



Studies on the Morphology, Morphometry and Course of Esophagus and Crop of Post-Natal Haringhata Black Chicken

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Abstract

The investigation was carried out on 60 Haringhata Black breed of chickens divided into five group viz. day old, 15 days, 30 days, 45 days and 60 days old with six birds of each sex in each age group. The present research about the morphological and morphometrical study of the esophagus and crop of the Haringhata Black chickens revealed that the esophagus was a long thin-walled muscular tube extending from the oropharynx to the proventriculus. Anatomically, the esophagus could be divided into a long cervical part and a comparatively shorter thoracic part. Before entering into the thoracic cavity, just at the thoracic inlet the esophagus formed an almost round ventral expansion called the crop. At an age of 15 days the average weight, length and diameter of the esophagus differed significantly between the male and female birds.

Keywords: Crop, Esophagus, Oropharynx, Proventriculus.

Introduction

From the very ancient times human beings have been dependent on animals and birds for their livelihood apart from vegetables and cereals. When it comes to agriculture, animal husbandry gets a special mention since ages and the human beings have been benefitted from the animals and birds. Animal husbandry includes rearing or farming of various animals and birds amongst which poultry farming is a remarkable one as it aids immensely to the economy of the farmers as well as the nation. Due to the rise in human population, there is an increased demand for protein and other nutrients. The poultry farming plays a major role in meeting this increasing demand of protein in the form of protein-rich meat and eggs.

The Haringhata Black Chicken

The Haringhata Black (HB) chicken is a native breed of West Bengal state of India. It has originated from the Haringhata and Chakdah blocks of Nadia district and nearby areas like Amdanga and Bongaon blocks in North 24 Parganas district of West Bengal. Haringhata Black chicken is the only registered indigenous chicken breed of West Bengal reported till date with accession number 12008 (Pal *et al.* 2020). It is a medium sized chicken with compact body and is reared for both meat and eggs. They have black feathers with red coloured single comb, ear lobe, wattle and white shank. They can be easily raised on feeding kitchen waste, mash, grain, etc. The most remarkable feature of this breed of chickens is that they are well tolerated and their surviving power against the predators is commendable. These birds are genetically superior to most other chickens and have a very good resistance to diseases (Mandal, 2020). The benefit of rearing HB chicken is that they can be reared in the backyard poultry farming system with minimum investment and also in commercial farms in the deep litter system. The by-products obtained from these birds also serve as a source of income, e.g. feathers can be used for making pillows, brooms, brushes and other fancy things.

The anatomy of the chicken gastrointestinal tract remarkably influences the utilization of feed processed by it. The anterior portion of the tract is adapted for ingestion, storage, and partial digestion of starch and proteins (Turk, 1982). As in most birds, a chicken uses its mouth to get the feed. Chickens don't bite their food as they don't possess teeth. Salivary glands present in the mouth secrete saliva that moistens the feed which is then swallowed. The chicken then pushes the feed further down through the throat using its tongue.

Esophagus (Gullet): A major organ of the digestive tract after the mouth is the esophagus. It transports food from the mouth to the glandular stomach (Proventriculus). The esophagus is an adaptable cylindrical structure that bridges the mouth to the rest of the digestive system. It transports food from the mouth to the crop and then to the proventriculus.

Crop: This is a pouch-like expansion of the esophagus and is found externally in the caudal part of the neck just in front of the thoracic inlet. The ingested feed and water are stored temporarily in the crop before they are passed to the remainder of the digestive tract.

Keeping in view, the immense role of the digestive tract and due to the paucity of relative literatures, the present study has been undertaken to understand the morphology, morphometry and course of esophagus and crop of the Haringhata Black chicken of different ages.

Materials and Method

The present study was carried out at the department of Veterinary Anatomy and Histology, West Bengal University of Animal and Fishery Sciences, Kolkata- 37.

Ethical Committee Approval

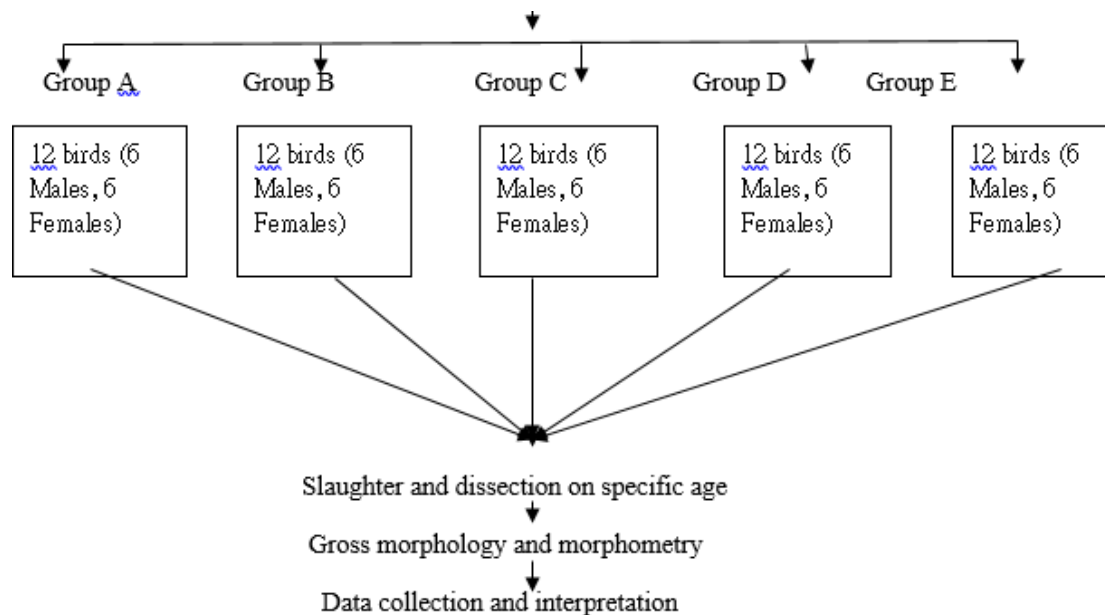
The proposed research work was duly approved by the Institutional Animal Ethics Committee, Faculty of Veterinary and Animal Sciences, Kolkata-37. The project proposal number was 763/GO/SL/03/CPCSEA/10/2021-22.

Experimental Design

Procurement and Distribution of Experimental Birds

A total of 60 Haringhata Black chickens were utilized for the present investigation. The birds were procured from State Poultry Farm-I, Mohanpur, Nadia, West Bengal. Based on age, the birds were divided into five groups, comprising day-old, 15-day-old, 30-day-old, 45-day-old, and 60-day-old birds. Each age group consisted of 12 birds, with an equal sex ratio of 1:1 (six males and six females). The birds were brought from the farm on the respective days of slaughter; therefore, no additional housing or feeding management was required for the birds under the present study.

A Brief Outline of the Research Work: 60 no. of birds



Collection of Specimen and Preservation

For the present study birds of desired age were procured from the farm and live weight of the birds were recorded with the help of digital weighing balance. The birds were then sacrificed by cervical dislocation after anaesthetising them with chloroform vapour. The thoracic and abdominal cavities were opened to observe the in-situ positioning of the different segments of the digestive tract and the associated organs. The whole digestive tract was then dissected out and weighed. The esophagus and crop were separated out and measurements were done.

Methods for Gross Studies

Gross Morphometry

Before sacrificing the birds, live weights of the birds were taken. After sacrifice, the skin and muscles of the neck were dissected and the thoracic cavity was opened to study the course of the esophagus. The intact esophagus and crop were then separated out. The weight of the esophagus and crop was taken after proper flushing of the lumen and removing the contents of all the segments by careful manual pressure. The individual segments were then weighed separately. The length and diameter of the esophagus and crop were measured by Vernier's scale and recorded. The diameter was measured after infusing water inside the hollow organs and then tying both the ends with thread.

Gross Photography

Immediately after opening the body cavities of the birds along the mid-ventral border of the body, gross photography of the anatomical positioning of the parts of the digestive tract and their relation with the adjacent organs was done before gross morphometry. Photographs of the esophagus and crop was also taken separately.

Statistical Analysis

The recorded data were analysed statistically as per the standard method given by Snedecor and Cochran (1989) with the help of SPSS 17.0 software.

Results and Discussion

Gross Morphology

The esophagus was a long, comparatively wider, thin-walled muscular tube extending from the oropharynx to the proventriculus. It was highly distensible in nature. It consisted of two parts: cervical and thoracic (Fig.2). The cervical part appeared to be longer than the thoracic one. At the anterior most part, the esophagus was placed dorsal in position to the trachea before it became laterally inclined to the right in most of the cervical part and lastly again it got its mid dorsal position in front of thoracic inlet. Just before passing into the thoracic inlet the tube presented ventral expansion to a great extent to form a pouch-like structure called the crop (Fig.1). Presence of numerous longitudinal folds was observed on the inner wall of the esophagus which allowed considerable expansion and shrinkage of the organ depending upon the quantity of contents within it (Fig.3). Just immediate cranial to the thoracic inlet the esophagus became narrow and reformed the esophageal tube and passed between the coracoid bones and continued to the proventriculus.



Fig. 1: Photograph showing in-situ positioning of the crop (shown by arrow) of day old Haringhata Black chicken.

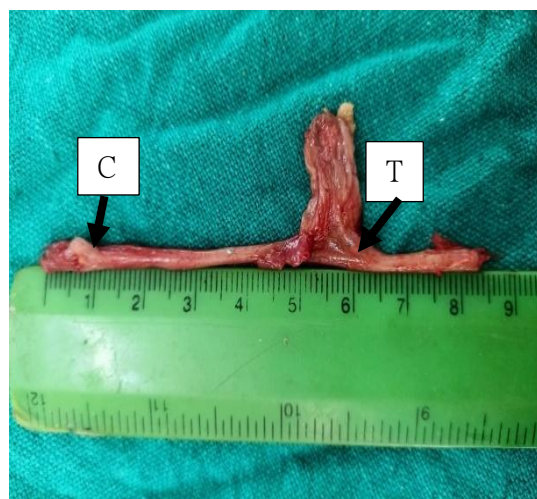


Fig. 2: Photograph of esophagus of Haringhata Black chicken showing cervical (C) and thoracic (T) portions.

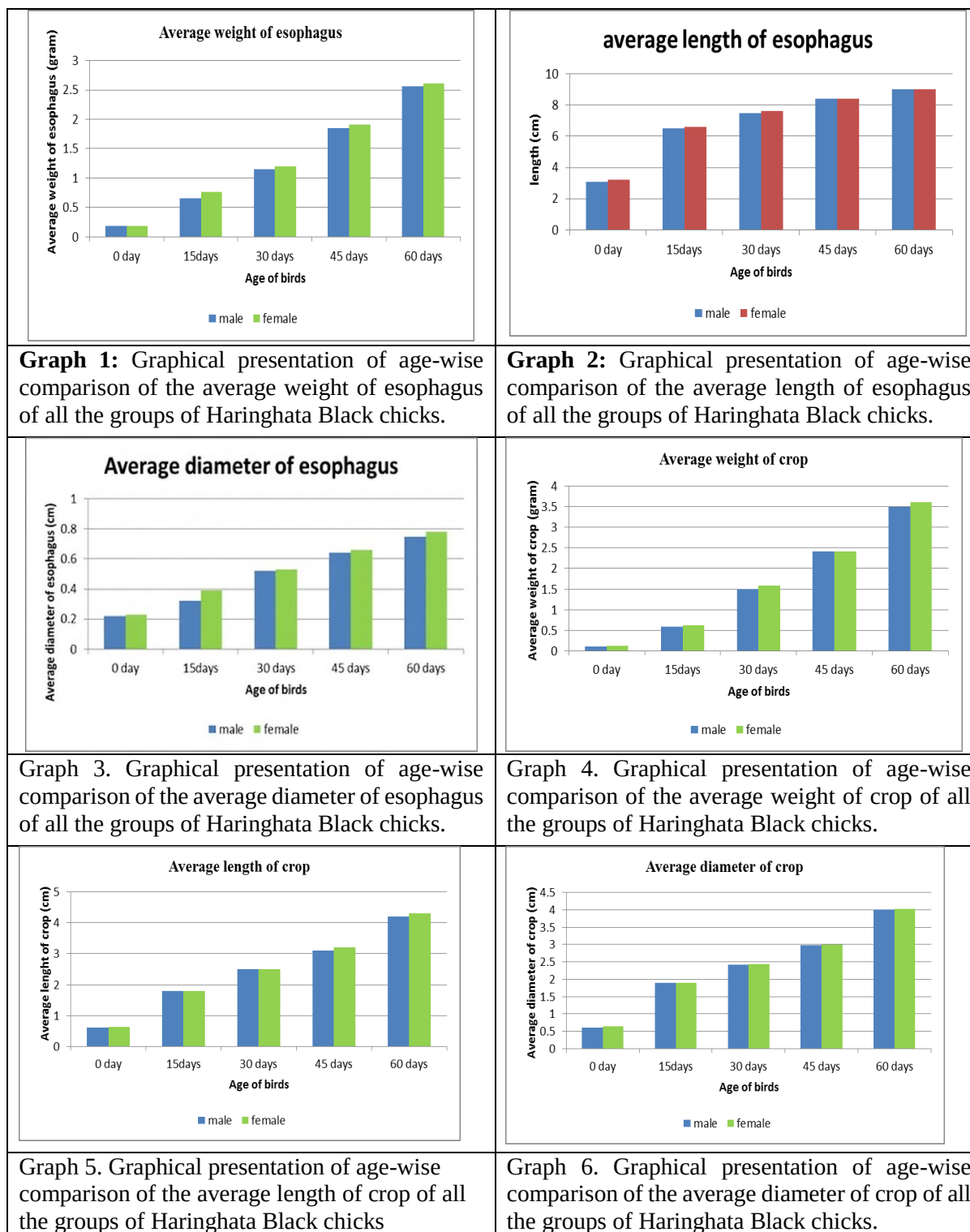


Fig. 3: Photograph of esophagus of Haringhata Black chicken showing longitudinal ridges (arrows) on the mucosal surface.



Fig. 4: Photograph of crop of Haringhata Black chicken showing longitudinal ridges (arrows) on the mucosal surface.

The crop was a distensible expansion of the ventral wall of the esophagus located just before the thoracic inlet at slightly right side of the mid-ventral line of the bird's body. It acted as a small pocket for storage of ingested feed material before they are transferred to the proventriculus. It was almost round in shape. Like the esophagus longitudinal folds were observed on the inner wall of the crop as well (Fig.4).



The average weight, length and diameter (Mean $\pm$ SE) of the esophagus of the male and female birds were recorded at 0, 15, 30, 45 and 60 days of age and presented in Graph 1, 2 and 3 respectively. The average weight, length and diameter of the esophagus were least in day old birds while maximum in birds of day 60 of age in both the sexes (Graph1-3). There was no significant difference of the weight, length and diameter between the male and female in the same age groups except in 15 days old chicks (Graph 1-3). However, the weight, length and diameter of the

birds of each sexes differed significantly ($p < 0.05$) among the different age groups (Graph 1-3). The average weight, length and diameter (Mean $\pm$ SE) of the crop of the male and female birds were recorded at 0, 15, 30, 45 and 60 days of age and presented in Graph 4, 5 and 6 respectively. The average weight, length and diameter of the crop were least in day old birds while maximum in birds of day 60 of age in both the sexes (Graph 4-6). There was no significant difference of the weight, length and diameter between the male and female in the same age groups however the weight, length and diameter of the birds of each sexes differed significantly ($p < 0.05$) among the different age groups (Graph 4-6).

Nasrin *et al.* (2012) observed the esophagus was a long and straight tube in the broiler chickens which was in accordance with findings of the present investigation. The esophagus was a distensible tube as reported by Saran *et al.* (2019) in guinea fowl. In the present investigation the esophagus was placed in the cervical portion on the right side of the body and could be divided into two parts: cervical and thoracic. The cervical part appeared to be longer than the thoracic one. Similar observations were reported by Rossi *et al.* (2006) in partridge and Madhu *et al.* (2015) in emu birds. At the anterior most part, the esophagus was placed dorsal in position to the trachea before it became laterally inclined to the right in most of the cervical part and lastly again it got its mid dorsal position in front of thoracic inlet. Just before passing into the thoracic inlet the tube presented ventral expansion to a great extent to form a pouch-like structure called the crop. Similar description of esophagus is available in the text of Getty (1975) in domestic fowl including chicken and Klasing (1999) in budgerigar. The crop was a distensible expansion of the ventral wall of the esophagus located just before the thoracic inlet at slightly right side of the mid-ventral line of the bird's body which agreed with the findings of Getty (1975) in domestic fowl including chicken. However, the crop was reported to be absent in avian species like emu (Madhu *et al.*, 2015).

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Conflict of Interests

There is no conflict of interest.

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