



Research Article

MACRO AND MICROSCOPIC EVALUATION OF PANCREAS OF HYBRIDS OF POULTRY IN INDIA

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Abstract- CARI Shyama and Vanaraja are colored hybrid breeds of poultry introduced for low cost production than desi breeds in the tribal area of India. Pancreas is an important accessory gland of the digestive system. The exocrine secretion of pancreas improves the feed efficiency so helps in increased production. The tissue samples were collected from birds of three different age groups of Vanaraja and CARI Shyama breeds of poultry, processed, sectioned and stained for normal gross, histological and histochemical studies. Grossly, weight and length of pancreas increased from 1st to 3rd age group in both the breeds. Histologically, gland was composed of capsule and parenchyma. Lymphoid aggregation was also noticed in 8 weeks old birds of both breeds but organization and occurrence were variable as per breed. The distribution of connective tissue fibres, PAS positive substances and AB-PAS positive substance was also studied.

Keywords- CARI Shyama, Pancreas, Histology, Lymphoid aggregation, Vanaraja

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Introduction

Pancreas is an important vital gland of the digestive system. The avian pancreas is located on the right side of the abdominal cavity in all birds. It is tightly bound by mesentery and blood vessels positioned between the descending and the ascending duodenal loops [1]. The exocrine secretion of pancreas improves the feed efficiency and enhances the production however endocrine secretion take part in maintenance of glucose concentration in body. CARI Shyama and Vanaraja are colored hybrid breeds of poultry introduced for low cost production than desi breeds in the tribal area of India to improve the livelihood of rural people. Perusal of the available literature revealed that not much work has been done on the microarchitecture and histochemistry of pancreas of these birds. Hence an attempt has been made to bring to light on the gross, histological components and histochemical features of the post hatch pancreas of these birds and to compare the morphometric relationship between these two hybrid breeds.

Materials and Methods

The present study was conducted on apparently healthy ten chicks, growers and layers of CARI Shyama and Vanaraja. Pancreas was collected, weighed and preserved in 10% buffered formalin [2].

Results

Pancreas, an accessory gland of digestive system was situated between two limbs of duodenum in all age groups. It was long narrow grayish white to grayish yellow in colour. It was composed of 3 lobes, two main long lobes and one small splenic lobe. Significant difference was noticed in the weight of pancreas of group 1 of CARI Shyama and Vanaraja, respectively [Table-1]. Gland was comprised of capsule and parenchyma. Capsule was composed of fibrous connective tissue and comparatively thicker in Vanaraja than CARI Shyama in all age groups. Interlobular septa arised from the capsule, traversed into the parenchyma to divide it into lobules [Fig-1]. Lobulation was more distinct in chicks of Vanaraja, due to presence of wide interlobular septa, however, in other two groups lobulation was distinct in both the breeds.

The interlobular septa of Vanaraja were more cellular. The parenchyma of gland was composed of exocrine tubuloacinar units and endocrine islets. Number of acini was significantly more in chicks and pullets of CARI Shyama [Table-2]. In growers, acini were significantly more in Vanaraja with mean value 34.4 than CARI Shyama with an average 28.92, which indicated more exocrine activity in growers of Vanaraja to fulfill the increased demand of nutrients to attain more body weight as this breed has higher body weight than the CARI Shyama at this age. Diameter of acini increased with age, however maximum diameter of acini was significantly more in Vanaraja in each age group and minimum diameter of acini was significantly more in chicks and growers of CARI Shyama. Diameter of nuclei of acinar cell was more in growers of both breeds and significant variability was found in chicks and pullets. Islets became more distinct in older age and three types of islets were noticed viz., islets comprised mainly of alpha cell, islets with mainly beta cells and islets containing of both alpha and beta cells. In the present study, columnar alpha cells and polygonal beta cells were found in the islets respectively. Number of islets per section was significantly more in chicks of Vanaraja with an average value 8.66 than 6.66 in CARI Shyama, while in pullets of CARI Shyama with an average value 13.1 than 11.1 in Vanaraja. Number of cells per islet was significantly higher in chicks of Vanaraja than CARI Shyama and pullets of CARI Shyama with an average than Vanaraja [Table-3]. It indicated that islets were well developed at an early age in Vanaraja and in later age in CARI Shyama. Number of alpha cells was significantly more in chicks of Vanaraja with an average 7.8 than CARI Shyama (6.2). In other two groups comparatively, increased number of alpha cells was recorded in Vanaraja. Number of beta cells was comparatively more in CARI Shyama in each age group. More number of alpha cells in Vanaraja might be indicative of high blood glucose demand of this breed. Lymphoid aggregations between the pancreatic acini were evident at grower stage of both breed [Fig-2]. Occurrence of lymphatic aggregation was more frequent in vanaraja. Collagen fibers were present in the capsule, trabeculae or interlobular connective tissue and around the glandular units. Density of fibers around the glandular units was more prominent in growers and pullets.

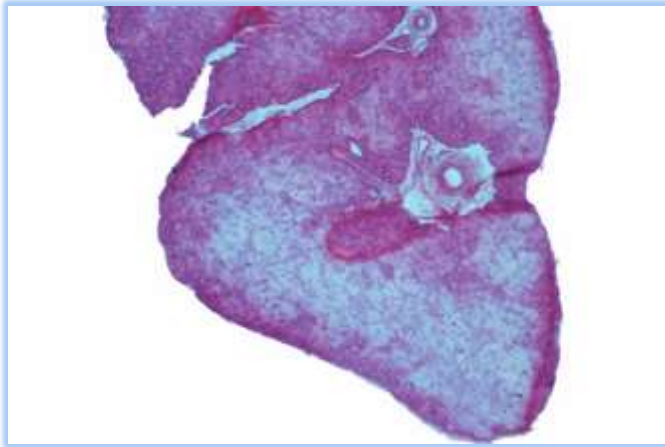


Fig-1 Photomicrograph of pancreas of CARI Shyama (group 1) showing capsule (c) and parenchyma (p) (H&E, 100X)

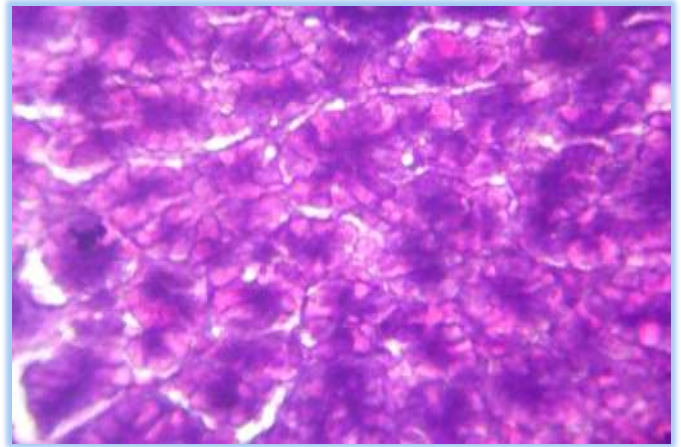


Fig-3 Photomicrograph of pancreas of CARI Shyama (group2) showing mild to moderate AB PAS activity (arrow) in glandular epithelium (AB-PAS, 400X)

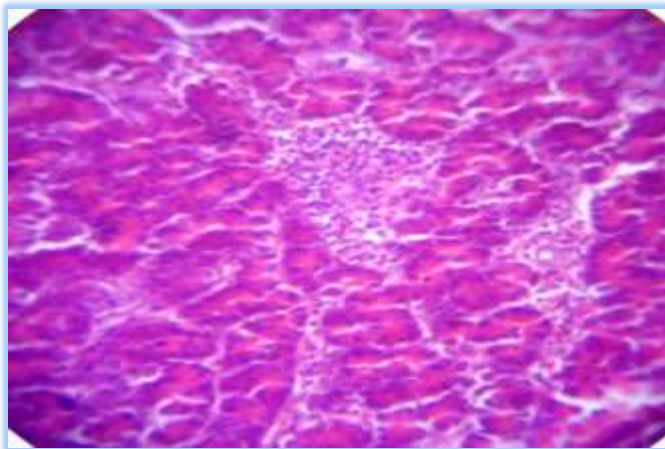


Fig-2 Photomicrograph of pancreas of CARI Shyama (group 2) showing lymphatic aggregation (arrow) and acini (a) (H&E, 400X)

Table-1 Gross Morphometrical Observations of Pancreas

Group	Parameter	Breed	
		CARI Shyama	Vanaraja
1	Weight (g)	0.074 ± 0.0003*	0.072 ± 0.003
	Length (cm)	2.85 ± 0.076	3.1 ± 0.003
	Width (cm)	0.20 ± 0.008	0.18 ± 0.11
2	Weight (g)	2.6 ± 0.16	3 ± 0.00001
	Length (cm)	9.69 ± 0.24	10.6 ± 0.4
	Width (cm)	0.62 ± 0.03	0.66 ± 0.02
3	Weight (g)	3.3 ± 0.15	3.4 ± 0.22
	Length (cm)	10.9 ± 0.49	11.05 ± 0.55
	Width (cm)	0.71 ± 0.026	0.75 ± 0.023

Mean values with * are significant ($P < 0.05$)

Table-2 Histomorphometrical observations of exocrine part of pancreas

Group	Breed	No. of acini/field (400X)		Diameter of acini/ tubule (µm)				Diameter of nucleus of acinar cells (µm)			
				Maximum		Minimum		Maximum		Minimum	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
1	Vanaraja	33.02	0.67	32.82*	1.16	23.52	0.72	3.56*	0.04	3.48*	0.04
	CARI Shyama	39.08*	0.89	32.64	0.84	27.12*	0.4	3.24	0.02	3.12	0.04
2	Vanaraja	34.4*	0.52	35.92*	1.4	19.76	0.52	4.16	0.04	3.92	0.08
	CARI Shyama	28.92	1.33	28.48	0.24	20.32	0.52	4.4	0.08	4	0.01
3	Vanaraja	29.69	2.02	40.48*	0.88	23*	0.44	3.96*	0.04	3.92*	0.03
	CARI Shyama	36.02*	0.44	27.52	0.6	18.44	0.32	3.68	0.04	3.56	0.04

Mean values with * are significant ($P < 0.05$)

Table-3 Histomorphometrical observations of pancreatic islets

Group	Breed	No. of islets per section		No. of cells per islet		No. of specific cells per islet			
						alpha		beta	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
1	Vanaraja	8.66*	0.23	14.2*	0.53	7.8*	0.44	7.8	0.44
	CARI Shyama	6.66	0.16	10.4	0.93	6.2	0.13	8.6	0.42
2	Vanaraja	7.8	0.38	24.2	1.8	18.1	2.37	17.5	0.54
	CARI Shyama	7.6	0.49	19.7	1.7	17.3	0.42	18.3	0.33
3	Vanaraja	11.1	0.36	38.8	1.47	26.7	1.35	24.5	1.43
	CARI Shyama	13.1*	0.64	48.7*	1.92	25.5	0.66	31.6	1.25

Mean values with * are significant ($P < 0.05$)

Density of fibers increased with age. Density of fibers was more in chicks and growers of CARI Shyama and pullets of Vanaraja. Elastic fibers were non-traceable in pancreas of chicks and growers, while presence of scanty fibers was noticed in capsule of pancreas of pullets. Reticular fibers were seen in capsule, interlobular connective tissue septa and around the pancreatic acini. Density was more in chicks and growers of Vanaraja. In growers of CARI Shyama, very fine

fibers around acini were also visualized. In pullets' fibers were coarse in CARI Shyama and fine in Vanaraja. PAS activity was noticed in the acini of pancreas. Intensity was moderate in chicks of CARI Shyama and mild to moderate in chicks of Vanaraja, moderate in growers of CARI Shyama, intense in growers of Vanaraja and mild to moderate in pullets of both breeds. In Pancreas AB-PAS positive material was noticed in the apical part of the acini.

In pullets, AB-PAS positive material was also observed in lumen of acini. Activity was very mild in all age groups; however, it was mild to moderate in growers of CARI Shyama [Fig-3].

Discussion

As reported in the earlier studies on poultry pancreas [3-5] in the present study pancreas was situated between two limbs of duodenal loop with 3 lobules, however some studies reported different lobulation pattern [6-8,19]. Histologically, capsular structure resembles with previous work [9,3,10,18], although indistinct lobulation was also reported [11] not resemble with the present finding. Parenchyma of gland was made up of exocrine and endocrine part. Exocrine part of gland was resembled with the previous research work [1,3,6], however morphometric variation between two species indicate that more exocrine activity is present in growers of Vanaraja than growers of CARI Shyama. This finding was also correlated with increased growth pattern in Vanaraja growers. In endocrine part three types of islets were identified [12,13], however some workers reported only two types of islets [3,11,14,19]. In the present study presence of columnar alpha cells and polygonal beta cells was similar with the previous findings [3,11,14]. More number of alpha cells were found in Vanaraja than CARI Shyama might be indicative of high blood glucose demand for rapid growth of this breed. Lymphatic aggregation between pancreatic acini was also found [1, 12]. Distribution pattern of connective tissue fibers was similar with the previous findings [1, 11, 16], however increase in the collagen fibers with increase in the age of birds may indicate the decrease pancreatic activity with senility. Fibers densities around the islets were absent and contradict the finding of previous reportings [11]. PAS and AB PAS activity was noticed, indicate the activity of pancreatic acini [16].

Conclusion

With slight differences, in the present study gross, histological and histochemical features of pancreas were similar with the pancreas of other birds. Morphometrically pancreatic acini were more developed in growers of Vanaraja correlated with more exocrine activity in these birds to attain more body weight at faster rate than the CARI Shyama.

Application of research: This research was taken in to consideration to evaluate differences in anatomical structure of pancreas of these two hybrids of poultry.

Research Category: Veterinary Anatomy

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Ethical Committee Approval Number: NIL

References

- [1] Mobini B. (2011) *Veterinary research forum*, 2 (1), 25-29.
- [2] Singh U.B. and Sulochana S. (1997) *Handbook of Histological Technique*. Premier Publishing House, Kothi, Hyderabad. pp. 42-63
- [3] Hodges R.D. (1974) *The Histology of the Fowl*. Academic Press, London, 35-112.
- [4] McLelland J. (1975) *Sisson and Grossman's The Anatomy of the Domestic Animals*, Vol. 2. 5th edn. Publ. W.B. Saunders Company, Philadelphia, 1857-1882.
- [5] Nickel, R., Schummer, A. and Seiferle, E. (1977) *Anatomy of the Domestic Birds (Translated by W. J. Siller and P.A. L. Wright)*, Verlag Paul Parey, Berlin, 75-81.
- [6] Turk D.E. (1982) *Poultry Science*, 61, 1225- 1244.
- [7] Gulmez N. (2003) *Journal of the Pancreas*, 4 (3), 125-128.
- [8] Kadhim K.K., Zuki A.B.Z., Noordin M.M., Babjee S.M.A. and Zamri S. M. (2010) *African journal of biotechnology* 9 (42), 7209-7215.
- [9] Bradley O.C. and Grahame T. (1960) *The Structure of the Fowl*. 4th edn. Publ. Oliver and Boyd, Edinburgh, London, 31-50.
- [10] Frappier B.L. (2006) *Textbook of Veterinary Histology*. 6th edn. Blackwell Publishing Ltd., Oxford, U.K., 208-211.
- [11] Calhoun M.L. (1954) *Microscopic Anatomy of the Digestive System of the Chicken*. Iowa State College Press, Ames, 1-108.
- [12] Aughey E. and Frye F.L. (2001) *Comparative Veterinary Histology with Clinical Correlates*, Massion Publishing Ltd., London, U.K., 134.
- [13] Simsek N. and Albay B. (2008) *Revue de Medicine Veterinaire* 159(4),198-206.
- [14] Bacha W.J. and Bacha L.M. (2000) *Colour Atlas of Veterinary Histology*, 2nd edn. Publ. Lippincott Williams and Wilkins, Baltimore, London, 121.
- [15] Shivkumar M., Basha H.S., Ushakumri S. and Vijayaraghvan C. (1998) *Indian Journal of Veterinary Anatomy* 10(1/2), 86- 87.
- [16] Vaish M.K. (2005) *Pre and post hatch developmental studies on digestive system of Kadaknath fowl*. M.V.Sc. Thesis, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, 25-58.
- [17] Dehkordi F. R.A. and Moradi H. (2015) *Veterinary Research Forum* 6(1), 49-54
- [18] Beheiry R.R. (2018) *Benisuef University Journal of Basic and Applied Sciences*.
- [19] Fesenko I. Miroshnik O. and Maslak Y. (2017) *Bulgarian Journal of Veterinary Medicine*, 2(1), 80-85.