

Histomorphological Study of the Small Intestine of the European Starling (*Sturnus Vulgaris*) in Basrah Province

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Abstract

Five European starlings (*Sturnus vulgaris*), which are necessary for this study, were procured from Basrah city. Two anatomical and histological studies were performed on each bird. Duodenum, jejunum, and ileum formed the small intestine's three parts. The ileum was short, the jejunum was large, and the duodenum was U-shaped. We will measure the weight and length, and calculate the ratio of length to weight for the small intestine/bird (IL/BL%) and (IW/BW%) . The small intestine has four tunicae; the mucosa covering with simple columnar cells with goblet cells, which has an oval shape. The mucosa layer descends in thickness from the duodenum to the ileum, whereas the goblet cells will be increased in number in the ileum than in the jejunum and duodenum. We note the difference in the lengths and diameters of the villi in the three parts , where the highest lengths are in the duodenum and the lowest in the ileum .

Key words : Histomorphological , european starling ,*Sturnus vulgaris*

I. INTRODUCTION

Birds must consume a large amount of food because their extremely fast metabolisms cannot keep up with their needs (1). As a result, their distinctively high metabolic rates cause them to consume more food relative to their size, and this attribute is different from those found in other animal species (2) .A number of studies have been conducted to determine how dietary practices affect the morphological characteristics and, consequently, the physiological functions of the digestive organs in birds (3) and some rats (3).In birds, the small intestine is divided into three sections: the duodenum, which extends from the gizzard to form a loop that encloses the majority of the pancreas (4). When the Mackle's diverticulum joins the duodenum and ileum, the jejunum then extends between them. The ileum, which begins at the diverticulum and



continues to the ileocaecal junction, is the third component (5). To our knowledge, no local investigations have been conducted to examine the histomorphological characteristics of the European starling small intestinal wall (*Sturnus vulgaris*). As a result, it may play a significant role in increasing digestion speed and decreasing the digestive burden. In the accessory gland that lies between the pancreas and liver, bile drains from the liver into the gallbladder, then into the duodenum via the bile duct (6).

II. MATERIALS AND METHODS

Five European starlings (*Sturnus vulgaris*). The regional vendors acquired them from particular markets in the province of Basrah. Prior to their euthanasia and dissection, they received food and water. Euthanasia was performed on birds. They were then fixed on a dissecting board and cut open. A mid-line abdominal wall incision was made to see the coelomic viscera. Using a digital camera, the small intestine's duodenum, jejunum, and ileum were recognized and photographed in situ. The locations and connections between these organs were clearly shown in the images. The parts were then washed in a normal saline solution to eliminate any blood or other adherent material (7). Each small intestine's contents were removed by gently pressing them, and they were then once again cleansed with normal saline. Anatomical information was presented in this section of the study, including the shape and location of the ratios of small intestine weight to body weight (IW/BW) and small intestine length to body length (IL/BL) (8). The specimens were preserved in neutral buffered formalin with a 10% concentration for the histology portion of the investigation. After being well-fixed, the specimens were dehydrated by being run through a series of ascending ethanol concentrations for 2 hours each (70, 80, 90, 95, and 100%) cleared in xylene for 1 hour, and then embedded in paraffin wax. The blocks were then cut into sections of 6 m thickness and stained with one of the dyes with hematoxylin and eosin. The experiment was conducted using light microscopy and an ocular micrometer(9).

III. RESULT & DISCUSSION

According to morphology, the European starling's (*Sturnus vulgaris*) small intestine was divided into the duodenum, jejunum, and ileum, which was consistent with (10) figures (1,2). The pancreas encircled the duodenum, which was pink in color and shaped like a U. The jejunum made up the second section of the small intestine. It is similarly long and wide. The cecum, which is the first portion of the large intestine, is joined to the jejunum, which was the final portion of the small intestine figure (2).

The birds were measured for length and weight, respectively ($14.5 \pm 0.70\text{cm}$) and ($50.33 \pm 1.18\text{gm}$), in order to calculate the ratios of the length and weight of the small intestine to the birds. Following that, the small intestine was removed and the length and weight were evaluated; the results showed that the ratio of length was (71.685%) and the ratio of weight was (1.605%), which is comparable to (11) and highlighted the fact that the birds were carnivores or frugivores birds.

The small intestine had mucosa, submucosa, muscularis, and serosa in all of its sections according to histology figure (3,6,9). The thickness of the duodenum mucosa was ($892.666 \pm 6.177\mu\text{m}$) and it had fingers-like projects called villi. The

tall of villi ($744.4 \pm 50.4 \mu\text{m}$) and diameter of villi was ($57.9 \pm 8.36 \mu\text{m}$) between the villi found in crypts and the depth of crypts ($39.9 \pm 10 \mu\text{m}$) figure (3,5). The most recent data (12) supported these results.

The tunica submucosa was thin and its narrow thickness was ($76.5 \pm 5.7 \mu\text{m}$), and the tunica muscularis or muscularis externa was composed of two layers of muscle, inner circular and outer longitudinal, whose thickness was ($133.166 \pm 15.23 \mu\text{m}$) figure (4). On the surface, villi have a round or oval shape known as a goblet, which is slightly visible in the duodenum ($26.4 \pm 2.78\%$) figure (5).

In addition to the four tunica seen on the duodenum, the jejunum wall also had these four. ($776.5 \pm 5.7 \mu\text{m}$) was the mucosa thickness figure (6). There are many structures in the mucosa (villi). The height of the villi on this section was ($675.6 \pm 37.2 \mu\text{m}$) and the diameter was ($87.9 \pm 4.47 \mu\text{m}$) figure (8). The invagination between two villi, which is called a crypt, was measured at a depth of ($39.9 \pm 10 \mu\text{m}$) figure (6). depicts the goblet cell, which is founded on villi (50.665m) figure (8). The tunica sub mucosa thickness in this section was (19.9 10m), but the muscularis externa, which is made up of two types of muscle, inner circular and outer longitudinal, was (109.833 9.95m) (figures 5, 6).

The ileum was the last section of the small intestine; the wall of it was similar to the duodenum and jejunum. The thickness of the mucosa of the ileum was measured at ($359.5 \pm 10.15 \mu\text{m}$) figure (9) in the mucosa had a villi structure. The length of the last two parts was ($353.80 \pm 34.73 \mu\text{m}$) and the diameter of it was ($61.9 \pm 8.36 \mu\text{m}$) figure(9,11) between the two villi had a crypt. The depth of the crypt was ($39.9 \pm 10 \mu\text{m}$) figure(9).

The goblet cells found in the epithelium of the mucosa had a higher value than the last two parts of the small intestine. It had a ratio of ($65.44 \pm 3.32\%$) figure (11). The submucosa was thin and the narrow thickness of the submucosa layer was ($23.23 \pm 15.27 \mu\text{m}$) and the muscularis was ($99.86 \pm 9.95 \mu\text{m}$) figure(10). In this study the substantially different ($P \leq 0.01$) these findings were in line with the most current records (12).

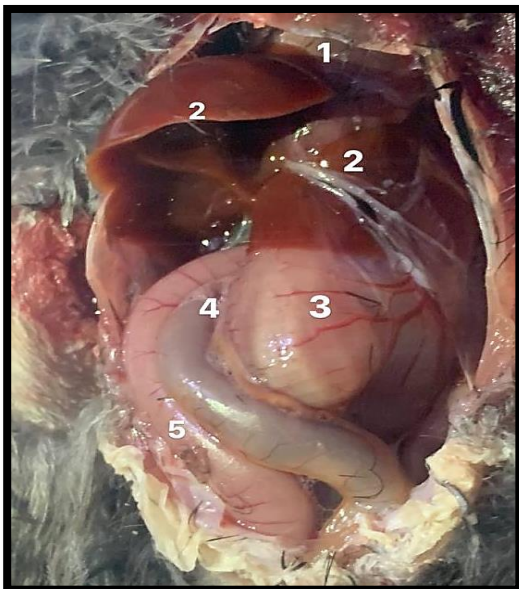


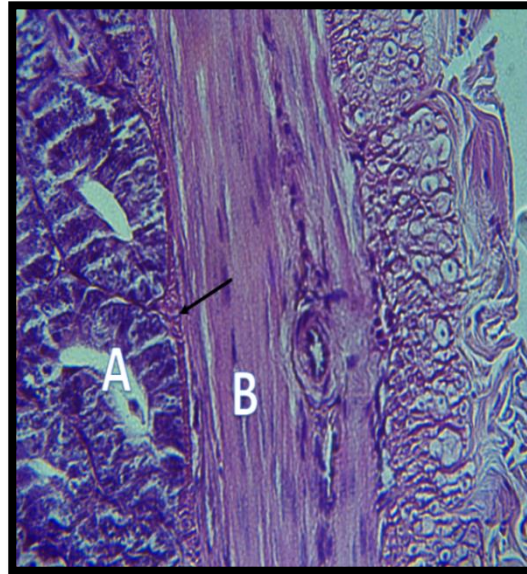
figure (1) Visceral of European starling. 1. heart, 2. liver, 3. Gizzard 4. duodenal loop enclosing pancreas and 5. Jejunum.



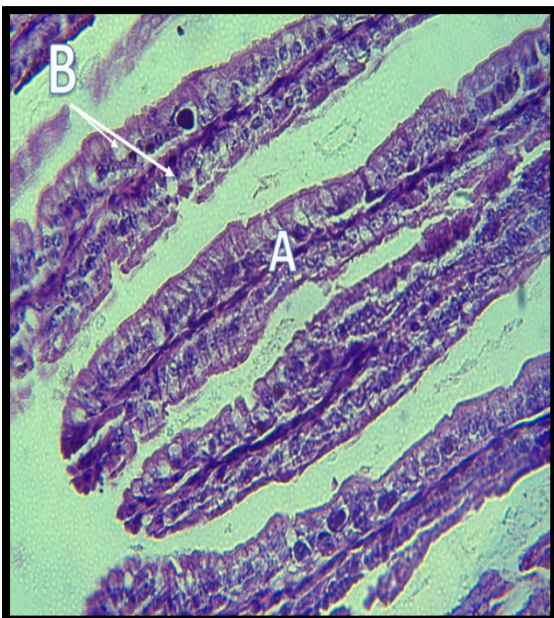
figure (2) The European starling small intestine and attached organs 1. Gizzard, 2. Duodenal loop, 3. Pancreas, 4. Jejunum and 5. Ileum



Figure(3) Transverse section of European starling duodenum (A)villi (B)inter villus space (c)lamina propria (yellow raw) sub mucosa (D)muscularis externa and (E) serosa (H&E stain , 100x)



Figure(4) Longitudinal section of European starling duodenum (A) Crypts of Lieberkühn (B) muscularis layer and (black raw) sub mucosa (H&E stain , 400x)



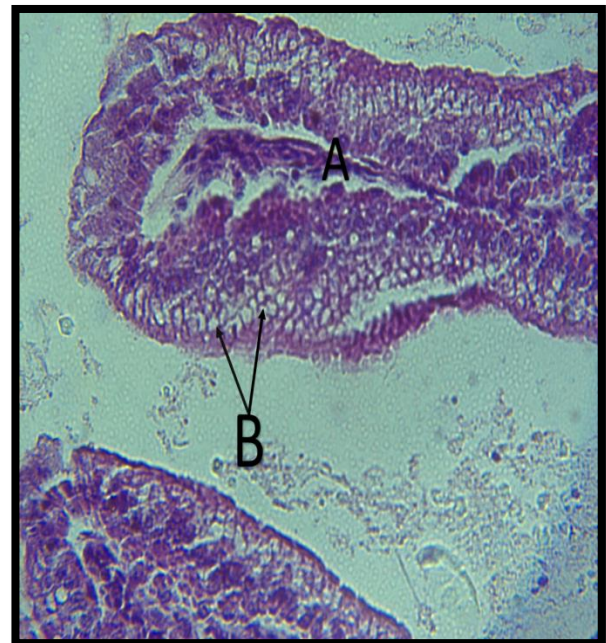
Figure(5) Duodenum villi of European starling (A) lamina propria and (B)goblet cells (H&E stain , 400x)



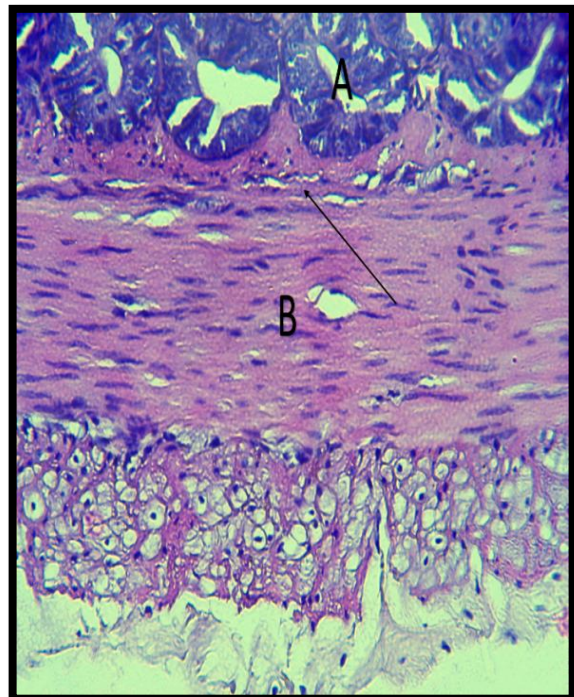
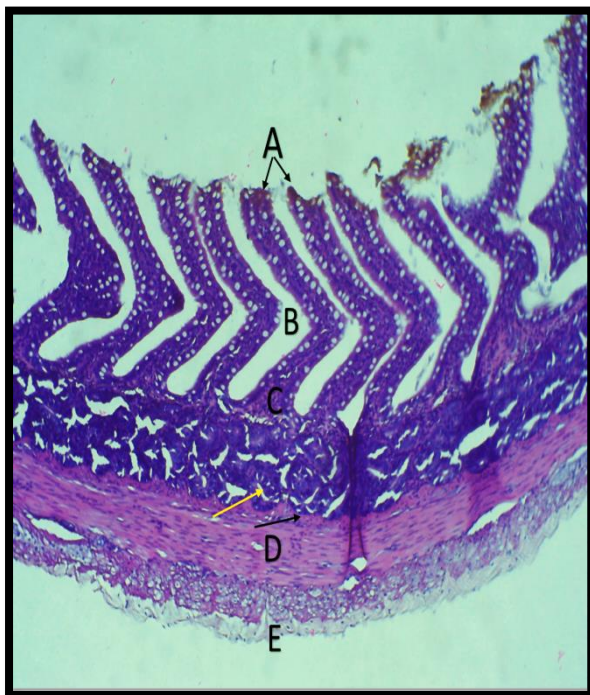
Figure(6) Transverse section of European starling jejunum (A)villi (B)inter villus space (c)lamina propria (yellow raw) intestinal gland (orange raw)goblet (black raw) sub mucosa (D)muscularis externa and (E) serosa (H&E stain , 100x)



Figure(7) Longitudinal jejunum section of European starling (A)intestinal crypt (B) muscularis layer and (black raw) submucosa layer (H&E stain , 400x)

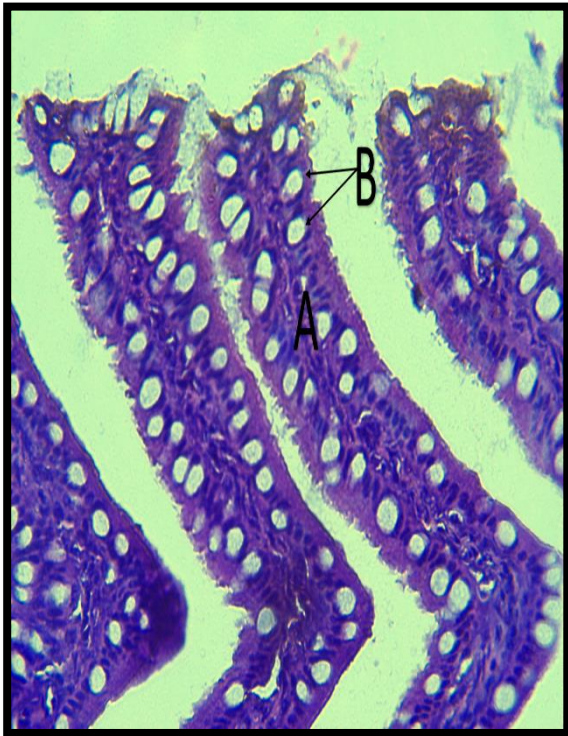


Figure(8) Histological section of the jejunum villi of European starling (A) lamina propria and (B)goblet cells (H&E stain , 400x)



Figure(9) Transverse section of European starling ileum (A)villi (B)inter villus space (c)lamina propria (yellow raw) intestinal gland (black raw) sub mucosa (D)muscularis externa and (E) serosa (H&E stain , 100x)

Figure(10) Longitudinal section of European starling ileum(A) Crypts of Lieberkühn (B)muscularis layer and (black raw) sub mucosa (H&E stain , 400x)



Figure(11) Histological section of the ileum villi of European starling(A) lamina propria and (B)goblet cells (H&E stain , 400x)

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