

Microscopic and Macroscopic Study on Iraqi Local Rooster Genital Tract

Khalid Ibrahim Abd Alkhazraji¹, Fatimah Swadi Zghair², Rabab abd Alameer Naser³

^{1,3}Department of Anatomy and Histology, College of Veterinary Medicine, University of Diyala, Iraq.

²Department of Anatomy and Histology, College of Veterinary Medicine, University of AL-Qadisiyah, Iraq.

Corresponding author : alkhazraji.khalid11@gmail.com

Abstract

The aim of current work was to evaluate the reproductive organs of Iraqi local rooster histologically and anatomically. Eighteen healthy, mature birds of this breed, weighed 1.92 ± 0.03 kg, aged 24- 26 weeks, they obtained from the local market in the Baqubah city, were used. Genital measurements were made in addition to their macro and microscopic description. It was observed the testes positioned on the two lateral aspects of midline of the body, located on ventral surface of corresponding kidneys and caudal surface of the pulmonary tissue. The testicles recorded means length and width of 24.68 ± 0.75 mm, 18.76 ± 0.51 mm and 23.27 ± 0.63 mm, 16.57 ± 0.29 mm in left and right one respectively. The epididymis appeared as short tube located over the testicle faced the dorsomedial surface and extend from proximal extremity of testicle to continuity with ductus deferens without any discrete portions in its course. It was lined with pseudostratified columnar type. The lining of ductus deferens showed alteration gradually along its course from pseudostratified columnar to terminated in distal part as simple cuboidal. The morphometric analysis reported non signification difference in length between the right and left ductus. It concluded that the testicles of Iraqi local rooster had oval shape and showed significant increase in length and width in left in compared with the right one. The epididymis did not show distinct parts as that present in mammals. The coiled ductus deferens had lumen characterize by expansion toward the distal part. Non intermittent form of phallus was clear feature in Iraqi local rooster.

Keywords: Microscopic, Ductus, Epididymis, Iraqi rooster.

INTRODUCTION

Improving the fertility of roosters in Iraq plays a vital role in the field of modern poultry industry (Khafaji *et al.*, 2019). The reproductive tract in bird species has attracted the interest of many researchers in anatomical, histological, and physiological studies, especially since all its parts are situated inside the bird (Bull *et al.*, 2007; Blesbois, 2018). Gross aspects of male system in fowl were examined by Amer and Shahin (1975), whereas Aire *et al.* (1980) explained the microscopic features of the epididymis area in a number of birds such as Duck (*Anas Platyrhynchos*), Quail (*Coturix coturinx Japonica*), fowl of guinea (*Numida moleagris*), fowl (*Gallus domesticus*). Some previous microscopic studies have also been documented in describing parts of male reproductive organs such as the cloaca, epididymis, ductus deferens, testis in domestic fowl (Marvan, 1969; Tingari, 1971; Aire *et al.*, 1979). The copulatory part, ductus deferens, epididymis and testis which forms the main structures of male system have been demonstrated anatomically in the pigeon (Mercadante *et al.*, 1983).

Some works indicated that there is a relationship between the growth of the testicles with the age and weight of avian species (Tingari and Lake, 1972; Aire, 1982). Besides, the

morphology and histological characters of the various regions of male duct system of turkey were detected successfully (Hess *et al.*, 1976). The copulatory organ of domestic fowl formed of two bodies of phallic structure situated in the proctodeum in the middle of ventral surface (Sugimura *et al.*, 1975). Zhang and Ren (2011) reported in his anatomical study on the ostrich, that the penis of this bird comprises two portions, as thick base and free hanging part, found at the cloaca on one side, and recorded average length of 26 cm. The ductus deferens in guinea fowl is the direct continuation of the epididymis, and this later portion is highly coiled organ surround with thicken capsule and attached frontally on dorsomedial surface of each testis via efferent ductules (Tamilselvan *et al.*, 2019)

Because of the scarcity of information, the study was aimed to observe and describe the genital organs of the Iraqi local rooster in the macroscopic and microscopic aspects.

MATERIALS AND METHODS

The present study was approved by the animal ethics committee at College of Vet. Medicine, University of Diyala, Diyala, Iraq. Eighteen mature and healthy Iraqi local rooster were used in the current experiment. The animals weight 1.92 ± 0.03 kg and aged between 24-26 weeks. All birds were obtained from the local market in the Baqubah city, and distributed into two groups (9 birds in each one) to conduct the gross and microscopic examination of reproduction organs. By using a high-dose of xylazine and ketamine anesthetic agents, all birds were euthanized and underwent to laparotomy to careful access to the genital organs (phallus, ductus deferens and epididymis).

Those organs were examined grossly in situ, then dissected to perform the anatomical measurements which includes the length and diameter for each one. In order to investigate those organs microscopically, they removing from the abdomen, and a small specimens of each organs were fixed in 10% formalin for two days, then processed routinely via technique of paraffin and section to get thin slices $5 \mu\text{m}$, then with aid of hematoxylin and eosin and masson trichrom stains, all sections stained and examined under microscope to investigate the histological composition of genital organs (Suvarna *et al.*, 2013), and the histomorphometric was done through ocular technique according to suggestion of (Abdul-Raheem and Al-Haak 2006).

For statistical analysis, all data express mean \pm SE, and the analysis of variance was used to find the differences with assist of SPSS (version 15) software.

RESULTS AND DISCUSSION

The study was revealed that the shape of two testicles (left and right) in Iraqi local rooster were oval, and found over the two lateral sides of midline of the body, on ventral surface to the kidneys and caudal surface to the lung (Figure. 1 and 2). The macroscopic measuring of testes showed means length, width, height and Wight of 24.68 ± 0.75 mm, 18.76 ± 0.51 mm, 13.97 ± 0.18 mm and 11.89 ± 0.17 gm in left testicle, and 23.27 ± 0.63 mm, 16.57 ± 0.29 mm,

14.16± 0.15mm and 10.25± 0.13gm for the right respectively (Table.1). Significant increase at level $P \leq 0.05$ in the length, width and weight were detected in left testicle in compared with those in the right one. The findings of shape and length of testes in our study were compatible with (Bull *et al.*, 2007) who mentioned that the oval shape of those organs also and the length of left one was higher than right testicle in domestic fowl. On other hand, our results were not the same the observations of (Razi *et al.*, 2010) who reported similar length for two testes in Iranian rooster.

It was observed the epididymis of adult Iraqi rooster as spindle tube, white in color, short and coiled. It's not have recognizable portions as that found in mammals (absence of epididymis tail, body and head). At the mediodorsal border of each testis and nearly along their length, the epididymis extends, and then continues in the shape of ductus deferens (Figure. 1 and 2).

Histologically, the epididymal area consists mostly from ductules, and from lesser extent of duct of epididymis. It was lined with epithelium of pseudostratified columnar type (Figure. 3), and contained three types of cells as basal, non-ciliated, and ciliated. This findings are resemble the results of (Simoes *et al.*, 2004) in domestic duck, and (Stefanini, 1999) in pigeon. In contrast with our findings, Hess *et al.*, (1976) detected that the epididymal region in the turkey bird had a smaller region occupied with ductules and a larger region of epididymal duct. On other hand, Budras and Sauer (1975) observed two compartments in the cock epididymis that includes appendix epididymis in addition to the main part, whereas in the current experiment there were no separate parts. The micrometric of epididymis in present work revealed that the mean lumen of this duct was 118.57± 3.23µm for left and 117.40± 2.63 µm for right epididymis (Table. 2). Further, the epithelial lining of this organ recorded mean height in both left and right side 19.67± 0.21 µm and 19.41±0.1µm respectively (Table. 3).

In the current study, the right and left ductus deferens which are the direct continuity of the corresponding epididymis, were a coiled tubes, white in color, each one running medially to the opposite ureter, and opened into the uredeo through the papillae of ductus deferens (Figure 1 and 2). The left and right ductus reported respectively mean length of 90.22± 2.18 mm and 89.78± 3.25mm (Table 1). This variation in length between them was non-significant.

Microscopically, the internal surface of ductus was covered with epithelium of pseudostratified columnar kind which progressively altering to the simple kind of cuboidal epithelium especially in the terminal portion of duct (Figure. 4). It was non-ciliated shape as well as we observed in some areas a mucosal fold particularly in first and middle part of ductus deferens. These finding are supported by (Tamilselvan and Singh, 2020) in Guinea fowl. The height of epithelial lining of proximal, middle and distal portion of left and right ductus were 22.35± 0.52 µm, 20.93± 0.74 µm, 18.98± 0.60 µm, and 22.12± 0.41 µm, 20.32± 0.55 µm, 18.73± 0.75 µm respectively. It was detected significant increase in height of

epithelium in proximal portion in compared with other parts (Table 3). The lumen of ductus deferens showed significant increase in the distal portion in comparable with the two other portions. These results are agree with the finding in vanarja and Assel birds by (Deshmukh *et al.*,2013). The mean lumen of proximal, middle, distal part of the left and the right ductus were $342.52 \pm 11.21 \mu\text{m}$, $612.18 \pm 13.18 \mu\text{m}$, $1021.85 \pm 19.47 \mu\text{m}$, and $339.75 \pm 14.32 \mu\text{m}$, $595.44 \pm 12.50 \mu\text{m}$, $898.35 \pm 16.15 \mu\text{m}$ respectively (Table 2).

The terminal part of ductus deferens (the papillae) which entered the urodeum appeared to be conical in shape, have tip pointed and base thickened (Figure 5). It was not detected significant differences in the length of two left and right papillae when recorded mean of $1.35 \pm 0.09 \text{ mm}$ and $1.31 \pm 0.02 \text{ mm}$ respectively (Table1). Microscopically, the wall of papillae lined with epithelium of pseudostratified kind (Figure.6). These results are correspond with reports of (Bull *et al.*,2007) in domestic fowl. The present experiment showed the type of phallus in Iraqi rooster was non-intermittent, vestigial structure found within the vent, contained middle rudimentary and two lateral bodies (Figure 7). This observations agree with (Herrera *et al.*,2013) who mentioned the similar notes in chickens.

Table 1: macro-morphometric data for the testes and ducts of Iraqi rooster

Parameter	Left side (Mean \pm SE)	Right side (Mean \pm SE)
Testis Length(mm)	24.68 ± 0.75 *	23.27 ± 0.63
Testis Wide(mm)	18.76 ± 0.51 *	16.57 ± 0.29
Testis Height(mm)	13.97 ± 0.18	14.16 ± 0.15
Testis Weight(g)	11.89 ± 0.17 *	10.25 ± 0.13
Ductus deferens length(mm)	90.22 ± 2.18	89.78 ± 3.25
Papilla length(mm)	1.35 ± 0.09	1.31 ± 0.02

(*) denote significant difference at level $P \leq 0.05$ between the left and right.

Table 2. micrometric data for the of genital ducts in Iraqi rooster

Parameter	Left duct (Mean \pm SE)	Right duct (Mean \pm SE)
Epididymis lumen (μm)	118.57 ± 3.23	117.40 ± 2.63
Ductus deferens lumen (μm) proximal portion	342.52 ± 11.21	339.75 ± 14.32
Ductus deferens lumen (μm) middle portion	612.18 ± 13.18	595.44 ± 12.50
Ductus deferens lumen (μm) distal portion	1021.85 ± 19.47 *	898.35 ± 16.15
Papillae lumen (μm)	787.91 ± 7.08	721.30 ± 8.52

(*) denote significant difference at level $P \leq 0.05$

Table 3. micrometric data for the height of epithelium of genital ducts in Iraqi rooster

Parameter (Height of epithelium) (μm)	Left duct (Mean \pm SE)	Right duct (Mean \pm SE)
Epididymis	19.67 \pm 0.21	19.41 \pm 0.15
Ductus deferens proximal portion	22.35 \pm 0.52	22.12 \pm 0.41*
Ductus deferens middle portion	20.93 \pm 0.74	20.32 \pm 0.55
Ductus deferens distal portion	18.98 \pm 0.60	18.73 \pm 0.75

(*) denote significant difference at level $P \leq 0.05$



Figure1. Macroscopic photograph in Iraqi local rooster shows: testis(T), ductus deferens(D), epididymis(E).

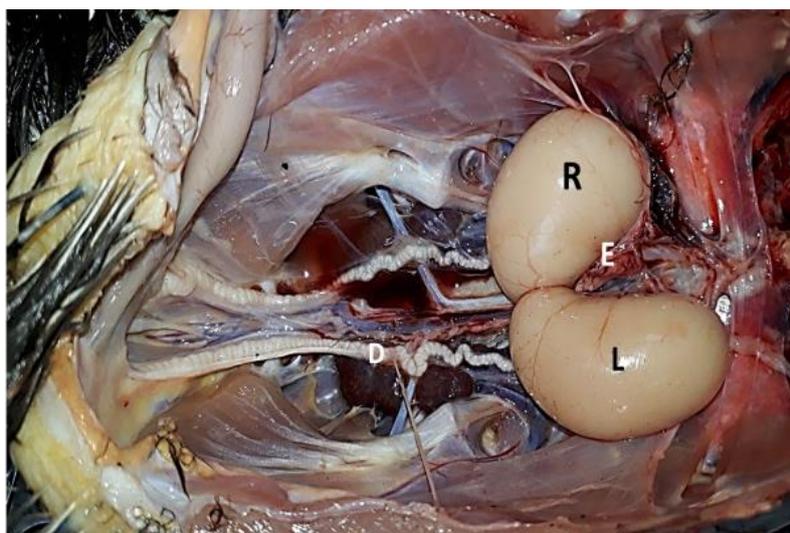


Figure 2. Macroscopic photograph in Iraqi local rooster shows: right testis(R), left testis(L), ductus deferens(D), epididymis(E).

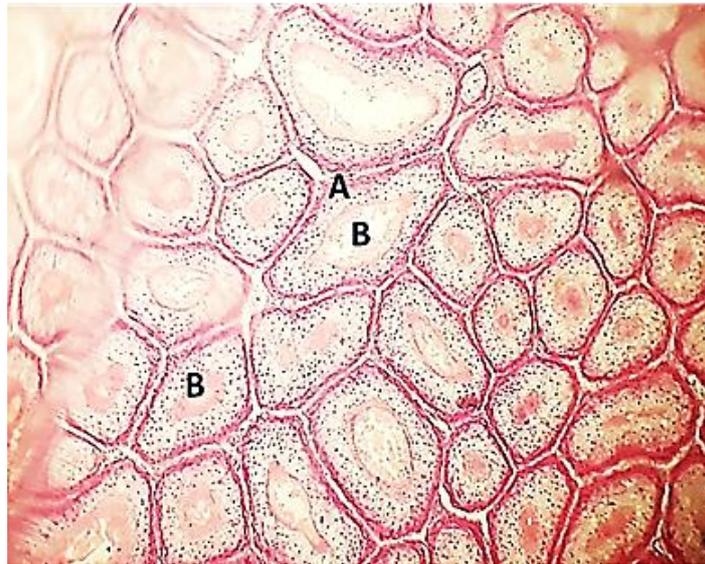


Figure 3. Microscopically section of the epididymis in Iraqi local rooster shows: epithelial lining pseudostratified type(A), ductus epididymis contains spermatozoa(B) . PAS stain(40X)

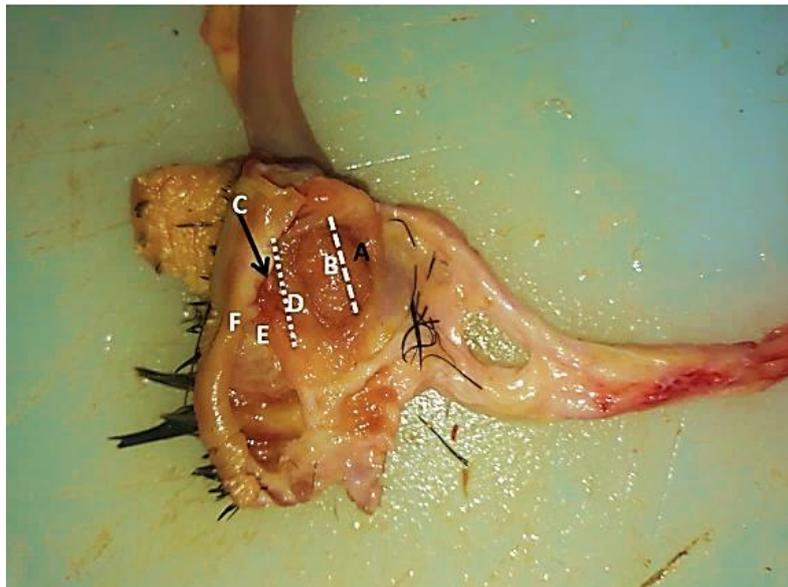


Figure 4. Macroscopic photograph in Iraqi local rooster shows: left papillae (C), lymphatic bodies (E), rectum(A), urodeum(D), proctodeum(F).

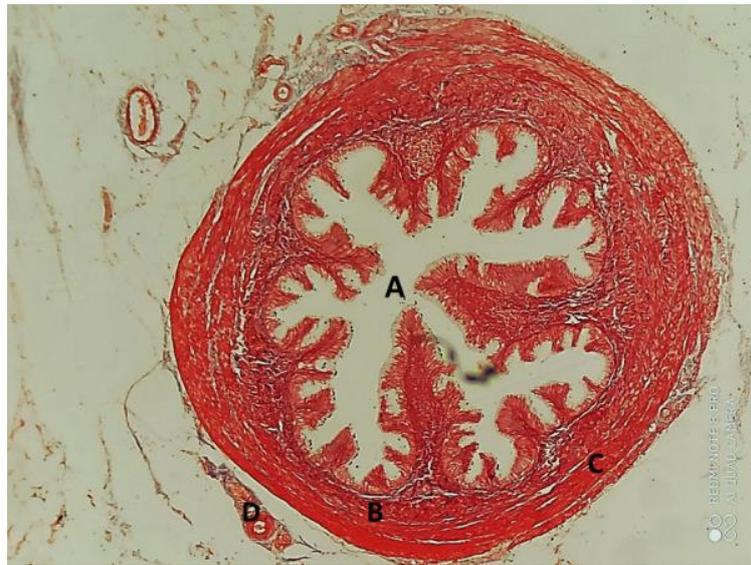


Figure 5. Microscopically section of the ductus deferens in Iraqi local rooster shows: Adventitia(D), muscularis tunic(C), Submucosa tunic(B), and the ductus lumen . H&E stain (40X)

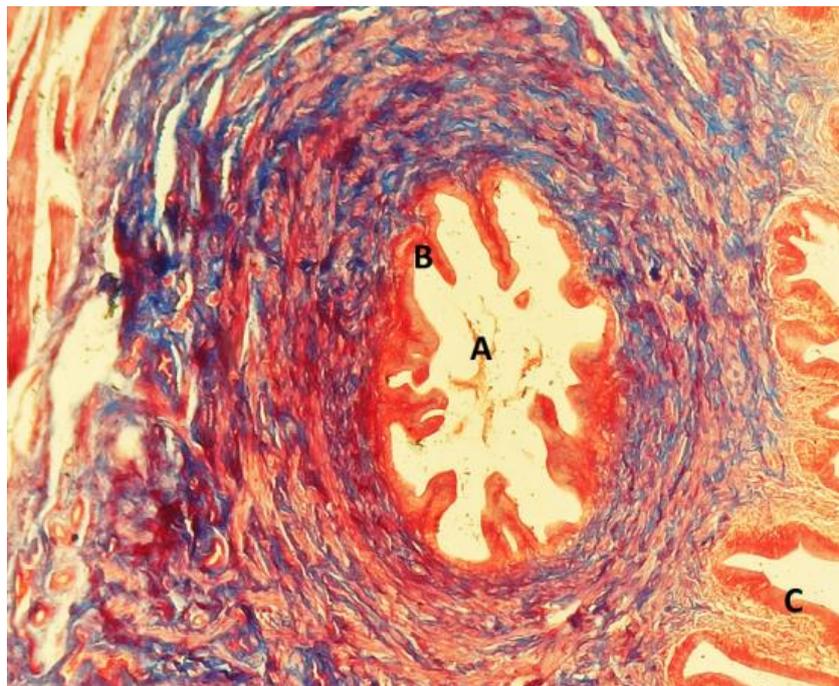


Figure 6. Microscopically section of the papillae in Iraqi local rooster shows: the lumen(A), epithelial lining Pseudostratified type (B), lining of urodeum stratified squamous(C) . H&E stain (40X)

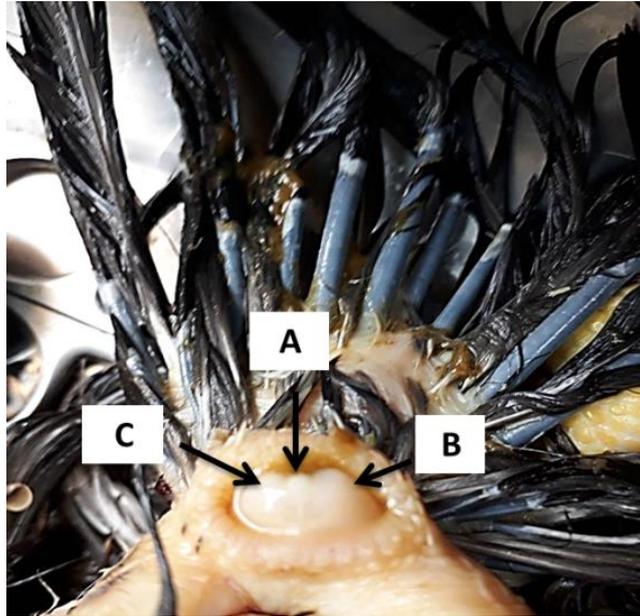


Figure 7. Macroscopic photograph in Iraqi local rooster shows the phallus which contain: two lateral bodies (B &C), behind them the dorsal wall (A).

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