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Comparative Histomorphochemical Studies on Uropygial Gland of Kadaknath and White Leghorn Breeds of Poultry

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Abstract

The present study was conducted on ten each uropygial glands of 6 to 8 months old healthy Kadaknath and White Leghorn breeds of poultry. The tissue samples were stained by H & E for normal histological structures, Verhoeff's stain for collagen and elastic fibers, PAS (Periodic Acid Schiff's) for glycogen and Alcian Blue PAS method for acid mucopolysaccharides. The uropygial gland in Kadaknath and White Leghorn was composed of two lobes. Each lobe had a single duct and these ducts were joined together by isthmus. The thickness of capsule was more in White Leghorn than Kadaknath breed. The lumen of tubules showed higher concentration of secretory product in Kadaknath breed. Numbers of tubules were higher in Kadaknath. No aggregation of lymphocytes was found in the preen gland of White Leghorn, whereas in Kadaknath, there was large number of lymphocytes aggregation alongwith lymphatic nodules. Melanin pigmentation was the characteristic feature of Kadaknath which was found towards the central cavity and in between ductules. The capsule of White Leghorn showed intense PAS activity, while moderate activity was found in Kadaknath breed of poultry. Intense ACPase reaction was noticed in capsule of uropygial gland of Kadaknath and White Leghorn breeds of poultry.

Key words: Kadaknath, White Leghorn, Histochemistry, Histology, Uropygial gland.

Introduction

Kadaknath is locally known as 'Kalamasi' meaning the fowl having black flesh, native breed of Jhabua region of Madhya Pradesh, India. These are mostly reared by tribals and rural poor farmers as an earning source. The flesh of these birds though black and repulsive to look however its dark colored meat considered not only for delicacy but also for medicinal value. Tribals' use Kadaknath blood in the treatment of many chronic diseases in human beings and meat as aphrodisiac (Pathan *et al.*, 2009). The uropygial gland of birds, also known as the oil gland/ preen gland /rump gland, is a pair of sebaceous glands located dorsally between fourth caudal vertebrae and the pygostyle. It is considered as the only organized tegumentary structure of secretion typical of birds, it is always found in embryonic stages, while in some species it may be vestigial or absent such as in Rheidae, Psittacidae and Columbidae. The oil gland consists of two lobes; each lobe had a duct which is joined together by isthmus (Sadoon, 2011).

Preen oil helps the plumage by maintaining the flexibility of feathers and keeps feather barbules from breaking. The interlocking barbules, when in good condition, form a barrier that helps to repel water (Moyer *et al.*, 2003). The gland secretion contains fatty acids antibacterial agents and vitamin D precursors, preserves feather structure by keeping keratin flexible, and also maintains feather waterproofing (Shafiiian and Mobini, 2014). The relative size of gland helps in hatching success in birds (Moller *et al.*, 2010). Present study was conducted to provide comparative information on the histology and histochemistry of uropygial gland of Kadaknath and White Leghorn breeds of poultry.

Materials and Methods

The study was done on uropygial gland of twenty healthy, 6 to 8 month old birds of Kadaknath and White Leghorn breed (10 each) of poultry irrespective of sex. These birds were sacrificed ethically and glands were fixed immediately in 10% neutral buffer formalin for 24 hours, followed by dehydration in a series of ascending grades of ethanol (70–96%), cleared in several changes of xylene and embedded in paraffin. Fixed glands were processed by routine paraffin embedding technique (Luna, 1968) and paraffin sections of 5 to 7 μ were subjected for histological and histochemical study. The tissue sections were stained by H & E for general histological study and Verhoff's staining for collagen and elastic fibers. Periodic Acid Schiff's staining for glycogen, Alcian blue PAS (pH 2.5) for mucopolysaccharides, alkaline phosphatase method for alkaline phosphate and acid phosphatase method for acid phosphate were implied (Singh and Sulochana, 1997).

Results and Discussion

The uropygial gland of Kadaknath and White Leghorn birds were comprised of two lobes that lies on the base of tail over pygostyle. Similar observations were recorded by Sadoon (2011) in Starling birds and by Salibian and Montalti (2009) in various avian species. Each lobe had single uropygial duct and these ducts were joined together by isthmus (Karmore *et al.*, 2011).

Histologically the uropygial gland was covered by a moderate thick capsule which was made up of collagen fibers, few elastic and reticular fibers along with the blood vessels, adipose tissue, smooth muscle fibers and Herbst corpuscles (Fig.1a). The thickness of capsule in White Leghorn breed was more than Kadaknath breed. However the smooth muscle fibers were absent in the capsule of Moorhen (Sawad, 2006) and European Starling birds (Sadoon, 2011). The gland parenchyma composed of secretory tubules, duct and trabecula, which were differentiated by connective tissue. These findings concurred with Sawad (2006) in Moorhen and Al-Mehdawi (2003) in broilers. The tubular epithelial cells were classified into germinative, intermediate, secretory and degenerative layers. The basal or germinative layer of Kadaknath as well as White Leghorn was consisted of one row of flat shaped cells lied on the basement membrane. In Kadaknath the intermediate layer was composed of 2-3 rows of polygonal cells lied on the germinative layer, while in White Leghorn consisted of 3-4 rows. In Kadaknath the secretory layer consisted of 4-5 rows

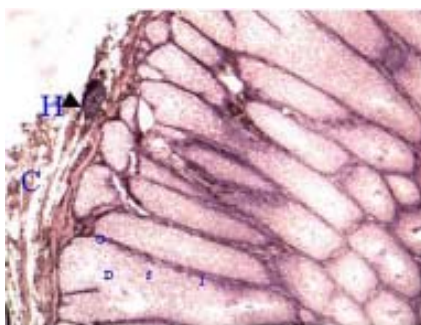


Fig. 1 a

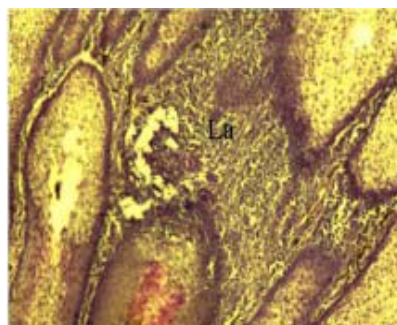


Fig. 2 a

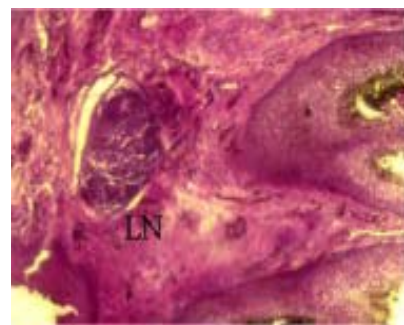


Fig. 3 a

Fig. 1 a) Photomicrograph of preen 1 gland of Kadaknath showing - Herbst corpuscle (H), capsule, Degenerative layer (D) decretory layer (S),intermediate layer (I) in H&E staining.

Fig. 2 a) Photomicrograph show lymphatic aggregation (La) in H & E staining(100x).

Fig. 3 a) Photomicrograph show lymphatic nodule (LN) in PAS staining(100x).

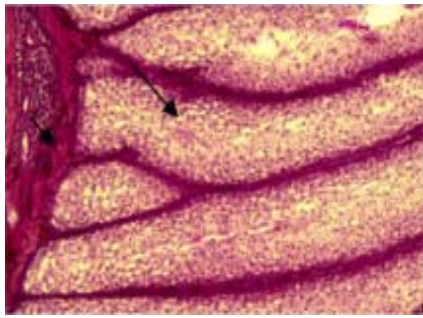


Fig. 4 a

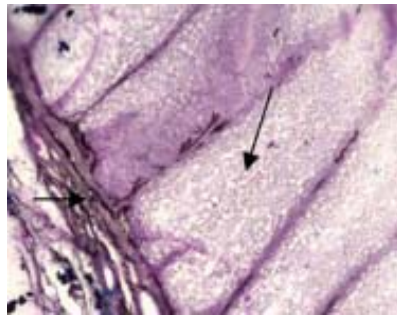


Fig. 5 a

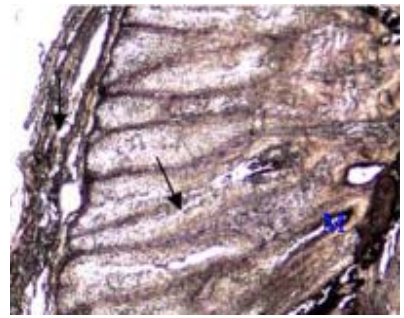


Fig. 6 a

Fig. 4 a) Photomicrograph of preen gland of Kadaknath, PAS staining (40x) show PAS activity of tubules and capsule.

Fig. 5 a) Photomicrograph of preen gland of Kadaknath, alcian blue-PAS staining (40x) show alcian blue PAS activity in tubules and capsule.

Fig. 6 a) Photomicrograph of preen gland of Kadaknath, Alkaline phosphatase staining (40x) show Alkaline phosphatase activity in tubules, capsule, and melanin pigment (M) toward the lumen.

of pyriform or polygonal cells contained lipid droplets and secretory granules, whereas in White Leghorn it consisted of 6-7 rows. The degenerative layer in Kadaknath as well as White Leghorn was adjacent to the lumen of each tubule, consisted of few cells with pyknotic nuclei (Fig.1a,1b). Similar observations were reported by Shafii and Mobini (2014) in Goose and Sawad (2006) in Moorhen. Each tubule had two zones, i.e. outer sebaceous zone and inner glycogen zone.

Melanin pigmentations were observed throughout the central cavity of gland and in between ductules in Kadaknath breed of poultry, whereas in White Leghorn no melanin pigmentation was observed (Fig. 6a). Most of the visceral organs of the Kadaknath breed showed intense black coloration due to the deposition of melanin pigment in the organs (Pathan *et al.*, 2009).

In Kadaknath bird lymphatic aggregations (Fig. 2a) and nodules (Fig. 3a) were observed in secretory tubules as well as in between ductules, while in White Leghorn there were no lymphatic aggregations. Lymphatic aggregations were also reported by Harem *et al.* (2005) in preen gland of wild and domestic ducks and Mobini and Ziaii (2011) in chickens. Wild behaviour and resistance to many of the disease could be attributed to lymphatic aggregation and nodules. Lymphatic nodules were perhaps first recognized and mentioned in this present study for Kadaknath breed of poultry.

Histochemistry of glands showed that PAS activity for glycogen was moderate in capsule of uropygial gland in Kadaknath, whereas intense in White Leghorn. Intense to moderate activities of PAS found in all four layers of tubular epithelium in White Leghorn as well as Kadaknath, whereas it was moderate reaction in all surface epithelium of secretory tubules as observed by Shafii and Mobini (2014) in Goose (Fig. 4a, 2b). The intense glycogen activity was due to continuous production of secretory material in the gland. Montalti *et al.* (2001) reported that the positive PAS staining of the tubule secretion products supported the presence of enzyme labile sialomucins and they further demonstrated that lipid compounds, particularly glycolipids, occur in the secretion.

Alcian blue PAS activity for acid mucopolysaccharides was moderate in capsule intertubular septae and duct. Weak activity of Alcian blue PAS was found in all four layers of tubular epithelium in Kadaknath, while intense activity was found in intertubular septae and all layers of tubular epithelium of White Leghorn (Fig. 5a, 3b). Mobini and Ziaii (2011) could not detect AB positive reaction in broiler and native chicken. The positive Alcian blue PAS staining showed that carboxylated acidic mucin, probably sialidase-sensitive sialomucins, are present in the gland secretion. Since mucin is capable of forming viscous solution, it is possible that these molecules act as lubricant on the body surface (Montalti *et al.*, 2001).

Alkaline phosphatase activity was intense in capsule whereas it was moderate to weak in tubular epithelium of uropygial gland of Kadaknath (Fig. 6a). Similar observation was found in white leghorn.

The positive alkaline phosphatase activity in preen gland (Fig.4b) was indicative of different compound of preen gland release inorganic phosphatase from ester compound in alkaline pH, but Ishida *et al.* (1973) reported no activity in tubular epithelium of preen gland.

Acid phosphatase activity was intense in intertubular septae in Kadaknath as well as White Leghorn, intense to moderate all layers of tubular epithelium in Kadaknath, whereas moderate to weak in White Leghorn (Fig.5b). The presence of acid phosphatase from ester compound of preen gland in acidic pH, was similar to the observation of Ishida *et al.* (1973) in Fowl.

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Conflict of Interest: All authors declare no conflict of interest.

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