

MORPHO-HISTOLOGICAL AND HISTOCHEMICAL STUDY OF ESOPHAGUS AND STOMACH IN SMALL INDIAN MONGOOSE IN BASRA (*Herpestes javanicus*)

Adel J. Hussein*, Sameera A. Da'aj* , Husham Kherala**

*Department of Anatomy and Histology, College of Veterinary Medicine, University of Basrah,
Basrah, Iraq

**Ministry of Education, basrah, Iraq.

Key words: Esophagus , Stomach , Histology , small Indian mongoose

Corresponding author: adil.jabar@yahoo.com

ABSTRACT

The aim of the present study was to investigate the morphological, histological, and histochemical structures of the esophagus and stomach in small Indian mongoose at anatomy and histology laboratory/ Veterinary Medicine College / Basra University in Basra/ Iraq. The current study was conducted on six local healthy adult male mongoose directly . Morphological results revealed that the esophagus is elastic muscular fibrous tube connects between pharynx and stomach. It consists from three parts; cervical, thoracic, and short abdominal part. The stomach appeared as simple type with shape of letter (J), and had three regions (cardiac, fundus, and pyloric region), two curvatures, and two openings. The mean length and width of esophagus and stomach (15cm, 0.5 cm) and (6.5 cm, 2cm cardiac, 1.5 cm fundus, and pyloric 1 cm in width) respectively. The histological study result showed the esophagus and stomach comprised four layers; mucosa, sub-mucosa, muscularis, and adventitia or serosa.

Microscopic examination of esophagus revealed that the mucosal layer lined with thin stratified squamous keratinized epithelium tissue. The gastric mucosa lined by simple columnar epithelium with goblet cells.

This study showed the positive reaction for periodic acid Schiff (PAS) stain in esophagus and stomach , when appear red purple colour for mucin in the mucosa layer for them .

INTRODUCTION

The small Indian mongoose *Herpestes javanicus* are small, widespread carnivores occupying various habitats from Africa to Southeast Asia (1).

The genus contain 10 species (2) and is considered the oldest genus within the order Carnivora. Dating back approximately 30 million years (3).

The genus *Herpestes* is represented by two species : small indian mongoose (*Herpestes javanicus* ; Geoffroy E 1818) and large Indian mongoose or the grey mongoose (*H.edwardsli*; Geoffroy, E1818)(4).

The small Indian mongoose is one of few animal that can survive a cobra attack, which makes it one of deadly snake's few predators(5) .

As there is limited information about the anatomy and histology of digestive system of mongoose .this will be a platform for better understanding of anatomy, pathology of diseases and subsequent application in clinical examination (6) .the digestive tract of the mongoose is highly consistent with the description ,It's characterized by same salient features including a wide acid secreting region in the stomach. (7)

A morphology description of esophagus in mongoose is a collapsible muscular tube lying behind the trachea .it extend from the laryngopharynx passes through the mediastinum, pierces the diaphragm at the esophageal hiatus, and ends at the superior portion of the stomach (8),it is from carnivorous (Simple) type with J shape have a concave lateral surface was the greater curvature and the smaller concave medial surface is the lesser curvature.(9).

The cardiac and body regions of stomach merged smoothly and capable of great expansion while the cylindrical and thicker walled pyloric part is less able to enlarge . The fundus projects dorsally to the left of the cardiac against the liver . The type of mucosa depend on function of this organs (10).

Function of esophagus is carrying the food from the pharynx to the stomach , its function is storage of ingested food, mechanical break down of food, disruption of chemical bonds of food

through the action of acid and enzyme and production of the intrinsic factor require for vitamin B12 absorption from the small intestine.

General histological structure of esophagus and stomach consist of four layers ;the mucosa layer, submucosa layer , muscularis and adventitia or serosa(11).

The aim of the study is to identify the morphological and histological structure of the esophagus and stomach in small Indian Mongoose because the studies in this field is rare especially in Iraq, because it's classified as wild mammals and this study consider for first time in Iraq.

MATERIAL AND METHODS

A total of (six) adults male small Indian mongoose (*Herpestes javanicus*) were collected from AL_Basra province, the animals were classified according to the field guide of wild mammals of Iraq(12), all animals were sacrificed by hunting . A representative samples were obtained from esophagus and stomach for morphohistological and histochemical study. Samples were fixed by 10% buffered formalin solution . After 72 hrs. fixation, the specimens were washed with water to carry out through routine histological procedure and passed during serial section (13). Dehydrated in different grades of alcohol, cleared in xylene and embedded in paraffin wax, section were cut at a 5-6 μm thickness by microtome. The stain used in this study was Hematoxyline Eosin, Masson's Trichrom & PAS stains (14) the microscopic slides were examined by a light microscope (Olympus BX) endowed with a digital camera.

Results & Discussion:-

-Morphological study

Results of the gross anatomy [fig.1] revealed that the esophagus is a collapsible muscular tube lying behind the trachea . It extends from the laryngopharynx passes through the mediastinum pierces the diaphragm at the esophageal hiatus and ends at the superior portion of the stomach this result similar with to (15)

The esophagus consist of three part: 1-cervical esophagus 2-thoracic esophagus and short part called abdominal esophagus.

While the morphological result of stomach [Fig.1] revealed that it was the carnivore type.

Stomach as a portion of the alimentary, it's widest or most dilated segment, like (J) shaped allowing for a considerable volume of food substances to be held while being broken down to digestible components by gastric juice and peristalsis for further absorption particularly with in the intestines .

The stomach consists of three region: *cardiac region *fundic region and pyloric region It have two curvatures greater and lesser Curvature and it have two surface parietal, visceral surface two opening cardiac and pyloric opening.

the results showed the esophagus was straight tube with 15 cm length and width of esophagus was about a 0.5cm.

This study appeared that the total length of stomach was 6.5 cm and circumference at cardiac, fundus, pyloric region was 2cm , 1.5cm and 1cm this result correspond with (16)

-Histological study:

Results of the present study[Fig.2] showed that esophagus has four layers: mucosa , submucosa, muscularis & adventitia or serosa layer. the first mucosal layer consist of three layers they are: lamina epithelial, lamina propria & muscularis mucosa. the lamina epithelial which was stratified squamous thin keratinized .the prominent epithelium is non keratinize in dog However ruminants species and to a lesser extent horses possess keratinized epithelia (17)(18) .The connective tissue beneath the epithelium that forms the lamina propria consists of numerous tightly interwoven collagen and elastic fibers of relatively small size. Which in turn is lined by a thin layer of smooth muscularis .The lamina muscularis consists of longitudinally oriented small bundles of smooth muscles .The submucosa houses the seromucous gland of an extracellular matrix that differs little from the lamina propria. These result similar with to (19) (20)

The muscularis layer is composed of two layers an inner circular bundle and an outer layer longitudinal. the outer portion of the esophagus is covered by a tunica serosa for much of its length especially the thoracic portion., where it is lined by the mediastinal pleural. Cranially the tunica muscularis of the esophagus is covered by adventitia. The junction of the esophagus and

the stomach is very close to the diaphragm and abdominal portion lacks a serosa. This result similar to the (21 , 22).

Result of the present study[Fig.4] showed the four tunics in the esophagus occurred in the stomach vary quite a bit in their development not only between species but also with different areas of the stomach of same animal. The mucosa can be either entirely glandular. The stomach is lined with simple columnar epithelium with goblet cells produce a layer of mucus protecting the mucosal surface of the stomach. Gastric pits or shallow depressions are visible on the mucosal surface. The wall of the gastric pits are formed mainly from goblet cells. Gastric gland are composed of different cells depending on the stomach region. the lamina propria of the stomach is continuous with that of the esophagus but it becomes a wide layer containing diffuse lymphatic tissue and gland. The lamina propria is intended by shallow foveolae or gastric pit.

The muscularis mucosa is continuous from esophagus to stomach

Submucosa is contain many blood vessels are seen throughout the length of the submucosa .the submucosa consist of loose connective tissue and nerves, blood vessels and lymph nodes

The muscularis layer consist of smooth muscle fiber only. The fourth layer of serosa consist of loss connective tissue this observation agree with (23)

The Histochemical study result: revealed that the esophagus [fig3] give a strong positive reaction for Masson Trichrom stain when appear collagen fibers was stained blue in colour while cytoplasm of epithelial cell appear red in colour , nucleous of cell appear blue to black colour . while the periodic acid Schiff stain was positive stained for glycoprotein distribution in mucus layer of esophagus.

The stomach result [fig.5] revealed the strong positive reaction for Masson trichrom Stain.the collagen fiber showed that take blue colour . Periodic acid Schiff stained of stomach take positive reaction when appear mucin rose to purple red colour in glandular mucosa layer.



Figure (1): The esophagus & stomach of mongeese. (A) the position & relationship of esophagus in the Abdominal cavity.(B) parts of esophagus (cervical esophagus , thorasic & short part of abdominal esophagus.(C): (a) cardiac region , (b) fundus or body, (c) pyloric (d) Grater curvature (e) lesser curvature (D):internal stomach ,(a) glandular stomach , (b) folded of stomach.

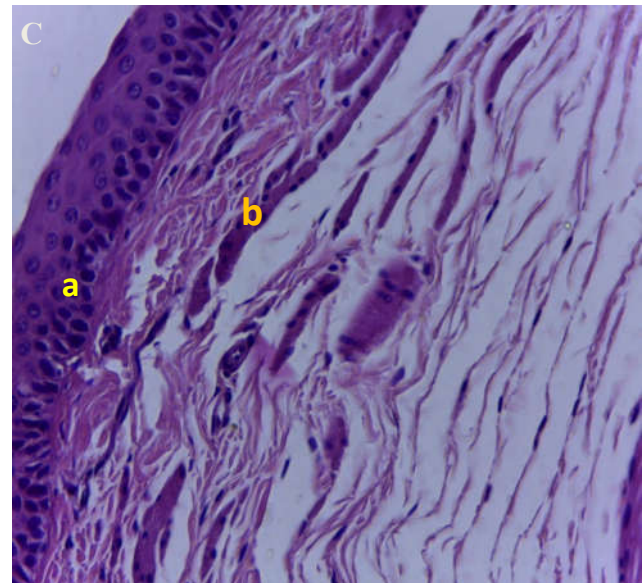
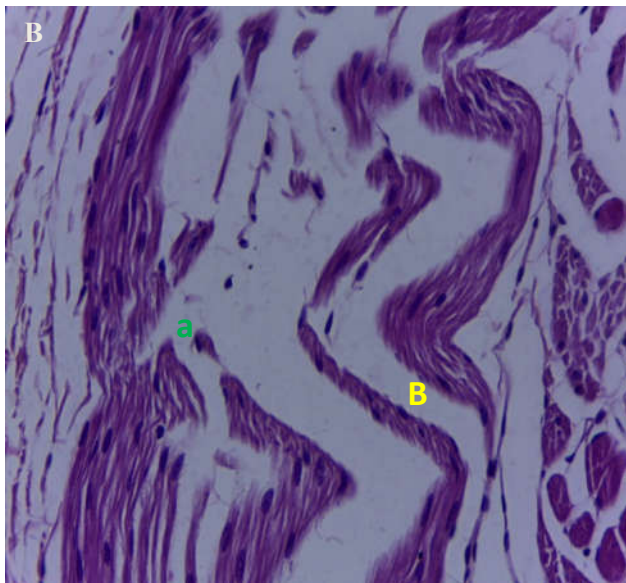
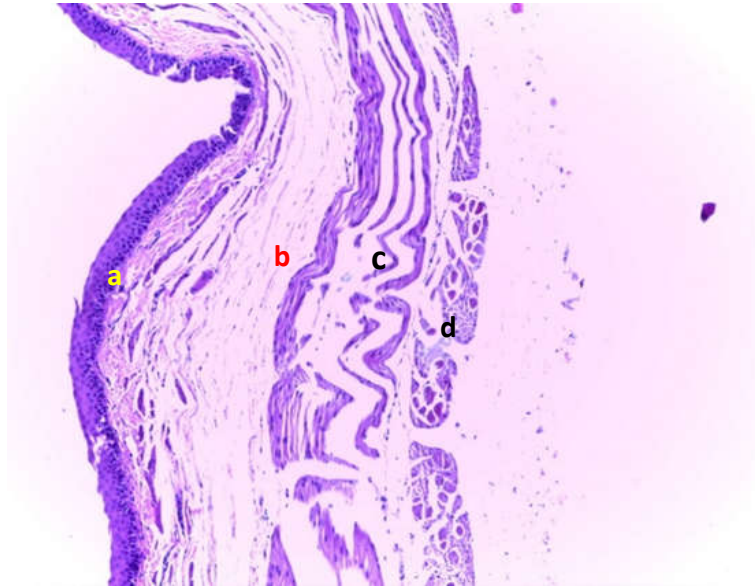


Figure (2) : Microphotograph of cross section in esophagus showing (A): (a) mucosa layers (thin keratin squamous tissue , lamina properia ,muscularis mucosa (b) submucosa muscularis (c) muscularis layer H&E stain 10X. (B) mucosa layer H&E stain 40X (C) muscularis layer (a)inner layer, (b) external layer H&E 40X

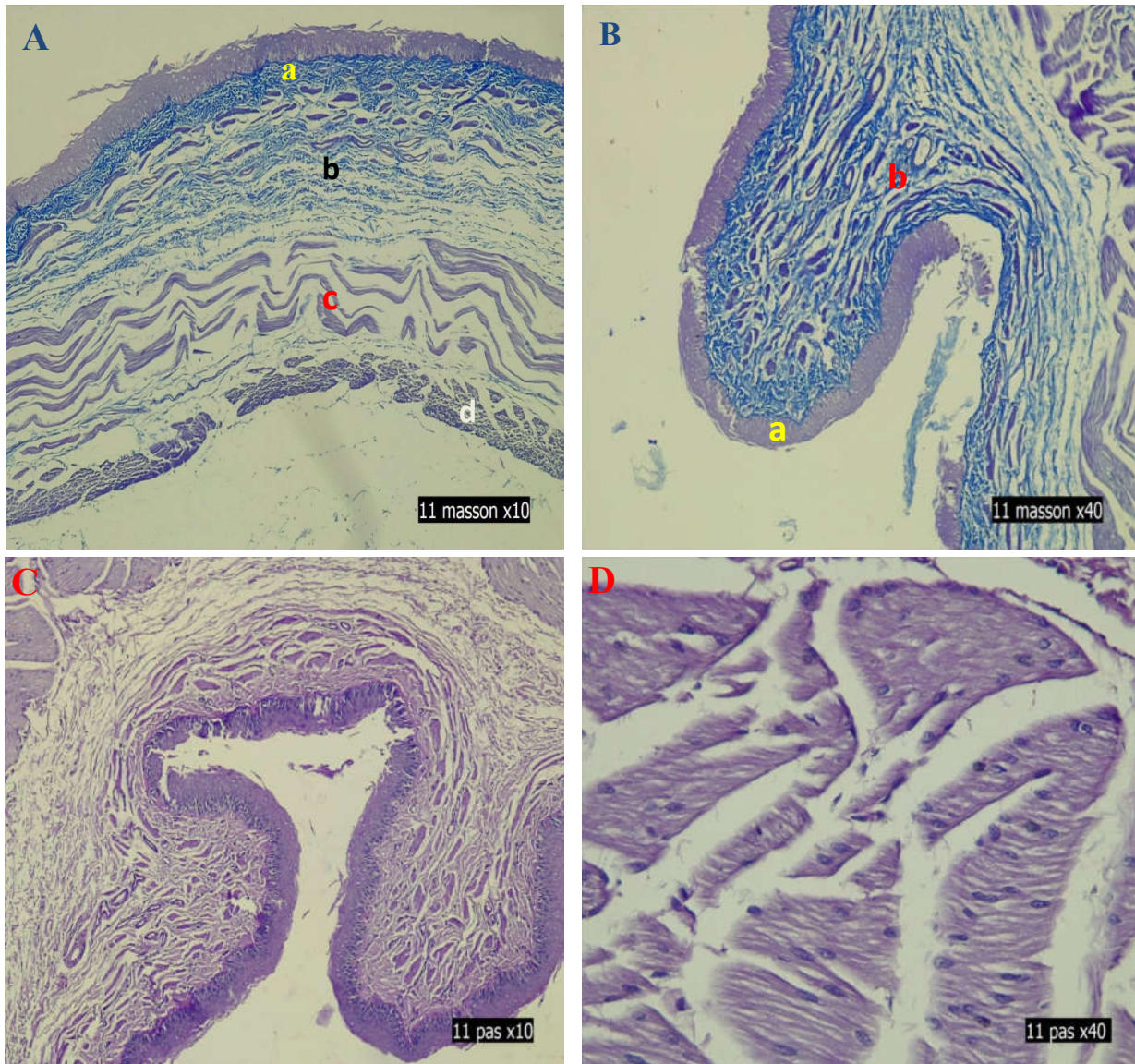
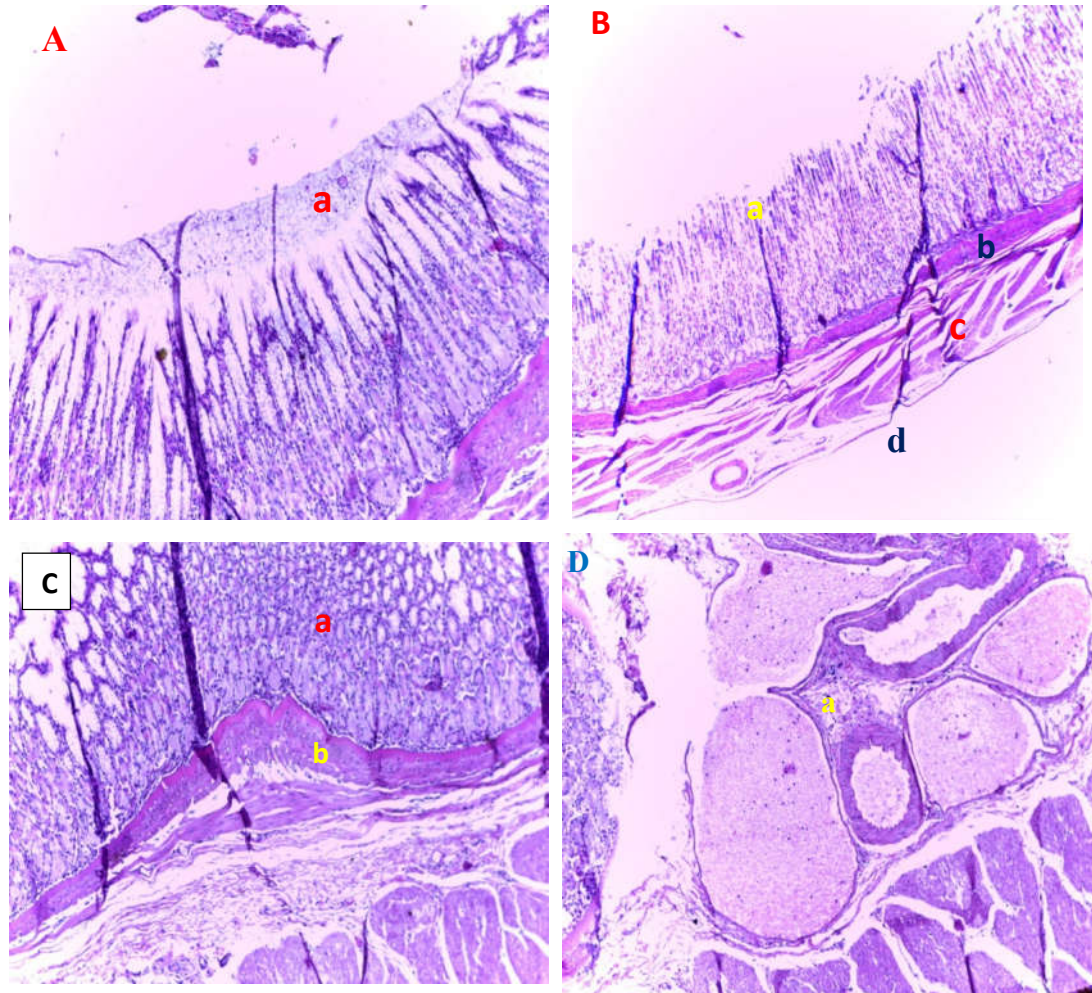


Figure (3): Microphotograph of cross section in esophagus showing (A) (a) collagen fiber mucus layer (b)submucosal layer(c)muscular layer (d)adventitia Masson's Trichrom 10X (B): (a)collagen fiber in mucosa layer ,(b)submucosal layer Masson's Trichrom 40X . (C) positive reaction of all fours layer of esophagus PAS stain 10X . (D) : glycogen in muscular layer in esophagus PAS stain 40X.



Figure(4): Microphotograph of cross section in stomach showing (A): (a) mucus layer of cardiac region H&E stain 10 X (B): (a) mucosa layer ,(b) submucosal ,(c) muscular & (d) serosa H&E stain 10X (C) (a) glandular mucosa in fundus or body region (b) lamina propria ,(c) submucosa (d) smooth muscular layer H&E stain10X , (D): (a)submucosa , (b) muscular layer H&E stain(40X).

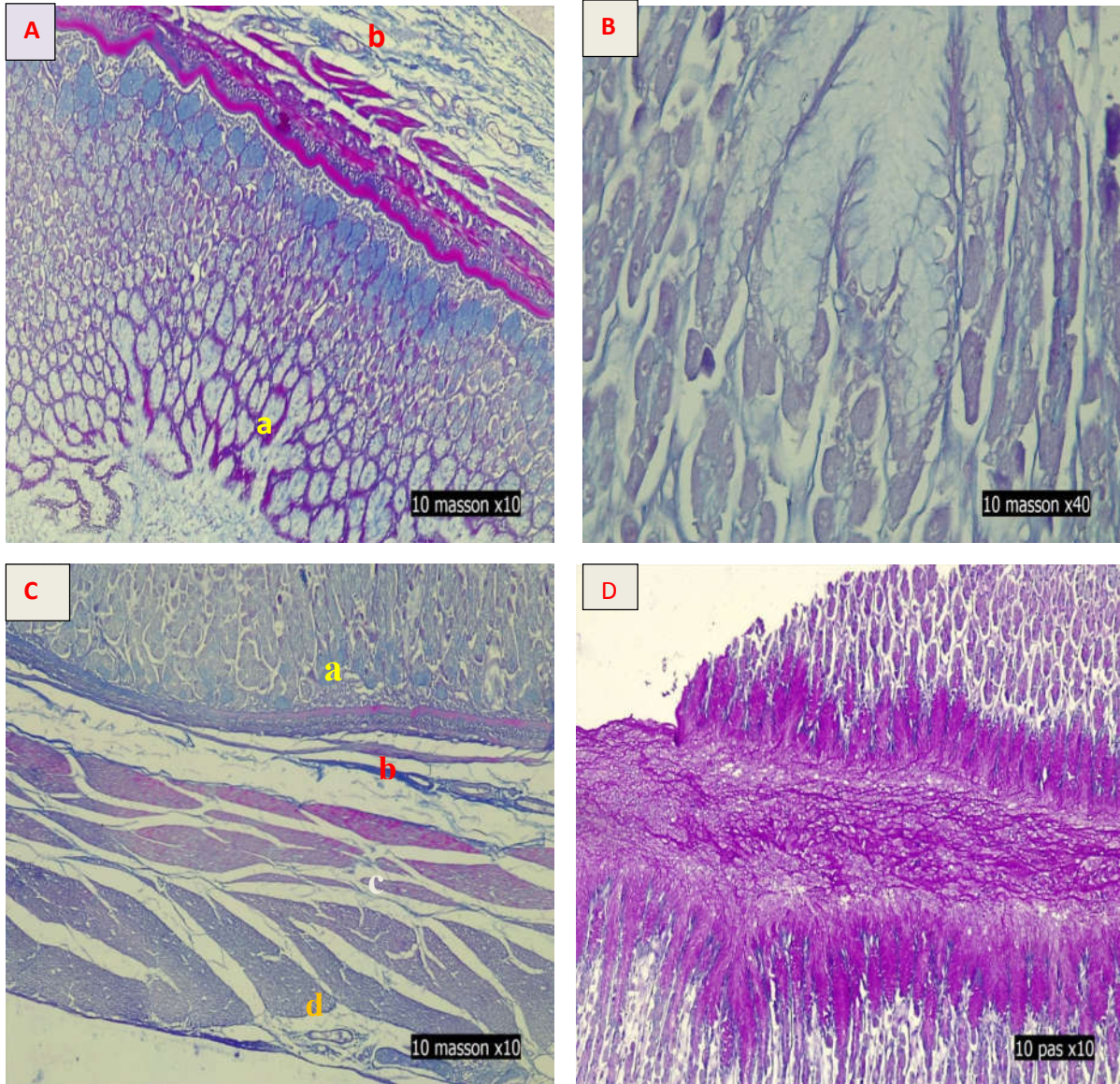


Figure (5): Microphotograph of cross section in stomach showing : (A): (a)collagen fiber in mucosa layer (b) sub mucosa Masson's Trichrom stain 10X ,(B) epithelium membrane Masson's Trichrom stain 40X (C): (a) glandular mucosa (b) submucosa (c) inner muscular layer (d) external muscular layer with Masson's Trichrom stain 10X , (D) : epithilium , glandular mucosa.

REFERENCES

- 1- Thulin, C., Simberloff, D., Barun, A., McCracken, G., Pascal, M. and Anwarul-Islam, M., 2006. *Mol. Ecol.*, 15; 3947-3956.
- 2- Nowak R.M. 1999. *Carnivora; Family Herpestidae*. In: *Walker's mammals of the world*, 6th edn. Vol.1. The John Hopkins University Press, Baltimore, London 766-78..
- 3- Hinton, H.E & Dunn, A.M.S 1967. *Mongoose: Their Natural History & Behavior*. London : Oliver & Boyd Ltd.
- 4- Hussain, R. and Mahmood, T., 2016 *Pakistan J. Zool* 48: 1931-1943.
- 5- Corbet, G. and Hill, J.E., 1992. *The mammals of the Indo-Malayan region: A systematic review*. Oxford University Press, Oxford, UK, pp.488.
- 6- Rasouli, B., Gholami, S. & Ahrari, S.M 2015 : *TOPOGRAPHIC AND MORPHOMETRIC STUDIES ON THE SPINAL CORD OF THE MALE AND FEMALE INDIAN GRAY MONGOOSE (HERPESTES EDWARDSII)*. *Cibtech Journal of Zoology* Vol. 4 (3) September-December, pp.75-82.
- 7- KAOANO H. YAMASHITAT., YAMADA J. and KITAMURA N. October 5, 1982. *A light microscopic study of Gastro-Entero pancreatic endocrine cells of the mink (Mustela vison)*. Obihiro University, Hokkaido, Japan.
- 8- R. Michael Akers and D. Michael Denbow (2008). *Anatomy and physiology of domestic Animals* Blackwell Publishing all rights reserved USA.
- 9- Gett, R. 1975; *Carnivore digestive system*. In: *Dissonance & Grossman's the anatomy of domestic Animals*, 5th edn. Vol.2 W.B. Saunders Company, Philadelphia, USA. 1547-1557..
- 10- Dyce, K.M. Sack, W.O and Wearing C.J.G. 2010 : *Text book of veterinary anatomy*. 4th ed.- Saunders Elsevier. St. Louis, USA..
- 11- 24- SAMULSON, A. DON 2009 *Textbook of veterinary Histology* University of Florida chapter 15 pp.320-324.
- 12- Igbow, C.O. (2010) *Gross and microscopic anatomy of thyroid gland of the wild African grasscutter (Thryonomys swinderianus, Temminck)* in south east Nigeria. *European J. Anat.*, 14 (1):5-10..
- 13- Luna, L.G. (1968). *Manual of histological staining*

- 14- Bancroft. J.D and Stevens, A.(2010) in theory of histological techniques, 2nd churchir Livingstone.
- 15- Daaj A. Sameera, 2017, MORPHOLOGICAL AND HISTOLOGICAL STUDY OF THE ESOPHAGUS IN LOCAL IRAQIAN SHEEP. Indo – Asian Journal of Multidisciplinary Research (IAJMR). Volume – 3; Page: 969 – 973.
- 16- Shill.S.K., Fast B.C., Uddin M,Rahman ML, Quasem M.A.2012 , Anatomy of digestive and respiratory system of Indian grey Mongoose, Rajshahi university Zoological society Vol 31 ,pp.83-84.
- 17- Koenig H.E and Liebich HG(2014).veterinary anatomy of domestic mammals Text book and colour Atlas. 6th edition (Germany, by Schattaur G MbH.Philadelphia,USA..
- 18- Evans. A. R.,Wilson. G.P,Fortelius.M.SJemvall S.2007:High-level similarity of dentitions in carnivorous and rodents-Nature 445:18-81 .
- 19- Mahmood,B. Hussein, Al-aameli,H.Muna,Obead,F.Walaa, 2017: Histological study of esophagus in dogs and rabbits. journal of kerbala university, Volume: 15,pp. 55-62.
- 20- Aughey E and Frye L (2010).Comparative veterinary histology with clinical correlates . Manson publishing the veterinary press.pp:14-125.
- 21- Pawan Kumar, R., S. H. Mahe and P.-Kumar. 2009. Histological architecture of esophagus of Goat (*Capra hircus*), 29- 32.
- 22- Salimi, E and J. Amiri. 2012. Some-histological and histological study of the esophagus in one Humped camel (*Camelus dromedaries*) and Gumped camel (*Camelus dromedaries*), *GlobalVeterinaria*, 32: 111 – 118.
- 23- Eroschinko p h D (2008). Diflore's atlas of histology with functional cod elations. Eleventh edition p:313-321.