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Original Research Article

Morphological Comparative Study of Proventriculus and Gizzard Between Bronze Fallow Cockatiel and White Eared Bulbul

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Abstract: The current result aimed to investigate the comparative morphological note of gizzard and proventriculus between two bird (white eared bulbul and bronze fallow cockatiel) according to their food type. In this study used (10 sample) from each bird. The proventriculus of bulbul was spindle tubular in shape- pink in color, the internal surface have shallow longitudinal fold. While in cockatiel the proventriculus was red in color with the spindle shape, the internal surface there was conical projection. The weight of proventriculus of bulbul was more the than that in cockatiel while the length of proventriculus in cockatiel more than that in bulbul. The gizzard of bulbul appear ben elongated in shape surrounding with fatty tissue that appear brown in color, the inner surface have longitudinal fold. While in cockatiel the gizzard was round muscular in shape pink in color and the inner surface was clear without any longitudinal fold.

Keywords: Proventriculu, gizzard, stomach of bird.

INTRODUCTION

The one of most active part of the digestive system of birds is the a stomach, and it has two parts, the first part is the proventriculus and the second part is the gizzard, the proventriculus also known as the glandular stomach where digestion begins (Rebecca, 2002). The morphology of an organ system varies according to the feeding habit, habitat and nature of their lifestyle. This phenomenon is called adaptation (Tomar, 2015). Glandular stomach (proventriculus) is lined with glandular mucous layer which secreted gastric juices such as pepsin and hydrochloric acid, by this mechanism, the ingested food with its juices passes quickly to the gizzard in which the food particles are reduced to small particles took by the intestine for more digestion and absorption (Saleem, 2012). The caudal compartment of avian stomach, the ventriculus, is thought to perform mechanical roles during digestion, due to its muscular nature. However, ventricular glands have been reported in some birds (Udoumoh and Ikejiobi, 2017).

MATERIALS AND METHODS

This study was designed to investigated the differences characteristic features of the gizzard and proventriculus in two birds that differences in their food types. Twenty adult healthy birds (10 white-eared bulbul and 10 Bronze Fallow Cockatiel) were obtained from birds owners at local markets (Spinning market in Baghdad) without attention to their sex (male or female). The morphological aspect which were used in this part of study were as fallow: (Position of the proventriculus and gizzard, Shape of the proventriculus and gizzard, color of the proventriculus and gizzard. Length and weight of the proventriculus, thickness of gizzard wall, Length and weight of the birds body, Ratio of body length to proventriculus length, Ratio of body weight to gizzard and proventriculus weight.

RESULTS AND DISCUSSION

Morphological result of proventriculus (bulbul and cockatiel):

Shape, color, relations ship:

The proventriculus of white-eared bulbul appear as spindle tubular in shape that connect between the esophagus and gizzard, the wall of proventriculus

thicker than that of esophagus that giving rise to well demarcation line between them, the inner surface of the proventriculus have shallow longitudinal fold. The proventriculus appear as pink in color that located in left midline of the body, its covered completely by the heart and the left lobe of the liver (Fig. 3,4,5). The bronze fallow cockatiel proventriculus have spindle in shape with thick wall that make demarcation line to recognized from the esophagus, the inner surface have conical projections. The proventriculus of bronze fallow cockatiel appear red in color that located at the same position of that in white eared bulbul and covered with the heart and left lobe of the liver (Fig. 1,2,3).

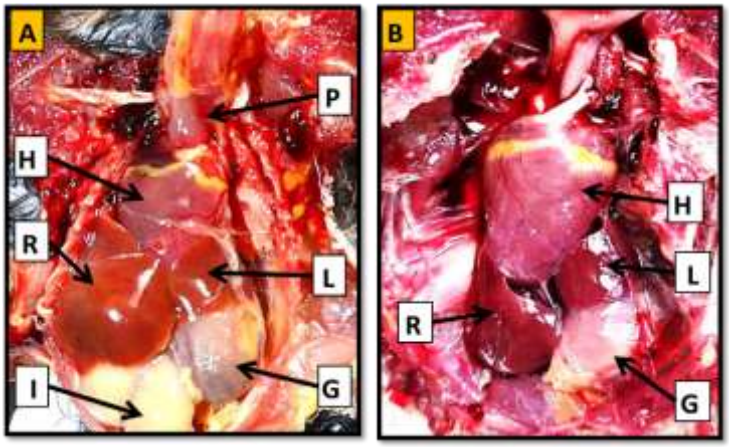

Figure 1: Photo-macrograph of proventriculus in (A) white eared bulbul and (B) bronze fallow cocktail show: proventriculus (p), heart (H), right lobe of liver (R), left lobe of liver (L), gizzard (G)

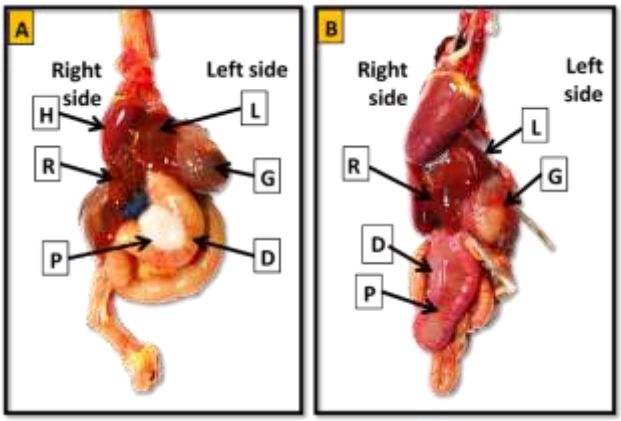

Figure 2: Photo-macrograph of gastro intestinal tract (A) white eared bulbul and (B) bronze fallow cocktail show: heart (H), right lobe of liver(R), left lobe of liver(L), gizzard (G), pancreas(P), duodenum(D)

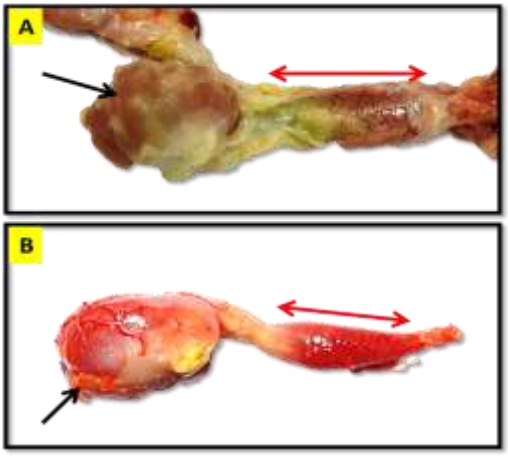

Figure 3: Photo-macrograph of gizzard and proventriculus (A) white eared bulbul, (B) bronze fallow cocktail show: the shape and color of proventriculus (red double head arrow), shape and color of gizzard (black arrow)

The findings in both birds intersected with what reported by Selvan *et al.,* (2008). Who mention that the proventriculus was elongated, spindle-shaped organ that extends caudally and is located ventrally, between the crop and gizzard, is known as the proventriculus in gunia fowle. The proventriculus wall is thicker than the esophageal wall, but there is little variation in the diameter of the lumen. On the inside, the proventriculus was spindle in shape and pink to red in color, with present of conical papilla at internal surface. Its left side was attached to the liver's left lobe, (Jassem *et al.,* 2016). This finding was agreement with the result of bronze fallow cockatiel. The finding of (Hamad ,2008; Al-Hamdany , 2012; Zaher *et al.,* 2012) was similar to the result of both bird (bulbul and cockatiel) in location of the proventriculus. Similar location of the proventriculus was found in other birds such as the ostrich Tadjalli *et al.,* (2011), common quail (coturnix caturinix) Zaher *et al.,* 2012), and falcon (Abumandoure, (2014) and (Umar and Atabo, 2019) in the barn owl.

Weight and Length:

The morphometric result of proventriculus in white eared bulbul revealed that the weight of the proventriculus was more than that in bronze fallow cockatiel that measured (0.397±0.149 mg) in bulbul and (0.239±0.015 mg) in bronze fallow cockatiel. While when measured the ratio the results indicated that the weight of bronze fallow cockatiel more than that in bulbul that measured (0.23%) in cockatiel and (0.17%) in bulbul. The weight of bulbul and cockatiel was measured (22.60±1.07gm), (103.42±1.41gm) respectively (Table.1). The length of the proventriculus of white eared bulbul was less than that in bronze fallow cockatiel that measured (14.104±0.141 mm) in bulbul and (27.142±0.124 mm) in bronze fallow cockatiel. When measured the ratio the results showed that the length of bronze fallow cockatiel less than that in bulbul that measured (2.03%) in cockatiel and (3.6%) in bulbul. The length of bulbul and cockatiel was measured (10.47±0.53 cm), (13.42±0.29 cm) respectively (table. 2).

Table 1: Shows the weight of body and proventriculus of white eared bulbul and bronze fallow cockatiel and ratio of body weight to proventriculus weight

Bird	Body weigh Men±Se gm	Proventriculus weight Men±Se gm	Ratio of body weight to proventriculus weight
Bulbul	22.60±1.07*	0.397±0.149*	(0.17%)
Cocktail	103.42±1.41	0.239±0.015	(0.23%)

Table 2: Shows the length of body and gizzard of white eared bulbul and bronze fallow cockatiel and ratio of body length to gizzard length

Bird	Body length Men±Se cm	Proventriculus length Men±Se mm	Ratio of body length to proventriculus length
Bulbul	10.47±0.53*	14.104±0.141*	(3.6%)
Cocktail	13.42±0.29	27.142±0.124	(2.03%)

Morphological result of gizzard (bulbul and cockatiel):

Shape, Color, Relations Ship:

The morphological results of the gizzard of white-eared bulbul revealed that the gizzard was appeared as bean elongated muscular sac, surrounded by fatty tissue. It was easy to distinguish proventriculus and gizzard by presence the differences in color, shape and the thickness with present of a constriction between them. the gizzard appear as brown in color from outside and dark brown from inside with present short longitudinal fold in the inner surface of the gizzard. The gizzard was located on the left of the midline plane after the proventriculus and covered partially at the apical part by the left lobe of liver and attached with the apex of the heart, the right surface of the gizzard attached with the small intestine and the left surface was attached with the abdominal wall (fig 5,6). The gizzard of the Bronze Fallow Cockatiel appear as round muscular sac that covered with thick layer of fatty tissue. There is constriction between the gizzard and proventriculus. The gizzard of Bronze Fallow Cockatiel was pink in color at the outer surface and take yellowish color at the inner surface, the inner surface was clear without any longitudinal fold that differ from that in white eared bulbul. The gizzard was located at the same position of that in white-eared bulbul and covered by the left lobe of the liver at the apical surface and attached with the right lobe of liver and small intestine at the right surface while the left surface attached with the abdominal wall (Fig 3,4).

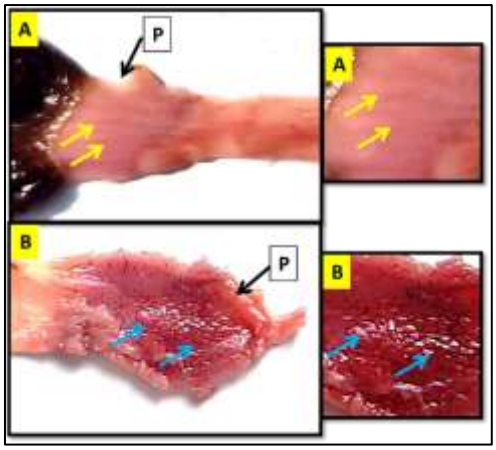

Figure 4: Photo-macrograph of proventriculus:
(A): show the proventriculus of white eared bulbul internal surface(P), the longitudinal fold (yellow arrow)
(B): show the proventriculus of bronze fallow cocktail internal surface (P), conical papillae (blue arrow)

The result was disagree with the finding. The ventriculus or gizzard is lens-shaped in herbivores, poultry, and waterfowl and is positioned with its convex surfaces facing more or less to the right and left. Its interior is elongated, and enlarged by cranial and caudal blind sacs, of which the former connects with the proventriculus, the duodenum arises on the right surface, adjacent to the cranial blind sac (Dyce *et al.*, 2010). Our findings were showed that the gizzard in white eared bulbul and cockatiel was covered by fatty tissue, so there was disagreement with previous findings of (Hodges,1974) who mentioned that the avian gizzard in general uncovered with fatty tissue. On the other hand this explanation was found in love bird whose gizzards were un covered with fatty tissue, these results were mentioned by (Sayrafi and Aghagolzadeh, 2020) in herbivores and carnivores.

Weight and Thickness:

The morphometric result of gizzard in white eared bulbul observed that the weight of the gizzard was less than that in bronze fallow cockatiel that measured (0.518±0.035 mg) in bulbul and (1.218±0.125 mg) in bronze fallow cockatiel. The ratio of the gizzard weight to body weight of bulbul was measured (0.22%) and in cockatiel (1.18%) in bulbul. The weight of bulbul and cockatiel was measured (22.60±1.07gm), (103.42±1.41gm) respectively. The gizzard in bronze fallow cockatiel was more thickness from the gizzard of the white eared bulbul that measured (9.506±2.134mm) in cockatiel and (3.094±0.298mm) in bulbul. (Table. 2, 4).

Table 3: Shows the weight of body and gizzard of white eared bulbul and bronze fallow cockatiel and ratio of body weight to gizzard weight

Bird	Body weight Men±Se gm	Gizzard weight Men±Se gm	Ratio of body weight to gizzard weight
Bulbul	22.60±1.07*	0.518±0.035*	1.18%
Cocktail	103.42±1.41	1.218±0.125	0.22%

Table 4: Shows the thickness of gizzard wall of white eared bulbul and bronze fallow cockatiel.

Bird	Thickness of gizzard men±se mm
Bulbul	3.094±0.298*
Cocktail	9.506±2.134

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