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Original Research Article

HISTO-MORPHOLOGICAL STUDY ON THE REPRODUCTIVE ORGANS OF THE GUINEA COCK (*NUMIDA MELEAGRIDIS*)

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ABSTRACT

The aim was to study the basic histo-morphology of the reproductive organs of the guinea cock (*Numida meleagridis*). Eleven (11) helmeted apparently healthy guinea cocks of 2 years old, were acquired for this study. The birds were transported to the small animal pen at the Veterinary Teaching Hospital, Joseph Sarwuan Tarka University, Makurdi where they were acclimatized. Thereafter, they were sacrificed by resection of cervical bones and surrounding structures. A ventral mid-line incision was made to expose the reproductive organs, which were identified, studied *insitu*, and exteriorized. The harvested organs were fixed in 10% formalin for 48 hours. The samples were further processed according to the standard procedure for routine histology. The prepared slides were studied under a binocular microscope (Model BM 130). Photomicrographs were obtained by the aid of a microscope camera connected to a computer. The results showed a testicular capsule which appeared as a coat of collagenous fibre, from which several septae extended to divide the testes into lobules. The parenchyma of the testes contained several highly convoluted seminiferous tubules and adjacent connective tissue sheaths. The germinal epithelium lining the tubules was pseudo-stratified columnar epithelium which contained several spermatogenic cells. The epididymis appeared as a homogenous organ with pockets of epididymal ducts, in which spermatozoa was consistently seen. The ductus deferens appeared as a duct surrounded by a band of smooth muscle and lined by a pseudo-stratified columnar epithelium with the presence of spermatozoa in the lumen of the ductus deferens. The presence of mucosal folds in the ductus deferens, was suggestive as the major site of spermatozoa storage in the guinea cock. These findings may be useful in future studies of the reproductive system of the guinea cock.

Keywords: Ductus deferens, Epididymis, Guinea cock, Phallus, Testes

INTRODUCTION

Guinea fowls are birds which belong to the *Numididae* family within the Galliformes order, and are sometimes called original fowl in some parts of the world. In Benue state, they are called Ikyange in Tiv, Okwureje in Idoma and Ujochinu in Igede. Guinea fowls are predominant in Africa (Annor *et al*., 2012). Though most of the species originate from Africa, a species of guinea fowl known as the helmeted guinea fowl has been displayed as a domesticated bird in other regions. It is said that guinea fowl derives its name from the coast of Guinea, where it is believed to have originated (Teye & Gyawu, 2002). These birds bear a resemblance to partridges but possess featherless heads, and a majority of the species have a blackish or dark grey plumage with deep white spots except for the two members of the genus *Agelastes* which do not have the spots.

Guinea fowls are long day seasonal breeders (Ali *et al*., 2015). The males breed between April and July. According to Dharani *et al*. (2018), intrinsic factors such as photoperiod may not affect breeding as will extrinsic factors such as food availability or rain. Similarly, in small ground finches, only rainfall, but not photoperiod, light intensity during the day, or ambient temperature, correlated with the pattern in gonad development (Hau *et al*., 2000).

The testes in birds are encapsulated (Kirby & Froman, 2000) and they contain interstitial tissues and seminiferous tubules. Within the interstitial tissue are Leydig or interstitial cells, responsible for the production of androgens (Madekurozwa *et al*., 2002).

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Despite several studies on the reproductive system of guinea fowl (Aire, *et al*., 1980; Brillard, 1986; Ibe *et al*., 2008; Umosen *et al*., 2008; Hein *et al*., 2011; Abdul-Rahman *et al*., 2016; Qureshi *et al*., 2016; Abdul-Rahman *et al*., 2017; Dharani *et al*., 2018, there is paucity of information on the histology of the reproductive organs of adult guinea cocks, hence this study. The aim of this work was to study the histo-morphology of reproductive organs of adult guinea cocks in Benue state, Nigeria, and relate the findings to the functions.

MATERIALS AND METHODS

HARVESTING OF REPRODUCTIVE ORGANS

A total of eleven (11) apparently healthy breeding helmeted guinea cocks (*Numida meleagridis*) of 2 years old were purchased from Oracle Farms at Naka Local Government Area, Benue State, Nigeria during the raining season of May 2023. Each bird was carefully identified and separated from the female through careful examination and identification of the copulatory organ (phallus). The phallus was identified by a gentle massage on the lower abdomen of each bird and a slight pressure applied to the vent revealing the pinkish protruding structure. The birds were transported in well-ventilated baskets to the poultry pen of the small animal unit, Veterinary Teaching Hospital Annex, North Bank, Makurdi, Benue State. The birds were allowed to acclimatize in a conducive pen for 7 days. During this period, the birds were fed with grower's mash and guinea corn, and water was given ad libitum. After acclimatization, birds were taken to the Experimental Animal Laboratory of the Department of Veterinary Anatomy, Joseph Sarwuan Tarka University, Makurdi for the experiment. The birds were sacrificed by cervical dislocation and allowed to bleed for 3 to 5 minutes into the sewer. A ventral incision was made and the breast muscle was reflected cranially to expose the coelomic cavity. The testes and reproductive tracts were completely freed from the adjoining ligaments and fascia and were fixed in 10% buffered formalin for histology.

PROCEDURE FOR HISTOLOGY

The fixed tissues were embedded in molten paraffin wax using embedding cassettes on a tissue Tek Embedding Centre (SLEE MPS/P2), and cooled rapidly on the cooling component. Tissues were sectioned using a rotary microtome (MICROM HM340E ThermoScientific) set at 4µ picked on slides and ready for staining. Sections were dewaxed and hydrated by passing through two changes of xylene and through descending grades of alcohol (100%, 80%, 70% 60%) for three minutes each and then into water, stained in Harris' haematoxylin solution for 5 minutes and washed in running water. The stain was differentiated in 1% acid-alcohol and then washed well in running water, blued in Scott's tap water substitute for 5 minutes and rinsed briefly in distilled water, counterstained in 1% aqueous eosin for 2 minutes, washed well in running water, dehydrated in descending grades of alcohol, cleared in xylene and mounted in DPX (Destrene, plasticiser and xylene). Sections were then placed in slide carriers and placed in a 40˚C oven to dry overnight.

The processed tissues were studied microscopically and photomicrographs were obtained using a digital camera (AmScope MU series 8.0MP) that was attached to the microscope and connected to a computer (Compaq Presario CQ57).

RESULTS

THE TESTES

The testicular capsule from the present study was a fine lining from which septae extended to divide the testes into lobules. The testis was comprised of seminiferous tubules. The seminiferous tubules were highly convoluted structures separated by surrounding connective tissue sheaths, which constituted the tunica albuginea. Germinal epithelium in the seminiferous tubules contained spermatogenic cells (Figure I: sp; spm). Sertoli cells (sustentacular) were evident on the tubular lining (Figure I: sc). In between the seminiferous tubules were the Leydig cells (interstitial cells).

The seminiferous tubules of the testes terminated into a straight duct lined by simple high cuboidal epithelium that become squamous epithelium as the duct approached the rete testis into which it opened. The rete testis extended from the testicular albuginea through the mediastinum to the epididymal region which was located on the dorso-medial surface of each testicle. The rete testis was on the lateral, cranial and caudal surfaces of the epididymal region. It was seen wrapped by a capsule of finely arranged thick dense connective tissue.

The rete tubules were identified by their irregularly-shaped thin walled lumens lined by squamous epithelium. The rete testis was the area where tubules coalesced and connected to efferent ductules, identified in this study as wide spaces lined by a fine layer of connective tissues both within the testicular capsule and the epididymal area. Contained within the rete testis were sparse, mainly spermatozoa and desquamated immature germ cells (Plates 1, 2).

THE EPIDIDYMIS

The epididymis was large, with pockets of tubules, and was not divided into histologically distinct parts. The tubules were lined by non-ciliated, pseudo-stratified columnar epithelium (Figure II: ec). Their lumen contained spermatozoa (Figure II: L). This was a confirmation that the birds were in their breeding phase. The wall of ductus deferens had an epithelial lining of columnar cells which had several longitudinal folds and consistently contained more volumes of spermatozoa as compared to the epididymis. The lamina propria was comprised of loose connective tissue (smooth muscles) and the muscularis appeared as a thick layer (Figure II: sm).

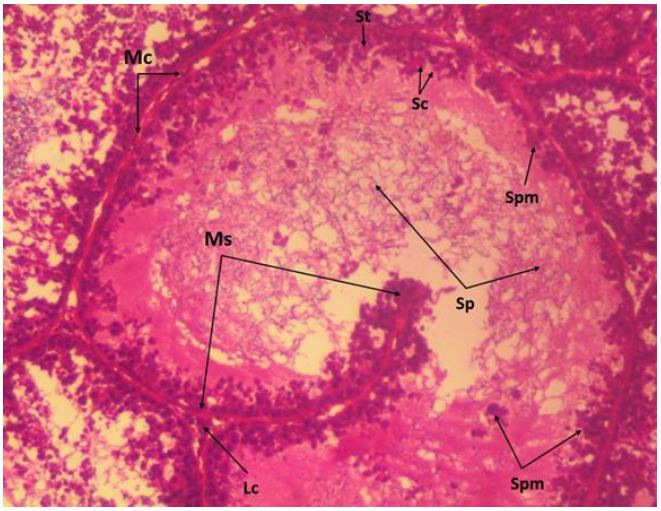

Figure I: Photomicrigraph of testis of guineacock: Mc = Myoid cells, Ms = Mediastinum with rete testis, Lc = Leydig cell, Sp = Spermatozoa, Spm = Spermatids, Sc = Spermatocyte, St = Sertoli cell nuclei **H & E ×40**

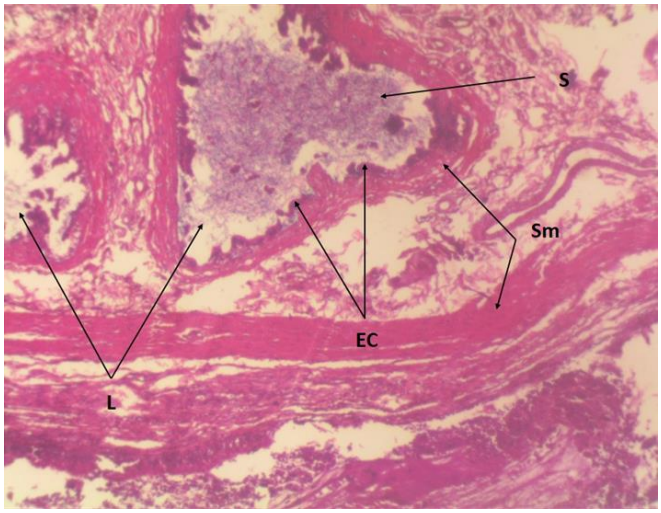

Figure III: Photomicrograph of ductus deferens of guineacock Ec = Epithelial Cells, Sm = Smooth muscles, L = Lumen, S = Spermatozoa **H & E ×40**

THE PHALLUS

The phallus was lined by stratified squamous keratinized epithelium. The lamina propria composed of loose connective tissues, small vessels and sparse lymphocytic infiltrate. Adipose tissues, blood vessels and loose connective tissues were observed as abundance of elastic fibers. The phallus consisted of fibro-muscular stroma and tubulo-alveolar glands and a large lumen (Figure IV: fs; tg). A well-developed muscular layer was also evident in the phallus.

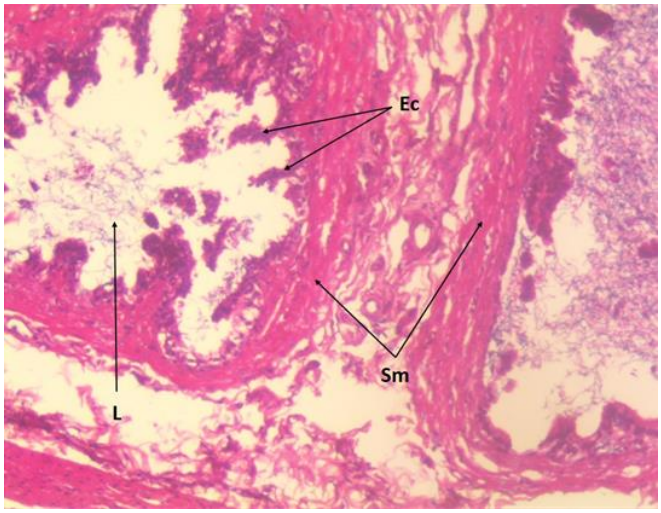

Figure II: Photomicrograph of epididymis of guineacock Ec = Epithelial Cells, Sm = Smooth muscles, L = Lumen bearing spermatozoa; **H & E ×40**

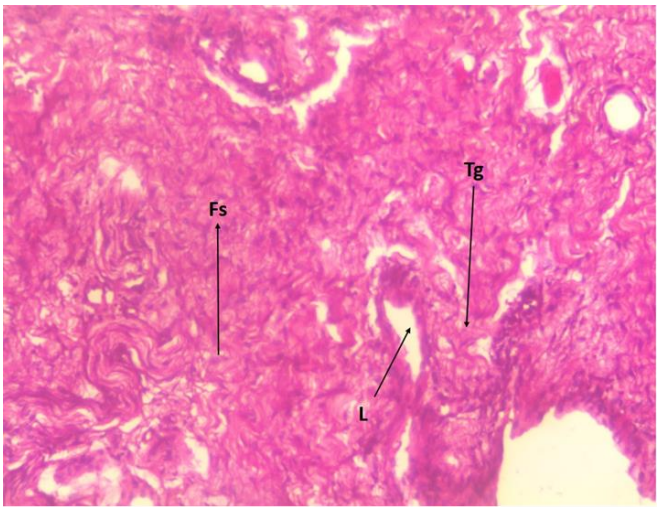

Figure IV: Photomicrograph of phallus of guineacock Fs = Fibromuscular stroma, Tg = Tubuloalveolar glands, L = Lumen; H **& E ×40**

DISCUSSION

The testicular capsule was a fine lining from which septae extended to divide the testes into lobules. This report does not align with that of Abdul-Rahman *et al.* (2017) who reported that the testicular capsule in guinea cocks has no

septae, and therefore no separation of testes into lobules seen in the testes of guinea cocks. This variation may be attributed to the age of guinea cocks used in the study and specie-specific morphological differences.

The epididymis was large, with pockets of convoluted tubules, and had no distinct separation into different parts, as head, body and tail. It was lined by non-ciliated, pseudo-stratified columnar epithelium. This aligns with report of Shahad & Shakir (2019) who studied and reported the histology of reproductive organs of guinea cocks in Baghdad. The wall of ductus deferens had an epithelial lining of columnar cells, and longitudinal mucosal folds. The mucosal folds in the ductus deferens may function in contraction of the walls to aid transportation of spermatozoa. The finding corresponds to that of Shahad & Shakir (2019) who reported that the wall of ductus deferens is lined by pseudostratified columnar epithelium. Also, the mucosal wall had longitudinal folds. In this study, it was observed that the amount of spermatozoa in the lumen of ductus deferens was relatively more in comparison to that found in seminiferous tubules and epididymal ducts, which suggests that the ductus deferens may be the major storage site for spermatozoa in the bird, and not the epididymis. This has also been observed by Tamilselvan & Balwinder (2020).

Fibro-muscular stroma and tubulo-alveolar glands were observed in the phallus, which suggests that the phallus of the guineacock may have additional anatomical modifications to compensate for the absence of a prostate gland.

CONCLUSION

The presence of mucosal folds in the ductus deferens, as the major site of spermatozoa storage, the large tubular epididymis with pockets of convoluted tubules, and the presence of a fibro-muscular stroma and tubulo-alveolar glands in the phallus are unique findings in the reproductive system of the guinea cook as reported in the present study. It is hoped that these information will be handy in future pathological or clinical investigations of the system in the species.

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