RESEARCH ARTICLE

Histo-Morphometrical Study on the Pancreas of Turkey

Shalini Suri[1], Jasvinder S. Sasan[1]*, Asma Khan[2]

Abstract

This study was conducted on the pancreas of 06 turkey birds. The pancreas of turkey is located between the descending and ascending parts of the duodenum with total length of 9.82 ± 0.28 cm, width of 2.17 ± 0.10 cm and thickness of 1.12 ± 0.08 cm. Histologically, the parenchyma of pancreas consisted of both exocrine and endocrine portion. The exocrine part composed of serous tubulo-acinar glands. Acinar cells were pyramidal to tall columnar in shape with round, basally situated nucleus with a prominent nucleolus and apically located acidophilic zymogen granules. The average longer diameter was 50.73 ± 5.59 µ whereas the smaller diameter was 35.08 ± 3.80 µ. The average height of acinar cell was 15.63 ± 1.59 µ with average nuclear diameter of 6.87 ± 0.35 µ. The ducts located within the lobules were small and lined by simple cuboidal to low columnar epithelium. The endocrine part consisted of islets of Langerhans. The average longer diameter was 49.26 ± 1.41 µ whereas the smaller diameter was 43.61 ± 1.23 µ.

Keywords: Acinar cells, Islets of Langerhans, Pancreas, Turkey, Zymogen granules.

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Introduction

The turkey is a large bird in the genus *Meleagris*, native to North America. Turkey occupies a prominent position next to chicken, duck, guinea fowl and quail in contributing the most evolving sector, which is playing a significant role in augmenting the economic and nutritional status of varied population. They are about two percent of the total poultry population and are reared for meat only. Its meat is the leanest among other domestic avian species. Turkeys are mostly concentrated in and around cosmopolitan cities of India in small numbers. Indigenous and non-descriptive turkeys are found in good numbers in Kerala, Tamil Nadu, eastern districts of Uttar Pradesh, states of India.

Pancreas of birds is located on the right side of abdominal cavity between ascending and descending loops of duodenum. It is an important mixed gland related to the gastro-intestinal tract (Beheiry *et al.,* 2018). It consists of both exocrine and endocrine part. The exocrine part consists of acinar cells and associated excretory ducts (Pieler and Chen, 2006). It secretes digestive enzymes which helps chemical digestion of the food (Denbow, 2015). The endocrine part produces hormones such as insulin, glucagon and somatostatin which control the level of blood glucose (Mescher, 2010). Work has been done on the histological properties of pancreas in different bird species as duck (Das *et al.,* 2003), ostrich (Stornelli *et al.,* 2006), quail (Simsek *et al.,* 2008), falcon (Simsek *et al.,* 2009), goose (Mobini, 2011), eagle (Al-Agele and Mohammed, 2012) and pigeon (Mobini, 2013). Due to paucity of literature on the histology and micrometry of pancreas in turkey, the present study was planned to study the same.

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Materials and Methods

This study was conducted on the pancreas of 06 turkeys collected from birds slaughtered in the Division of Livestock Production Management, Faculty of Veterinary Science & Animal, Husbandry, SKUAST-J, Jammu. Samples were collected and examined grossly for any abnormalities. Samples were immediately immersed in 10% Neutral Buffered Formalin (NBF) and paraffin blocks were prepared (Luna, 1968). 5-micron thick sections were obtained and stained with Hematoxylin and Eosin (H&E) for general histo-morphology. Different morphometrical parameters *viz*. Diameter of longer and smaller acini (µ), Height of acinar cell (µ), Nuclear diameter (µ) of acinar cells, Longer and smaller diameter (µ) of Islets of Langerhans were recorded.

Results and Discussion

The pancreas of turkey was a short lobulated gland located between the descending and ascending parts of the

duodenum. Similar observation has been recorded in most of the species of birds such as Palam Dove (Saadaftar *et al.,* 2011) and goose (Deprem *et al.,* 2015). The total length of pancreas of turkey was 9.82 ± 0.28 cm, width of 2.17 ± 0.10 cm and thickness of 1.12 ± 0.08 cm. The pancreas of Guinea fowl was 8.2 cm long with width of 3.1 cm whereas the same for Common gull was 5.1 cm and 3.4 cm, respectively (Hamodi *et al.,* 2013).

The pancreas of turkey was covered by a thin connective tissue capsule. The parenchyma of pancreas consisted of both exocrine and endocrine portion (Fig. 1) as also seen in Common gull and Guinea fowl (Hamodi *et al.,* 2013). The exocrine part composed of tubulo-acinar serous glands that secrete digestive enzymes and occupied a larger area of pancreas. It consisted of numerous secretory acini along with duct system. This observation concurred with the findings of Das *et al.* (2003) in duck, Gulmez (2003) in goose and Mobini (2013) in mature pigeon. The secretory acini varied in shape from spherical to oval and elongated (Fig. 2). Hamodi *et al.* (2013) reported globoid, oval elongated acini in Guinea fowl. Saadatfar *et al.* (2011) reported oval shaped acini in Palam dove. These acini consisted of single layer of variable number of pyramidal to tall columnar or rectangular cells (Fig. 3). Mobini (2013) in pigeon, Mobini and Aghaabedi (2009) in turkey, Helmy and Soliman (2018) in ostrich and Das *et al.* (2003) in duck also made similar observations. Gulmez (2003) in goose reported columnar shaped secretory acini. Each acinar cell contained round, large, basally situated nucleus with a prominent nucleolus. The cytoplasm contained acidophilic zymogen granules located at the apical portion of the cell facing the lumen of acinus (Fig. 4). The bizonal character of acinar cells could be attributed to the presence of mitochondria in basal part and zymogen granules in apical part (Das *et al.,* 2003). Centro-acinar cells were seen in the central lumen as the beginning cells of the duct (Fig. 3). One or two nuclei were seen in the centre of pancreatic acini as also observed in kestrel (Al-Haaik, 2019).

Both longer and smaller diameters of serous acini were calculated (Table 1). The average longer diameter was 50.73 ± 5.59 µ whereas the smaller diameter was 35.08 ± 3.80 µ. In Guinea fowl, the secretory acini had average thickness of 46.588 ± 6.18 µ whereas the average thickness was 29.754 ± 4.72 µ in Common gull (Hamodi *et al.,* 2013). The difference in average thickness/diameter may be due to species difference. In pancreas of turkey, the average height of acinar cell was 15.63 ± 1.59 µ with average nuclear

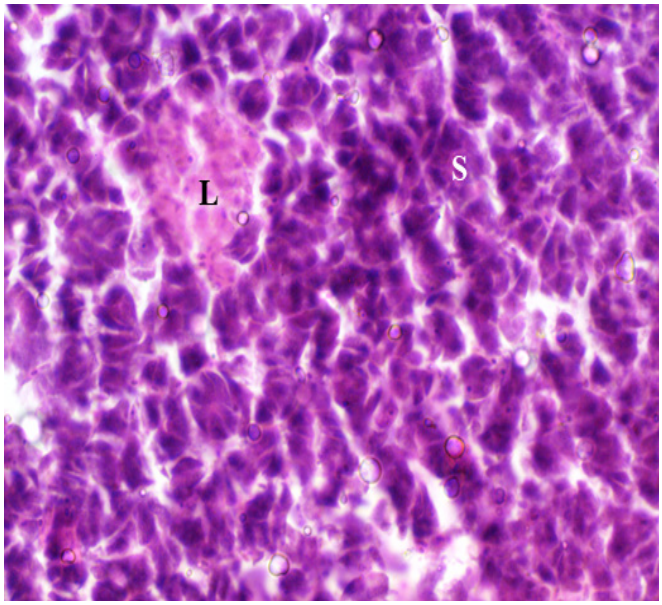

Fig. 1: Photomicrograph of pancreas of turkey showing Ilets of Langerhans (endocrine part, L) surrounded by serous acini (exocrine part, S). H&E stain 400X

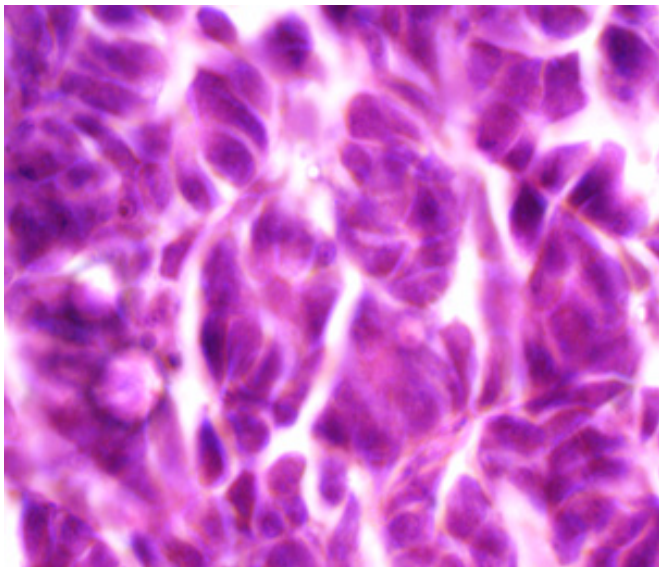

Fig. 2: Photomicrograph of pancreas of turkey showing serous acini of different shapes and sizes. H&E stain 1000X

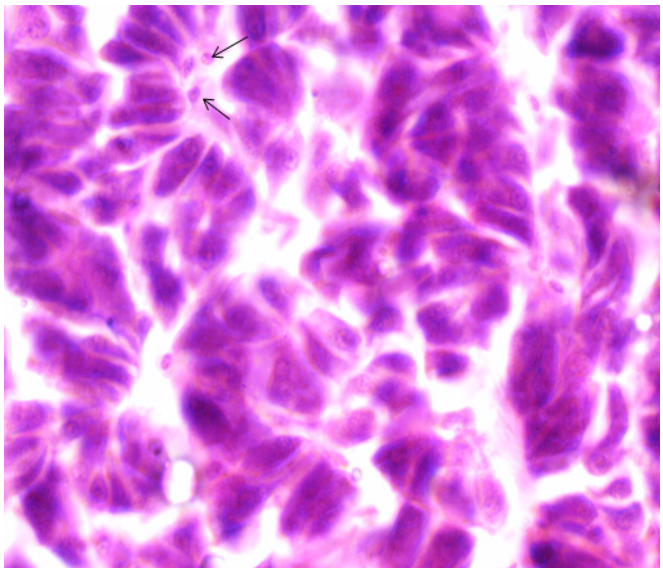

Fig. 3: Photomicrograph of pancreas of turkey showing acinar cells having pyramidal to tall columnar shape and centro-acinar cells (arrow). H&E stain 1000X

diameter of 6.87 ± 0.35 µ. In Guinea fowl, the average nuclear diameter was 3.415 ± 0.21 µ and the same was 4.268 ± 0.27 µ in Common gull (Hamodi *et al.,* 2013).

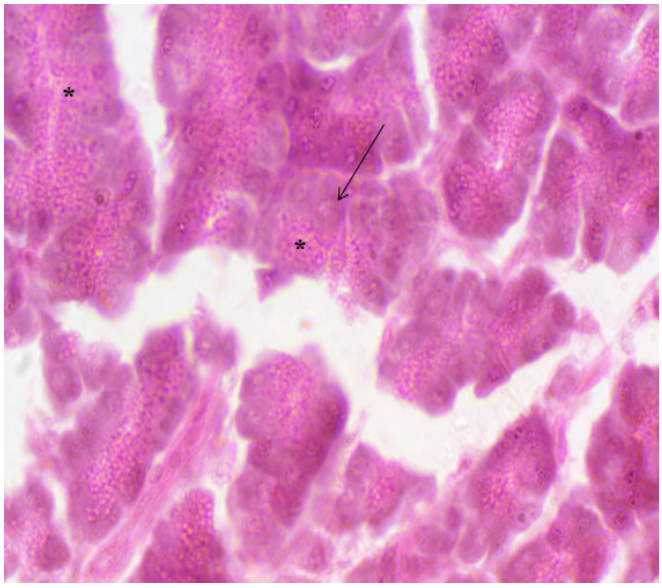

Fig. 4: Photomicrograph of pancreas of turkey showing acinar cells having round basally located nucleus (arrow) and apically located zymogen granules (*). H&E stain 1000X

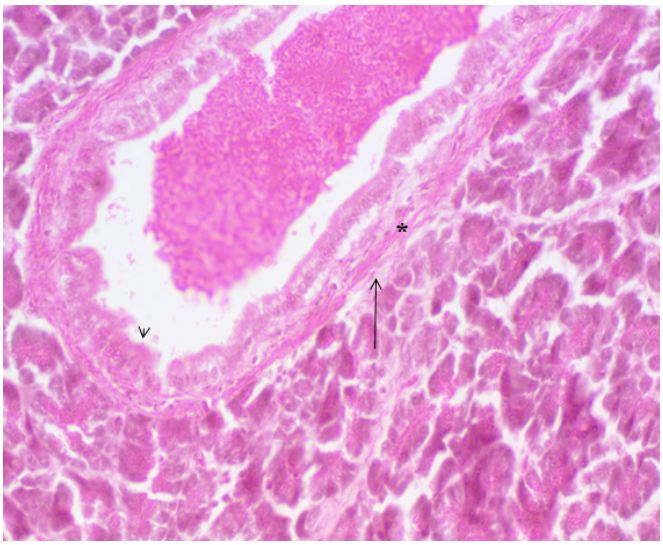

Fig. 5: Photomicrograph of pancreas of turkey showing inter-lobular duct lined by simple columnar epithelium (arrow head) surrounded by smooth muscle layer (*) and connective tissue (arrow). H&E stain 1000X

Table 1: Micrometrical parameters of pancreas of turkey

Parameter	*Value (in µ)*
Longer diameter of acini	50.73 ± 5.59
Shorter diameter of acini	35.08 ± 3.80
Height of acinar cell	15.63 ± 1.59
Nuclear diameter of acinar cells	6.87 ± 0.35
Longer diameter of Islets of Langerhans	49.26 ± 1.41
Shorter diameter of Islets of Langerhans	43.61 ± 1.23

The ducts located within the lobules were small and lined by simple cuboidal to low columnar epithelium (Fig. 5) as seen in the pancreas of Japanese quail. The ducts composed of three layers namely inner mucosal layer showing mucosal folds, circularly arranged smooth muscle fibers and external connective tissue. In some lobules, ducts contained homogenous material indicating the functional status of the particular region of the pancreas. Similar observation was made by Sivakumar *et al.* (2000) in Japanese quail. Hamodi *et al.* (2013) observed ductal system of exocrine part of common gull and Guinea fowl which included intercalated ducts, intra-lobular duct as well as inter-lobular ducts. Blood vessels were seen within the connective tissue septa (Fig. 6).

The endocrine part consisted of Islets of Langerhans varying in shape and size. These were scattered within the exocrine part. Mobini (2011) in pancreas of goose described two types of islets namely alpha and beta islets. Alpha islets were larger than beta islets and had no distinct borders with exocrine part whereas beta islets were delineated from the surrounding acini by collagenous fibers. In pancreas of turkey, the islets do not have distinct borders with the exocrine part. These islets lacked the fibrous connective tissue capsule. Similar observations were made by Gulmez *et al.* (2004) in goose; Hamodi *et al.* (2013) in common gull and Guinea fowl and Abou-Zaid *et al.* (2010) in pigeon.

Both longer and smaller diameters of Islets of Langerhans were recorded (Table 1). The average longer diameter was 49.26 ± 1.41 µ whereas the smaller diameter was 43.61 ± 1.23 µ. In pancreas of kestrel, the smaller islets had mean diameter of 40.02 ± 0.9 µ and larger islets had diameter of 126.3 ± 3.8 µ (Al-Haaik, 2019).

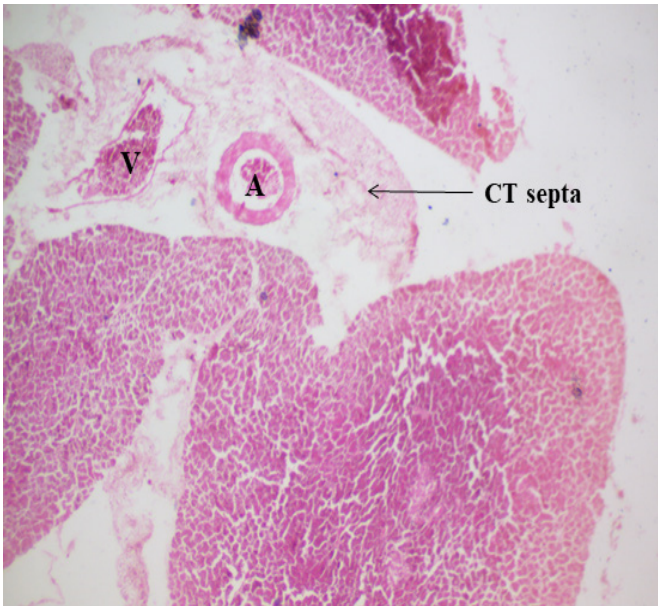

Fig. 6: Photomicrograph of pancreas of turkey showing presence of blood vessels (artery A and vein V) within the connective tissue septa. H&E stain 40X

Conclusion

The pancreas of turkey was located between the descending and ascending parts of the duodenum. Histologically, the pancreas consisted of both exocrine and endocrine portion. The exocrine part which composed of serous tubulo-acinar glands had pyramidal to tall columnar shaped acinar cells with basally located nucleus and apically located acidophilic zymogen granules. The average longer diameter was 50.73 ± 5.59 µ whereas the smaller diameter was 35.08 ± 3.80 µ. The average height of acinar cell was 15.63 ± 1.59 µ with average nuclear diameter of 6.87 ± 0.35 µ. The ducts located within the lobules were lined by simple cuboidal to low columnar epithelium. The endocrine part consisted of islets of Langerhans with average longer diameter as 49.26 ± 1.41 µ and the smaller diameter as 43.61 ± 1.23 µ.

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