reiss (2018) and the bird's aging causes the capsule to appear invaginated (Figure 2). Three major tissue layers make up the testicular capsule. There is no distinction between the tunica serosa, tunica albuginea, and tunica vasculosa a single layer of flattened mesothelial cells, with significantly longer nuclei, is formed by the tunica serosa. The basement membrane supports this layer of cells. The primary tissue layer, the tunica albuginea, is made up of dense bundles of collagen fibers that are orientated differently in all directions and alternate with cellular components (Figure 3). The innermost, poorly differentiated layer of tunica vasculosa is called tunica albuginea. Most people agree that the avian capsule is extremely thin. It exhibits a thick, central tunica serosa and in the outside. In contrast to was in the rabbit, rat, and mouse (Fleck *et al*., 2021; Clement and Giuliano, 2016), the birds in this study had tunica albuginea (Mustafa and Elhanbaly, 2021).

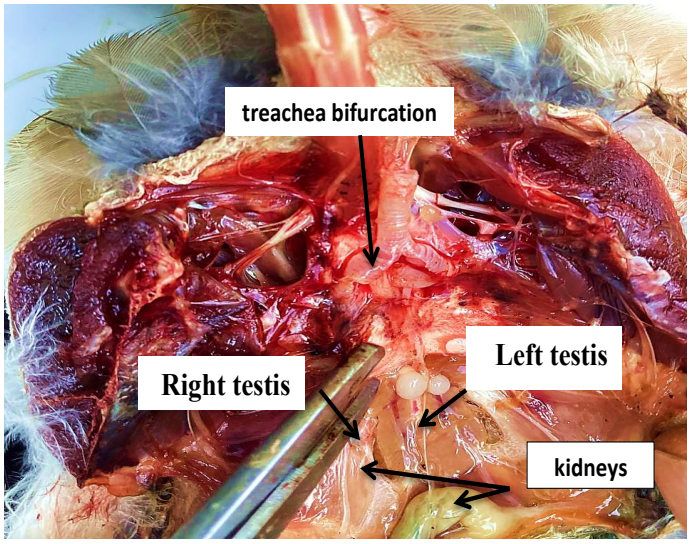

Figure 1: The testis of Iraqi hooepoe bird.

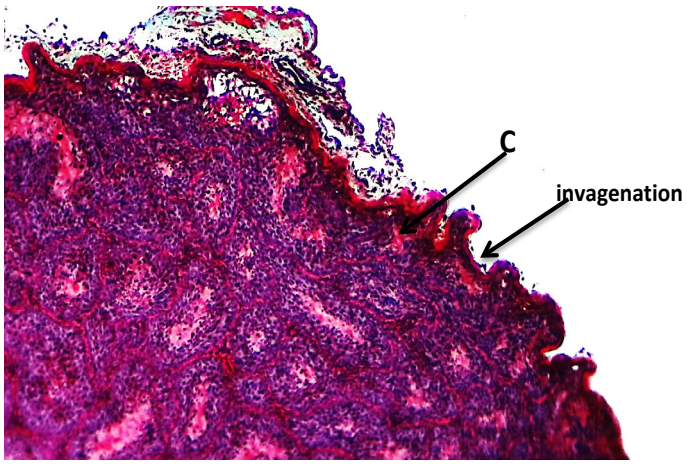

Figure 2: Histological section showing the testis of hoopoe bird (C) cortex (Masson, 4 X).

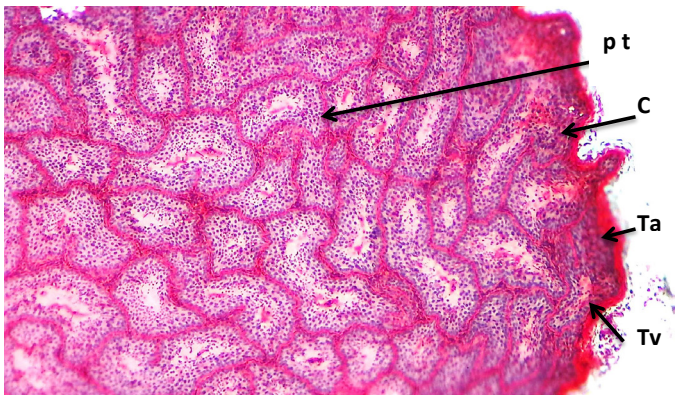

Figure 3: Histological section showing the testis of hoopoe bird (C) cortex. (pt).pretubular tissue (Ta) tunica albugenia (Tv) tunica vasculosa. (Masson, 10X).

Semineferous tubules were observed in seminiferous tubules. Prescent germ cells spermatozoa and were also found in blood supply. The interstitial tissues appeared as thin bands, as shown in Figure 4.

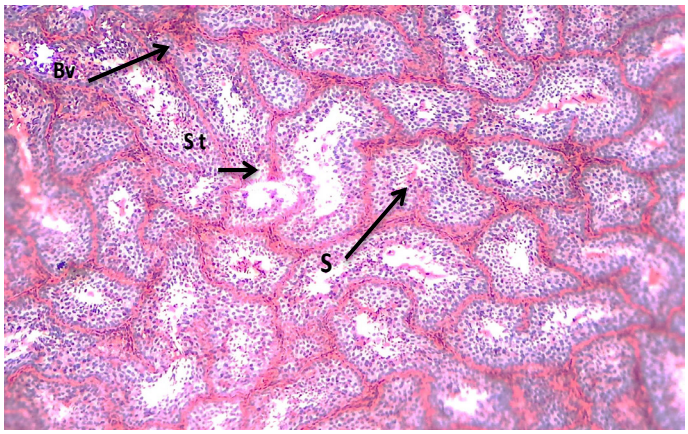

Figure 4: Histological section showing the testis of hoopoe bird; Bv: blood vessel; st: semeniferous tubules; s: spermatozoa. (Masson, 10X).

The interstitial tissue occupied a considerable part of the testicular parenchyma and a variety of cells were present within spermatids are characterized by round shape cells, the nuclei pale color is found in groups close to the somniferous tubule's lumen. Although the late spermatids are small and oval to elongated in shape, the head is large and dark, and the tail is faintly protruding towards the lumen. These findings are consistent with those of male white eared bulbul (Al-Khakani *et al*., 2020). Ultimately, they emerge as spermatozoa from the somniferous epithelium. According to the data, the lyding cell is also present, and the tall, columnar Sertoli cells extend from the basal lamina line to the epithelial cells of the luminal border of the seminiferous (Figure 5).

The findings demonstrating the continuous nature of the straight and convoluted somniferous tubules (tubule recti), and The interstitial connective tissue and seminiferous

tubules in the testes changed throughout the non-breeding season. The testes histological anatomy revealed that Leydig cells were present in the interstitial tissue and that the germinal epithelium lining the seminiferous tubules contained cells of various sizes and shapes. These results concur with those published by Sun *et al*. (2019).

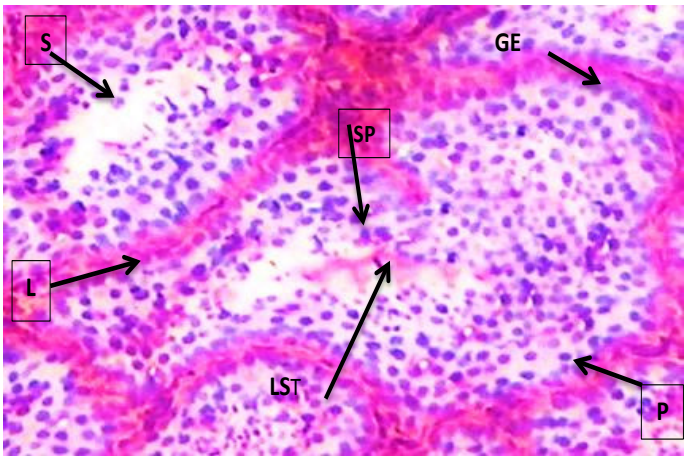

Figure 5: Histological section showing the testis of hoopoe bird; GE: germinal epthelium; LST: lumen semieferos tubules; L: lyding cell; S: sertoli cell; sp: spermatocyte; P: primary spermato cyte. (Masson, 40X).

The convulation of seminiferous tubules shwoed reduced lumen where it become cleft-like with reduced presence of most germ cell generations except for spermatogonia. In some tubules, detritus cell masses were found and some semniferous tubules showed incomplete convulation (Figure 6).

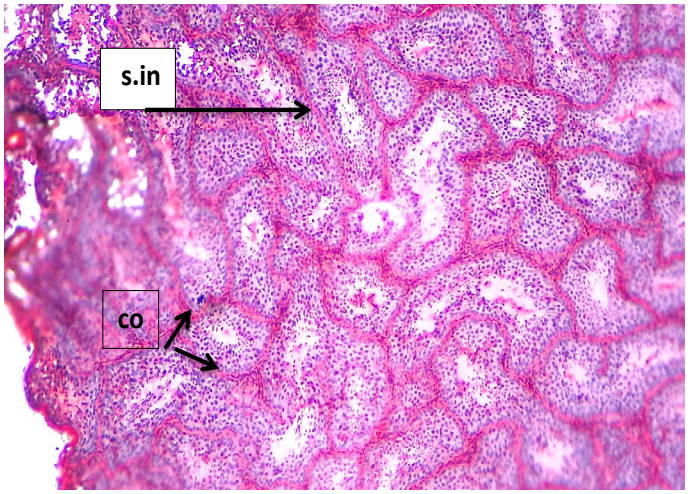

Figure 6: Histological section showing the testis of hoopoe bird; s.in: seminiferous tubules inconvulation; co: convulation; (Masson, 10X).

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NOVELTY STATEMENT

Development histological and anatomical of a study on testicles in hoopoe birdsdue to lack of information available about this bird.

AUTHOR'S CONTRIBUTION

All authors contributed equally for complete this research.

Conflict of interest

The authors have declared no conflict of interest.

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