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Certain histological and histochemical studies on gizzard of parent stock of Gramapriya

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Abstract

The present study was designed to study certain histological and histochemical characteristics of gizzard in parent stock of Gramapriya by light microscope. The study was conducted on twelve adult Gramapriya birds of either sex whose weight varied from 1.5 - 2 Kg. All the birds were purchased from Central poultry farm Bihar Animal Sciences University, Patna. Before culling the birds were anaesthetised by giving inhalant anaesthesia and the organs were immediately removed after slaughter. The organs were gently cleaned and fixed in 10% buffered neutral formalin and then processed for various histological and histochemical studies. The histological observations revealed that like other species of birds the Gizzard of Gramapriya consisted of four tunics; tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa. The mucosa of gizzard was lined with thick layer of cuticle which consisted of gastric pits. The lamina epithelialis was lined with simple cuboidal epithelium and the lamina propria contained simple tubular glands which were arranged in groups and these glands were lined by simple cuboidal epithelium. The secretion of inner part of the tubular glands was eosinophilic in nature. PAS positive substances were distributed nearly in almost entire region. It was scattered within the lumen of the glands, within the cells lining the surface and crypts. It was also observed within the deep glandular cells. The submucosa consisted of connective tissue formed mainly of collagen fibers. The tunica muscularis was very thick formed from parallel bundles of smooth muscle fibers which were separated by thin layer of connective tissue. The tunica serosa was made up of connective tissue which was covered with mesothelium.

Keywords: Gizzard, histology, Gramapriya, chicken

Introduction

A major contribution to India's economy is contributed by livestock and poultry sector (Nath *et al.* 2012) [15]. Out of total income earned by Agriculture sector 17% is contributed by the poultry sector. Poultry are mainly reared for their egg and meat which have high quality nutrients and micronutrients which are essential for a balanced diet. Gramapriya chicken breed is a dual purpose multicolored breed mainly reared for its egg and meat production. The male and female parent of Gramapriya is a strain cross evolved by breeding of genes (WHLXRIR) for free range farming (No. ICAR-KVK (TML)/Folder-4/2017-18). The breed was developed for its high juvenile body weight, better feed conversion ratio, better immunity and an ideal body weight of about 1.5-2 Kg at the time of sexual maturity. Backyard poultry farming of Gramapriya is gaining great economic importance in agribusiness. They can be reared in rural village conditions with minimum input and low cost of production than those produced under intensive rearing condition with high input cost. Gizzard play a significant role as the performance of a bird depends on its digestive system and the feed which subsequently affect the F.C.R which is required for growth, maintenance, and egg production. Although Rupam *et al.*, (2018) [18] studied certain morphological, histological and histochemical structures on gizzard of Uttara fowl but very few literature is available on the gizzard of Gramapriya. Hence the present study was undertaken to reveal the microscopic structure of gizzard of Gramapriya chicken.

Materials and Methods

The present study was conducted on twelve adult Gramapriya birds of either sex whose weight varied from 1.5-2 Kg. All the birds were purchased from Central poultry farm Bihar Animal Sciences University, Patna. Before culling the birds were anaesthetised by giving inhalant anaesthesia and the organ was collected and preserved in 10% neutral buffered formalin for histological and histochemical studies.

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After fixation a tissue of 5 mm thickness was cut with the help of BP blade and processed for various histological and histochemical processes such as washing, dehydration, clearing, paraffin impregnation, embedding and sectioning. Paraffin sections were cut at 5-7micron thickness with the help of semiautomatic rotary microtome and sections were stained with different staining procedures for various microscopic observations as per (Luna, 1968) [14].

Results and Discussion

The wall of gizzard of parent stock of Gramapriya consisted of four tunics: tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa (fig. 1). The observations were in consistent with the findings of Abumandour (2014) [1] in fowl, Zhu *et al.* (2013) [21] in gizzard of yellow-billed grossbeak, Hassan and Moussa (2012) [9] in fowl, Liman *et al.* (2010) [13] in proventriculus and gizzard of Japanese quail, Ogunkoya and Cook (2009) [16] in fowl. In addition to the four layers, an internal secretory lining layer called koilin was found above the mucosa which was in accordance with the findings of Selven *et al.* (2008) [19] in Guinea fowl.

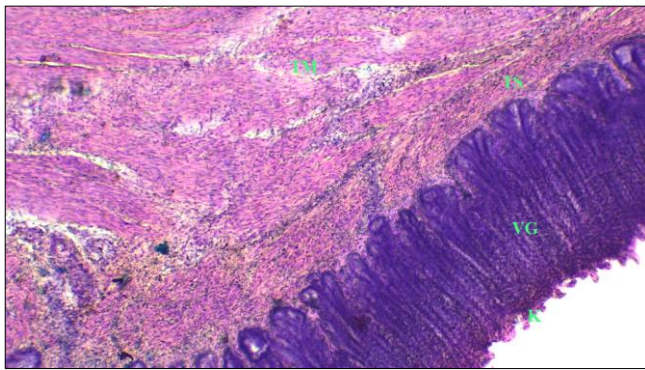


Fig 1: Photomicrograph of transverse section of gizzard of parent stock of Gramapriya showing koilin layer(K), ventricular glands (VG), tunica submucosa (TS) and tunica muscularis (TM). H & E stain, X100.

The tunica mucosa consisted of lamina epithelialis and lamina propria. The lamina muscularis mucosae was not observed (fig. 2). This finding was relevant with the observations of Ahmed *et al.* (2011) [2] in blue and yellow Macaws and Catroxo *et al.* (1997) [7] in the gizzard of red-capped cardinal and chicken in which they reported that tunica mucosa was absent. Upon the surface of tunica mucosa there was a thick layer of cuticle that may be detached throughout the preparation of histological section.

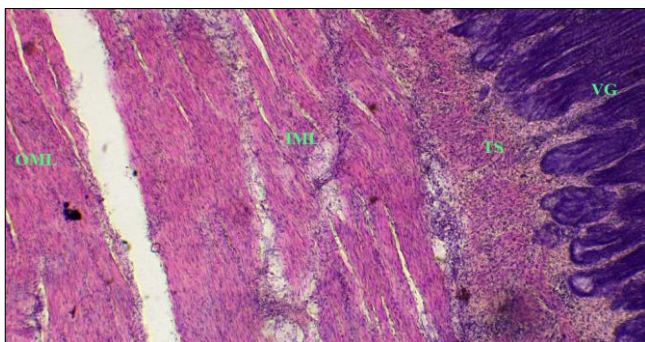


Fig 2: Photomicrograph of transverse section of gizzard of parent stock of Gramapriya showing ventricular glands (VG), tunica submucosa (TS), inner muscular layer (IML) and outer muscular layer (OML). H & E stain, X100.

The mucosa consisted of gastric pits. The lamina epithelialis was lined with simple cuboidal epithelium and was invaginated towards the lamina propria. The present observations were similar to the observations made by Al-Saffar *et al.* (2015) [4] in Mallard and Batah *et al.* (2012) [6] in Coot bird (*Fulica atra*). Lamina propria consisted of simple tubular glands that produced a material called the gastric cuticle mucosa as mentioned by Rocha and Lima, (1998) [17]. The pits extended along the glandular layer (fig. 3). The finding was in agreement with the previous results of Akaster (1986) [3] and Hodges (1974) [10] who mentioned that the lamina propria is rather obscured by the glandular tubules which penetrate down through its thickness and terminate at the level of the submucosa. These glands are lined by simple cuboidal epithelium. The inner part of these tubular glands consisted of an eosinophilic secretion along with the cuticle (fig 4). This observation was similar to the findings of Banks (1993) [5] who mentioned that the lamina propria composed of loose connective tissue and consisted of blood vessels, lymphatic vessels, nerve, and glands.

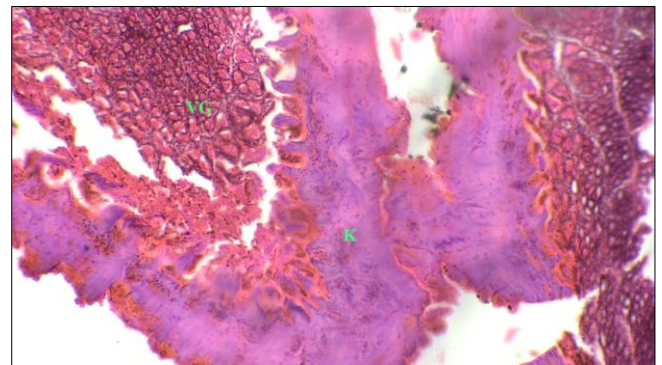


Fig 3: Photomicrograph of transverse section of gizzard of parent stock of Gramapriya showing thick koilin layer (K) and ventricular gland (VG). H & E stain, X100.

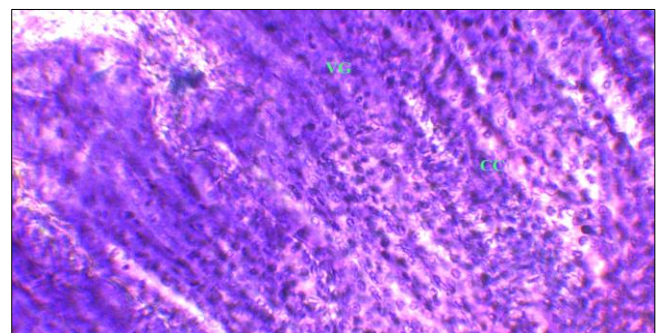


Fig 4: Photomicrograph of transverse section of gizzard of parent stock of Gramapriya showing ventricular glands (VG) lined with cuboidal cells (CC). H & E stain, X400.

The cuticle showed a positive reaction to PAS stain. The reaction with PAS positive material distributed nearly in almost entire region. It was within the lumen of the glands, within the deep glandular cells, within the cells lining the surface and crypts and also within the submucosa and between the smooth muscle bundles of tunica musculosa (fig 5&6). The observations were in accordance to the findings made by Hamdi *et al.* (2013) [8] in the ventriculus of the black-winged kite (*Elanus caeruleus*) and Selvan *et al.* (2008) [19] in the Guinea fowl (*Numida meleagris*). The positive colored cuticle was recorded currently which was also observed by Zaher *et al.* (2012) [20] in Quail.

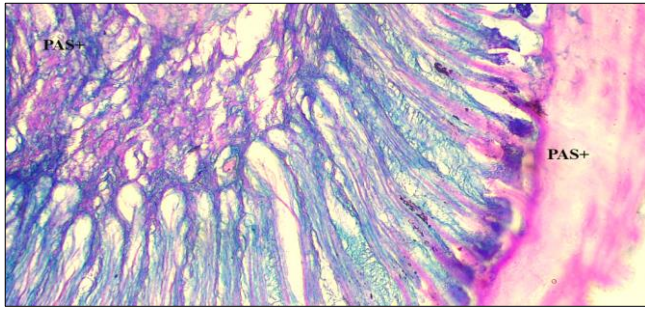


Fig 5: Photomicrograph of transverse section of gizzard of parent stock of Gramapriya showing PAS positive koilin layer and tubular glands in the region of laminae propria. PAS stain, X100.

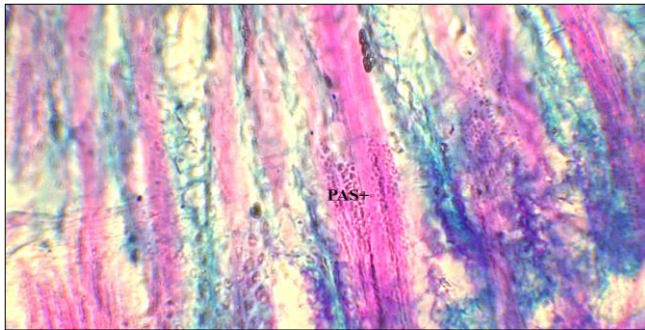


Fig 6: Photomicrograph of transverse section of gizzard of parent stock of Gramapriya showing PAS positive tubular glands in the region of laminae propria. PAS stain, X400.

Tunica submucosa consisted of connective tissue formed mainly from collagen fibers. The tunica muscularis was very thick formed from parallel bundles of smooth muscle fibers and were separated from each other by thin layer of collagen fibers. Well-developed blood vessels were observed within tunica muscosa. The tunica muscularis consisted of two muscular layers: inner circular layer and outer longitudinal layer of muscular fibers. This result was agreed with Hodges, (1974) ^[10] in chickens, Jain (1976) ^[11] in frugivorous, carnivorous and omnivorous species of birds, Batah *et al.* (2012) ^[6] and Hamdi *et al.* (2013) ^[8] in Coot bird. The present observation was in disagreement with Ahmed *et al.* (2011) ^[2] and Kadhim (2011) ^[12] who mentioned that in addition to these layers, oblique. Muscle fibers formed the most internal layer of the tunica muscularis in the ventriculus of red jungle fowl. Tunica serosa was formed from connective tissue covered with mesothelium (fig 7 & 8). Tunica serosa consisted of loose connective tissue lined by mesothelium, blood vessels and nerve elements as mentioned by Catroxo *et al.* (1997) ^[7].

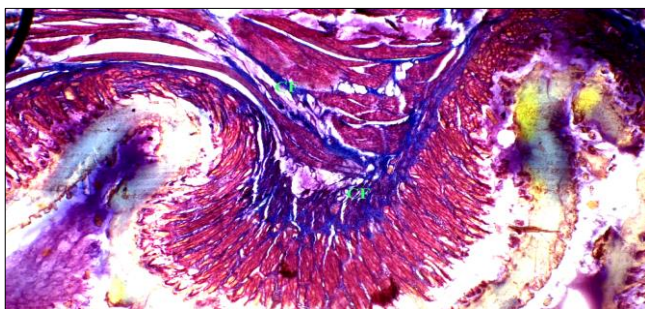


Fig 7: Photomicrograph of transverse section of gizzard of parent stock of Gramapriya showing collagen fibers (CF) in the region of laminae propria, tunica muscularis and tunica serosa. Masson Trichome stain, X100.

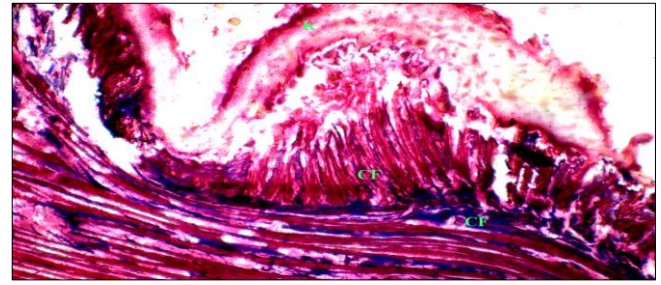


Fig 8: Photomicrograph of transverse section of proventriculus of parent stock of Gramapriya showing collagen fibers (CF) in the region of laminae propria, tunica muscularis and tunica serosa and koilin layer (K). Masson Trichome stain, X100.

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