



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2025): 4.61

VET 2025; 10(10): 425-432

© 2025 VET

www.veterinarypaper.com

Received: 13-09-2025

Accepted: 11-10-2025

Dr. Pakala Vamsi Krishna

Department of Veterinary
Anatomy, PG Scholar, NTR
College of Veterinary Science,
Gannavaram, Andhra Pradesh,
India

Dr. S Dhilleswara Rao

Assistant Professor, Department
of Veterinary Anatomy, College
of Veterinary Science, Garividi,
Andhra Pradesh, India

Dr. NKB Raju

Professor, Department of
Veterinary Anatomy, College of
Veterinary Science, Garividi,
Andhra Pradesh, India

Dr. V Samatha

Assistant Professor, Department
of Veterinary Pathology, NTR
College of Veterinary Science,
Gannavaram, Andhra Pradesh,
India

Corresponding Author:

Dr. Pakala Vamsi Krishna

Department of Veterinary
Anatomy, PG Scholar, NTR
College of Veterinary Science,
Gannavaram, Andhra Pradesh,
India

Histomorphology of oviduct in adult Rajasri fowl

Pakala Vamsi Krishna, S Dhilleswara Rao, NKB Raju and V Samatha

DOI: <https://www.doi.org/10.22271/veterinary.2025.v10.i10f.2672>

Abstract

The present study was conducted on thirty-six (36) apparently healthy laying Rajasri fowls and elucidates the histological variations of different oviductal regions, namely the infundibulum, magnum, isthmus, uterus, and vagina. The mucosal folds varied significantly in length, measuring $419.62 \pm 94.28 \mu\text{m}$ in the infundibulum, $2268.87 \pm 424.22 \mu\text{m}$ in the magnum, $1468.32 \pm 58.51 \mu\text{m}$ in the isthmus, $2235.11 \pm 121.31 \mu\text{m}$ in the uterus, and $1265.85 \pm 152.36 \mu\text{m}$ in the vagina. The epithelial height ranged from $17.96 \pm 4.48 \mu\text{m}$ in the infundibulum to $28.87 \pm 8.86 \mu\text{m}$ in the magnum. The tunica muscularis showed regional thickness variations $208.7 \pm 28.62 \mu\text{m}$ in the infundibulum, $196.09 \pm 62.38 \mu\text{m}$ in the magnum, $171.24 \pm 32.42 \mu\text{m}$ in the isthmus, $310.46 \pm 26.18 \mu\text{m}$ in the uterus, and $418.56 \pm 36.15 \mu\text{m}$ in the vagina. The mucosa was lined by simple or pseudostratified ciliated columnar epithelium with goblet cells, and tubular glands were confined to the uterus. These findings highlight distinct regional histomorphological adaptations reflecting functional specialization of the oviduct in avian reproduction.

Keywords: Oviduct, Rajasri fowl, histology, avian reproduction

Introduction

The "Rajasri" bird is a dual-purpose bird and has great potential due to its versatile capacity to adapt to various climatic conditions. The oviduct is a highly convoluted muscular tube that is suspended from the left side of the abdominal cavity by the dorsal and ventral oviductal ligament. Segments are responsible for synthesizing specific components of eggs, including the peri-vitelline membrane, egg yolk, albumin and eggshell. Additionally, the oviduct plays a critical role in transporting the ovum, depositing sperm and providing a storage site for eggs and fertilization. The information on histoarchitecture of the oviduct in laying Rajasri fowl was scarce. Therefore, the present study was undertaken to conduct histological investigation of oviduct in laying Rajasri fowl.

Materials and Methods

The present study was conducted on thirty-six (36) apparently healthy laying Rajasri fowls. The study was conducted in laying birds of the same age group ranging from 26 to 28 weeks. The oviducts were collected from these birds which were slaughtered in the Department of ILFC, Poultry Science of N.T.R College of Veterinary Science, Gannavaram and from local slaughter houses.

The tissue samples from different segments of the oviduct were fixed in 10% Neutral buffered formalin and Bouin's fluid (Singh and Sulochana, 1996) [12]. The fixed tissues were subjected to routine tissue processing and paraffin blocking and sections of $4\text{-}5\mu\text{m}$ thickness, and the sections were stained by Haematoxylin and Eosin stains for routine histological study and Verhoeff's method for elastic fibres (Singh and Sulochana, 1996) [12], Masson's Trichrome for collagen fibers, Wilder's method for reticular fibres and Bielschowsky's method for nerve fibers (Luna, 1968) [5].

The length of mucosal folds, height of epithelium, thickness of *propria submucosa* and thickness of tunica muscularis in different segments of oviduct was measured by using ocular and stage micrometer under light microscope. The data was subjected to the statistical analysis by using SPSS software.

Results and Discussion

Oviduct

The tunica mucosa was determined to form a varied number of longitudinal folds protruding into the lumen in different segments of the entire oviduct (Fig. 1). The height, width and shape of these longitudinal folds were varied in different regions of the oviduct and the epithelium of this mucosa was also observed varying in different regions of the oviduct (Figure 2 & 3). The lamina *propria submucosa* consisted of loose connective tissue with collagen, reticular, elastic fibres, nerve fibres and scattered blood capillaries (Figure 4, 5 & 6). The tunica muscularis consisted of a thin outer longitudinal and thick inner circular layer of smooth muscle fibres and the thickness was varied in different regions of oviduct. The tunica serosa, which was the outermost layer, consisted of connective tissue fibres and was lined by simple squamous epithelium externally. These observations are in accordance with the findings of Gana *et al.* (2022) [3] in adult normal feathered and naked-neck genotypes of Nigerian chickens.

Infundibulum

The tunica mucosa of anterior funnel part of the infundibulum was projected into mucosal folds which were lower in height when compared to the posterior part of infundibulum. These observations were in accordance with findings of Nabil *et al.* (2022) [8] in laying turkey hens. Contrary to this, Sharaf *et al.* (2012) [11] noticed the mucosa of infundibular funnel gave short, broad and highly branched mucosal folds carrying secondary and some tertiary folds with short primary folds in laying Ostriches. The average length of mucosal fold was $419.62 \pm 94.28 \mu\text{m}$ (Table 1). The luminal epithelium was lined by simple columnar epithelium and consisted of non-ciliated cells, ciliated cells and goblet cells (Figure 2). These observations are in accordance with findings by Mehta and Guha (2012) [6] in both developing and laying hens and Patki *et al.* (2013) [9] in the adult Kuttanad duck. The average height of the epithelium was $17.96 \pm 4.48 \mu\text{m}$ (Table 1).

The lamina *propria submucosa* was extended into the core of mucosal folds, but the tubular glands were absent. It was vascularized and consisted of loose connective tissue with collagen, reticular and elastic fibres. Similar observations were noticed in adult turkey hens (Islam *et al.*, 2021) [4]. The tunica muscularis was well represented with inner circular and outer longitudinal smooth muscle layers (Figure 7). Similar findings were noticed by Mehta and Guha (2012) [6] in both developing and laying hens. The average thickness of the tunica muscularis was $208.7 \pm 28.62 \mu\text{m}$ (Table 1). The tunica serosa which was outermost layer was comprised of loose connective tissue and was lined by simple columnar epithelium.

Magnum

In the magnum part of the oviduct, the tunica mucosa was thrown into the lumen and formed the tall and thick longitudinal mucosal folds (Figure 8). The mucosal folds were leaf-like in shape and were longer in length when compared to the in fundibulum (Graph. 1). The core of mucosal folds was formed by dense collagen and reticular fibres. These observations are in accordance with findings of Vijaykumar *et al.* (2016) in laying emu birds, Wani *et al.* (2017) [14] in Kashmir faverolla chicken and Nabil *et al.* (2022) [8] in laying Turkey hens. Contrary to the present findings, Paul *et al.* (2016) [10] observed that the mucosal folds were comparatively shorter than other regions of the oviduct

in the magnum of Sonali, Deshi, and Hyaline chickens. The average length of mucosal fold in magnum was $2268.87 \pm 424.22 \mu\text{m}$ (Table 1). Contrary to this, Mahammadpour and keshtmandi (2008) [7] in turkey and pigeon reported $1987.5 \pm 161.25 \mu\text{m}$ and $775.12 \pm 35.16 \mu\text{m}$ respectively. It was lined by pseudostratified ciliated columnar epithelium along with non-ciliated cells (Figure 9). These ciliated and non-ciliated cells were prismatic and goblet in shape, respectively. These results were in accordance with the findings of Nabil *et al.* (2022) [8] in laying Turkey hens. The average height of epithelium in tunica mucosa was $28.87 \pm 8.86 \mu\text{m}$. The average thickness of *propria submucosa* was $472.69 \pm 69.71 \mu\text{m}$ (Table 1).

The tunica muscularis was clearly demarcated into inner thicker circular and outer longitudinal smooth muscle fibres (Figure 8). These observations are in accordance with findings of Islam *et al.* (2021) [4] in adult Turkey hens. The average thickness of tunica muscularis was $196.09 \pm 62.38 \mu\text{m}$ (Table 1).

Isthmus

The tunic mucosa of the isthmus segment showed longitudinal mucosal folds (Figure 10). These folds were lower in height when compared to magnum (Graph 2). It was lined by pseudostratified columnar epithelium. The ciliation was present on the mucosal surface of epithelium (Figure 11). Both the secretory goblet cells and non-secretory prismatic cells were observed in the epithelium. Similar findings were observed by Islam *et al.* (2021) [4] in adult turkey hens whereas, Eurell and Frappier (2006) [2] reported that the epithelium of isthmus was simple columnar in adult birds. The average length of mucosal fold and height of mucosal epithelium of isthmus was $1468.32 \pm 58.51 \mu\text{m}$ and $26.85 \pm 5.31 \mu\text{m}$ respectively (Table 1).

The tunica muscularis was clearly demarcated into inner circular and outer longitudinal smooth muscles (Figure 10). The average thickness of tunica muscularis was $171.24 \pm 32.42 \mu\text{m}$ (Table 1 and Graph 3). Contrary to this, Balash and Baghdady (2013) reported $600 \pm 2 \mu\text{m}$ thickness in turkey.

UTERUS

The tunica mucosa of the uterus was projected into longer and more complex mucosal folds than isthmus (Figure 1). The mucosal epithelium was lined by pseudostratified epithelium with intermittent ciliated columnar cells. The ciliated cells contained secretory granules. Similar observations were noticed by Islam *et al.* (2021) [4] in uterus of adult turkey hens and Nabil *et al.* (2022) [8] in laying Turkey hens as in the present study. The average length of mucosal folds and height of epithelium were $2235.11 \pm 121.31 \mu\text{m}$ and $25.48 \pm 4.34 \mu\text{m}$ (Table 1). Contrary to this, Paul *et al.* (2016) [10] in the uterus of Deshi, Sonali and Hyaline chickens noticed $1716.7 \pm 143.76 \mu\text{m}$, $1458.3 \pm 66.46 \mu\text{m}$ and $1416.7 \pm 408.25 \mu\text{m}$ respectively.

The lamina *propria submucosa* consisted of highly vascularized loose connective tissue with branched tubular glands. The tubular glands were densely packed and were separated from each other by collagen, reticular and nerve fibres. These observations are in accordance with findings of Islam *et al.* (2021) [4] in uterus of adult turkey hens and Nabil *et al.* (2022) [8] in laying Turkey hens. The tunica muscularis was thicker than the other parts of the oviduct and was made up of inner thicker circular and outer longitudinal muscle layers. The thickness of tunica muscularis was $310.46 \pm 26.18 \mu\text{m}$ (Table 1).

VAGINA

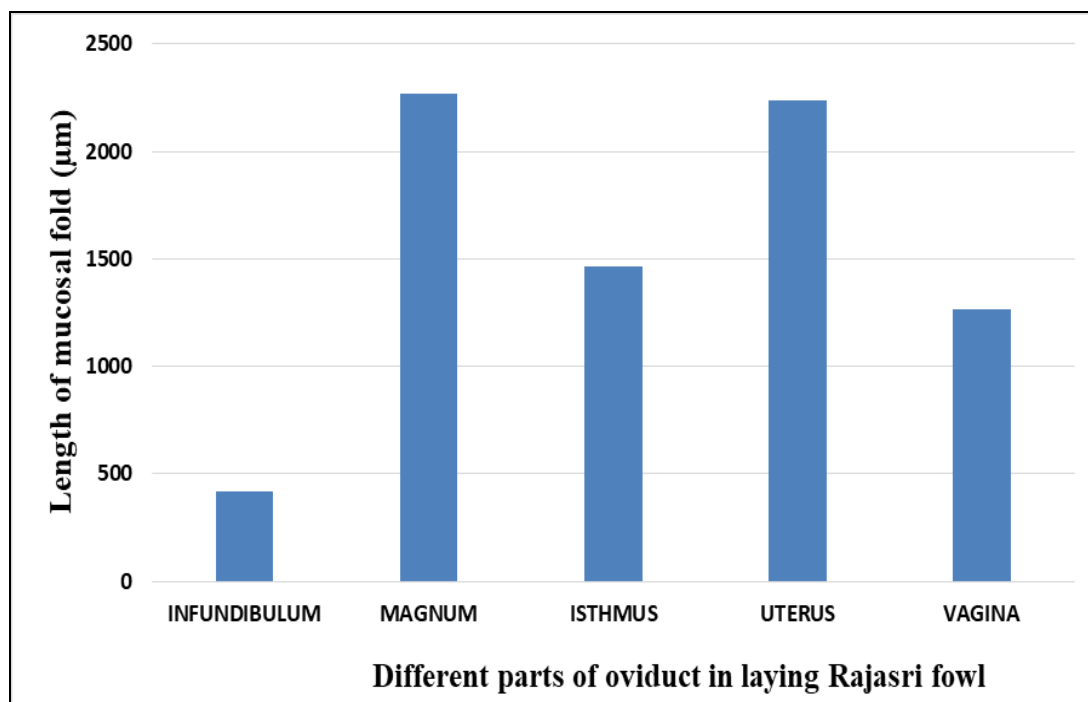
The tunica mucosa was raised into numerous longitudinal mucosal folds, and these are narrow when compared to other parts of oviduct (Figure 12). The mucosal folds were branched into primary, secondary, tertiary folds and are elongated and thin (Figure 12). Similarly, Vijaykumar *et al.* (2016) reported in laying Emu birds, Wani *et al.* (2017) ^[14] in Kashmir faverolla chicken and Nabil *et al.* (2022) ^[8] in laying Turkey hens as noticed in the present study. The average length of mucosal fold in the vagina was $1265.85 \pm 152.36 \mu\text{m}$. The luminal epithelium was lined by pseudostratified columnar epithelium containing both non-secretory prismatic cells and secretory goblet cells (Figure 3). The lining epithelium was tallest in the vagina among the entire portion of the oviduct. These results were in accordance with the findings of Islam *et al.* (2021) ^[4] in adult turkey hens and Nabil *et al.* (2022) ^[8] in laying Turkey hens. The average

height of epithelium was $28.46 \pm 5.32 \mu\text{m}$ (Table 1). The mucosa lacked tubular glands in the vagina.

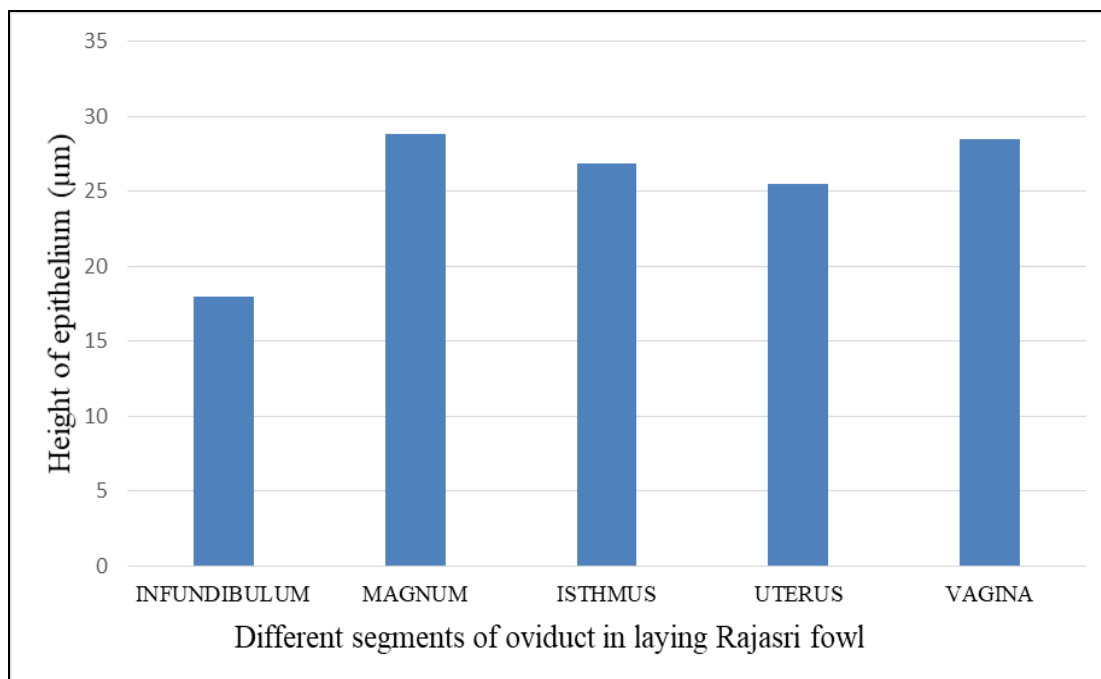
The lamina *propria submucosa* was very scanty and continued with muscularis layer. The thickness of lamina *propria submucosa* was $19.32 \pm 6.52 \mu\text{m}$ (Table. 1). The tunica muscularis formed the greater part of the thickness in the vagina and was composed of an inner thicker circular layer and an outer longitudinal layer of smooth muscles (Figure 12). The inner circular layer was strongly developed and formed the vaginal sphincter at the opening of cloaca. Similar findings were noticed by Islam *et al.* (2021) ^[4] in uterus of adult turkey hens, Gana *et al.* (2022) ^[3] in adult normal feathered and naked-neck genotypes of Nigerian chickens and Nabil *et al.* (2022) ^[8] in laying Turkey hens. The thickness of tunica muscularis was $418.56 \pm 36.15 \mu\text{m}$ (Table 1). The serosa was thin and lined by simple squamous epithelium and contained connective tissue fibres like collagen, reticular and small blood vessels.

Table 1: The average micrometrical observations of different parts of oviduct in laying Rajasri fowl

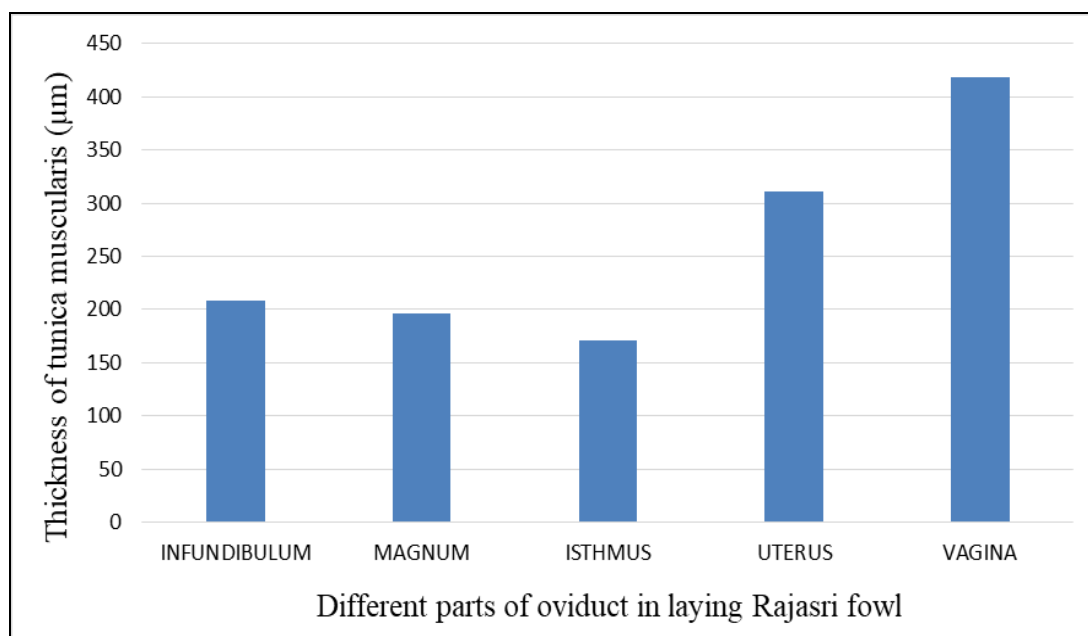
Part	Parameter	Laying Rajasri fowl (Mean $\pm$ S.E)
Infundibulum	Length of mucosal fold (μm)	419.62 $\pm$ 94.28
	Height of epithelium (μm)	17.96 $\pm$ 4.48
	Thickness of tunica muscularis (μm)	208.7 $\pm$ 28.62
Magnum	Length of mucosal fold (μm)	2268.87 $\pm$ 424.22
	Height of epithelium (μm)	28.87 $\pm$ 8.86
	Thickness of <i>propria submucosa</i> (μm)	472.69 $\pm$ 69.71
Isthmus	Thickness of tunica muscularis (μm)	196.09 $\pm$ 62.38
	Length of mucosal fold (μm)	1468.32 $\pm$ 58.51
	Height of epithelium (μm)	26.85 $\pm$ 5.31
Uterus	Thickness of <i>propria submucosa</i> (μm)	386.46 $\pm$ 63.32
	Thickness of tunica muscularis (μm)	171.24 $\pm$ 32.42
	Length of mucosal fold (μm)	2235.11 $\pm$ 121.31
Vagina	Height of epithelium (μm)	25.48 $\pm$ 4.34
	Thickness of <i>propria submucosa</i> (μm)	79.42 $\pm$ 16.58
	Thickness of tunica muscularis (μm)	310.46 $\pm$ 26.18
Vagina	Length of mucosal fold (μm)	1265.85 $\pm$ 152.36
	Height of epithelium (μm)	28.46 $\pm$ 5.32
	Thickness of <i>propria submucosa</i> (μm)	19.32 $\pm$ 6.52
	Thickness of tunica muscularis (μm)	418.56 $\pm$ 36.15



Graph 1: The average lengths of mucosal folds (μm) in different segments of oviduct in laying Rajasri fowl



Graph 2: The average height of epithelium (μm) in different segments of oviduct in laying Rajasri fowl



Graph 3: The average thickness of tunica muscularis (μm) in different segments of oviduct in laying Rajasri fowl

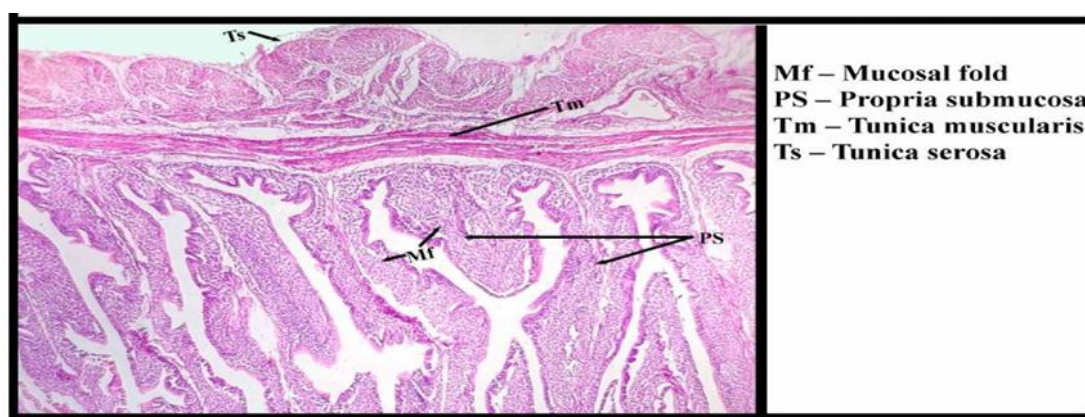


Fig 1: Photomicrograph of the uterus in laying Rajasri fowl showing different tunics, H&E x 40



Fig 2: Photomicrograph of infundibulum in laying Rajasri fowl showing mucosa lined by simple columnar epithelium, H&E x 400

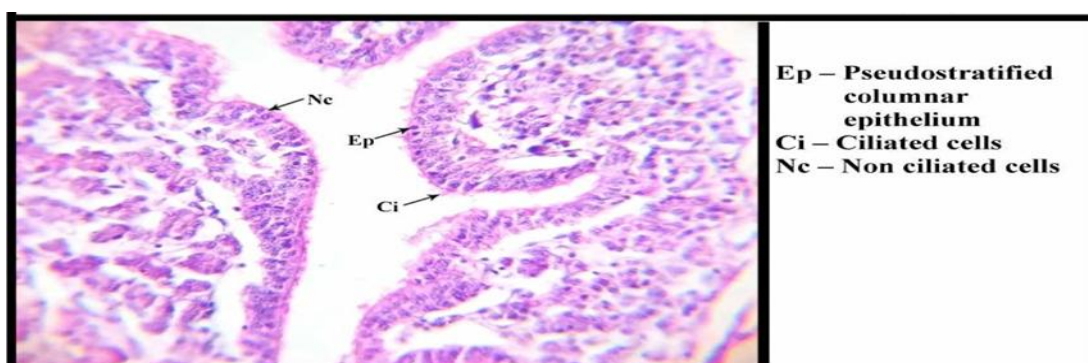


Fig 3: Photomicrograph of vagina in laying Rajasri fowl showing mucosa lined by pseudostratified columnar epithelium, H&E x 400



Fig 4: Photomicrograph of uterus in laying Rajasri fowl showing collagen fibres in core of mucosal folds, Masson's Trichrome x 100



Fig 5: Photomicrograph of magnum in laying Rajasri fowl showing reticular fibres in core of mucosal folds, Wilder's x 100

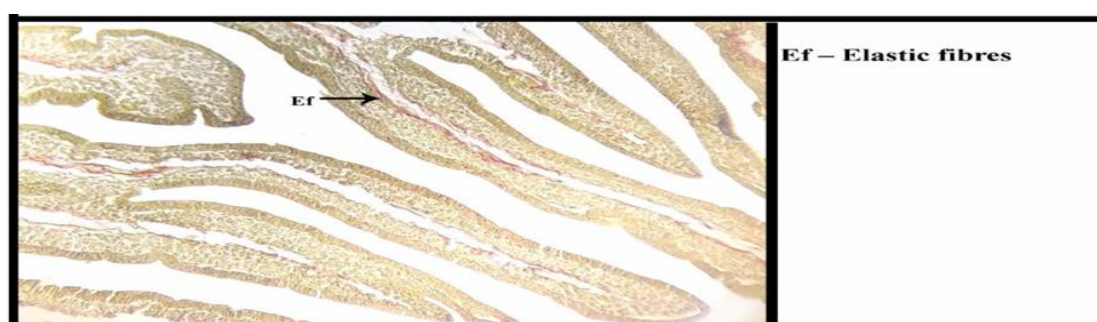


Fig 6: Photomicrograph of uterus in laying Rajasri fowl showing elastic fibres in core of mucosal folds, Verhoeff's x 100

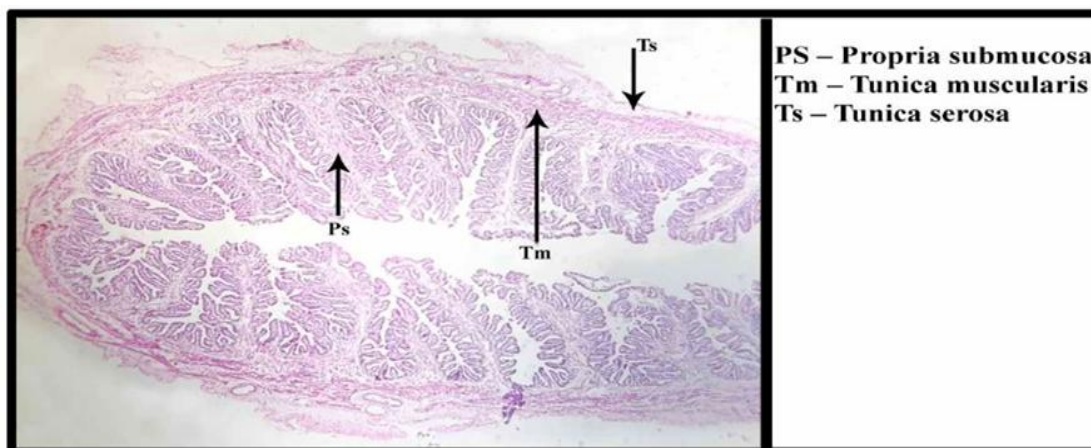


Fig 7: Photomicrograph of infundibulum in laying Rajasri fowl showing different tunics, H&E x 40



Fig 8: Photomicrograph of magnum in laying Rajasri fowl showing different tunics, H&E x 40

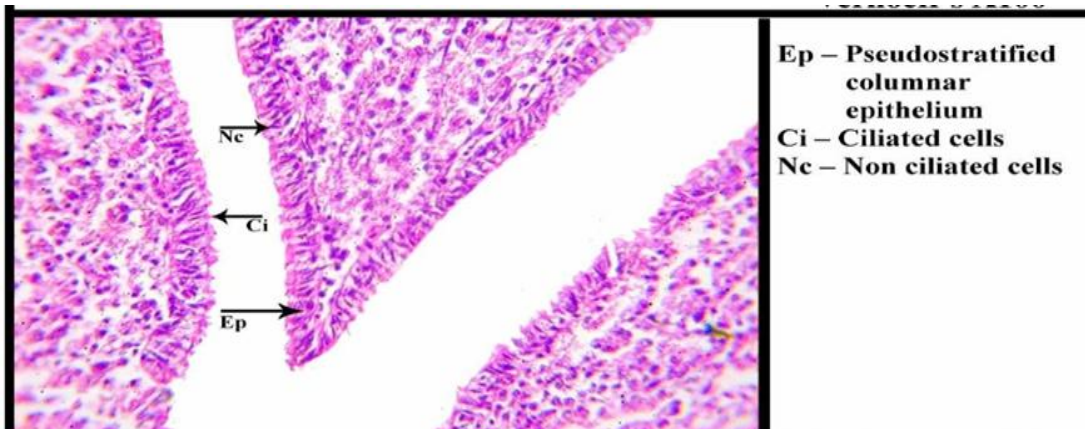


Fig 9: Photomicrograph of magnum in laying Rajasri fowl showing mucosa lined by pseudostratified columnar epithelium, H&E x 400

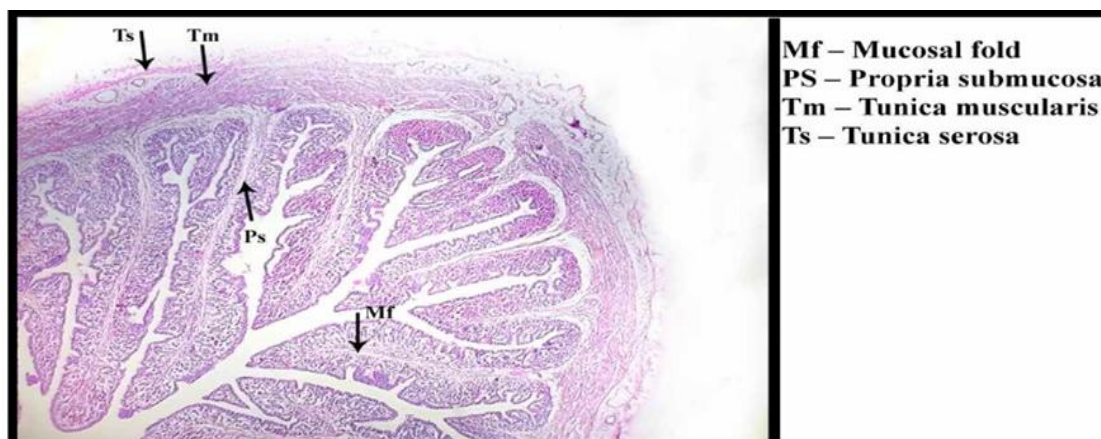


Fig 10: Photomicrograph of isthmus in laying Rajasri fowl showing different tunics, H&E x 40

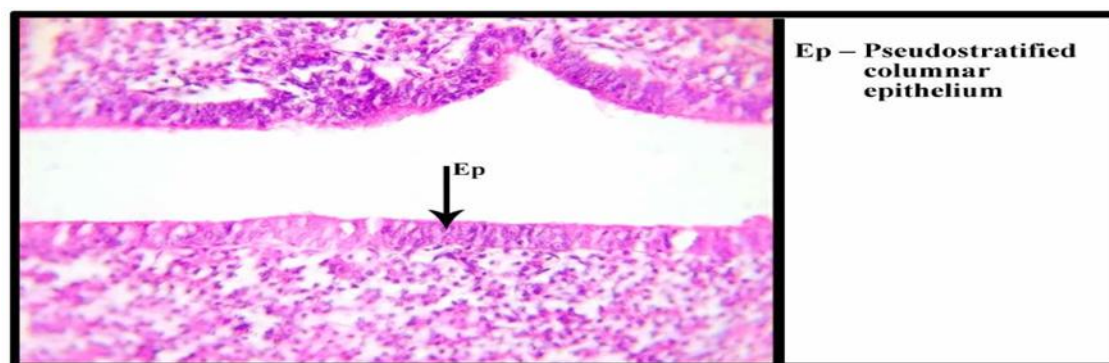


Fig 11: Photomicrograph of isthmus in laying Rajasri fowl showing mucosa lined by pseudostratified columnar epithelium, H&E x 400

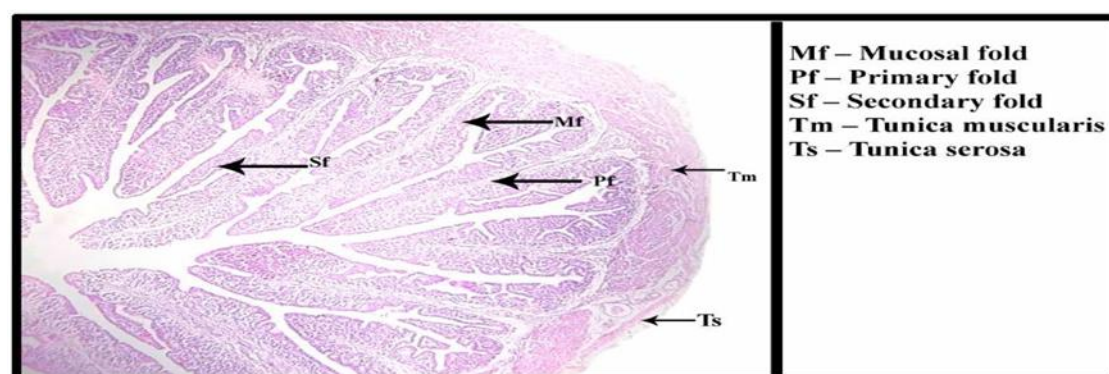


Fig 12: Photomicrograph of vagina in laying Rajasri fowl showing different mucosal folds, H&E x 40

Conclusion

The histomorphological characteristics of the oviduct were studied by using a light microscope, and it was divided into five regions, i.e., infundibulum, isthmus, magnum, uterus, and vagina. The wall of oviduct was composed of tunica mucosa, lamina propria sub mucosa, tunica muscularis and tunica serosa from inside to outside. The length of mucosal folds was more in the magnum was $2268.87 \pm 424.22 \mu\text{m}$ and least in the infundibulum with $419.62 \pm 94.28 \mu\text{m}$ while the thickness of tunica muscularis was more in the vagina ($418.56 \pm 36.15 \mu\text{m}$) and less in the isthmus ($196.09 \pm 62.38 \mu\text{m}$).

Conflict of Interest

There is no conflict of interest

Financial Support

Not available

Reference

- Balash KJ, Al-Baghdady EF. Histological study of the isthmus segment of the oviduct in female turkey at egg-laying stage. *Al-Qadisiya J Vet Med Sci*. 2013;12(2):13-18.
- Eurell JA, Frappier BL. *Dellmann's Textbook of Veterinary Histology*. 6th Ed. USA: Blackwell Publishing; 2006, p. 256-62.
- Gana J, Eche AJ, Kontagora KI, Mgbonu K, *et al*. Histomorphological studies on oviduct of Nigerian genotype chickens. *Int J Food Sci Agric*. 2022;6(2):192-199.
- Islam MR, Hasan I, Monisha NZ, Afrin M, *et al*. Gross and histomorphological study of the ovary and oviduct of turkey hen with special emphasis on the sperm-host gland. *Iraqi J Vet Med*. 2021;45(1):1-8.
- Luna LG. *Manual of Histological Staining Methods of the Armed Forces Institute of Pathology*. 3rd Ed. New York: McGraw-Hill; 1968.
- Mehta S, Guha K. Comparative histological study on the oviduct of developing and laying hens (*Gallus domesticus*). *Indian J Vet Anat*. 2012;24(2):92-4.
- Mohammadpour AA, Keshtmandi M. Histomorphometrical study of infundibulum and magnum in turkey and pigeon. *World J Zool*. 2008;3(2):47-50.
- Nabil TM, Hassan RM, Mahmoud HH, Tawfik MG, Moawad UK, *et al*. Histomorphology and histochemistry of the oviduct in laying turkey hens with emphasis on the sperm host glands. *Adv Anim Vet Sci*. 2022;10(5):1076-89.
- Patki HS, Lucy KM, Chungath JJ, *et al*. Histological observation on the infundibulum of Kuttanad duck (*Anas platyrhynchos domesticus*) during postnatal period. *Int J Sci Res*. 2013;3(1). Available from: <https://www.ijsrp.org/research-paper-1301.php?rp=P13618>
- Paul B, Sarkar S, Islam MN, Aktaruzzaman M, Chowdhury SK, *et al*. Comparative histomorphology of the oviduct of three lines of chicken namely: Sonali, Deshi and Hyline chicken. *J Sylhet Agric Univ*. 2016;3(2):173-80.
- Sharaf A, Eid W, Abuel AAA, *et al*. Morphological aspects of the ostrich infundibulum and magnum. *Bulg J Vet Med*. 2012;15(3):145-159.
- Singh UB, Sulochana S. *Handbook of Histology and Histochemical Techniques*. 2nd Ed. Hyderabad: Premier Publishing House; 1996, p. 84-102.
- Vijayakumar K, Paramasivan S, Madhu N, *et al*. Histological and histochemical observations on oviduct of laying and non-laying emu birds (*Dromaius novaehollandiae*). *Int J Adv Sci Res*. 2016;6(4):89-96.
- Wani H, Darzi M, Kamil SA, Wani SA, Munshi ZH,

Shakoor A, Shah A, *et al.* Histological and histochemical studies on the reproductive tract of Kashmir Faverolla chicken. J Entomol Zool Stud. 2017;5(6):2256-2262.

How to Cite This Article

Krishna PV, Rao SD, Raju NKB, Samatha V. Histomorphology of oviduct in adult rajasri fowl. International Journal of Veterinary Sciences and Animal Husbandry. 2025;10(10):425-432.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.