

STUDY OF SOME ANATOMICAL AND HISTOLOGICAL CHARACTERISTICS IN LIVER OF MALE INDIGENOUS TURKEY (*Meleagris gallopava*)

Ahmed Saad Al-A'Araji

Department of Anatomy and Histology ,College of Veterinary Medicine, University
Baghdad ,Baghdad,Iraq

(Received 8 April 2015 ,Accepted 18 August 2015)

Key words: Hepatocytes ,Liver, Turkey.

ABSTRACT

The present study was performed to illustration some anatomical and histological characteristics of the liver of adult male local turkey. The present study was conducted on 20 turkeys divided into two groups (10 for anatomical study and 10 for histological study) mature male healthy turkey were used. The anatomical results showed that the liver of male turkey located in the right and left hepatoperitoneal cavity, it has red- brown to dark brown in color and it consisted of right and left lobes, left lobe subdivided into dorsal part and ventral part. The present study revealed that the weight of the liver was $(1.89 \pm 0.112)\%$ in relation with the body weight. From the result of the histological study was noted there was no clear distinct limited between lobules in the hepatic parenchyma, the hepatocytes are usually arranged as two cell thickness between the liver sinusoids, the sinusoids lined by endothelial cells contract with the kupffer's cells. The portal area contained branch of portal vein, branch of hepatic artery and 2-3 inter lobar bile ducts.

INTRODUCTION

The liver in birds is one of the largest, most important organ in the body. It has numerous functions, as in other vertebrates, including digestive functions, metabolism of proteins, fats, and carbohydrates, synthesizing and secreting bile which contains two bile pigments, bilirubin and biliverdin into the small intestine (1,2).

The avian liver is suspended by peritoneum that is connected with overlying air sac and surrounded by hepatic celomic cavities (3,4). The avian liver has two lobes, it's in most avian have the right lobe larger than the left one for example, in pigeon, bustards and ostrich (5,6,7), while the two lobes can be of equal size, for example, in Galliformes (8). However, the left lobe of the domestic fowl divided into the dorsal and ventral parts (3,9)

The avian liver is covered by a peritoneal layer of mesothelium, under this layer the dense connective tissue. The liver of avian similar to that in mammals but there is some differences such as absent connective tissue septa between lobules except in portal area (8).

The principal cell of avian liver is the hepatocyte. Avian hepatocytes are polyhedral cells with a large rounded, oval and centrally located nucleus, the sheets of hepatocytes are separated by sinusoids.(6, 10 and 11).

In both birds and mammals, the sinusoids lined by endothelial cells and Kupffer's cells, and the perisinusoidal spaces may be linked directly by penetrating

traversing the endothelial cells or by intercellular gaps in the sinusoidal linings, forming a mass of branching and hollow cords, their lumina called the bile (12).

The hepatocytes drain the bile substance into bile canaliculi that located on opposite side of the hepatocytes from Disse's space. The bile canaliculi drain this substance into the interlobular ducts of the portal area, the portal area has also hepatic portal veins which drain into the hepatic sinusoids and hepatic arteries also connected with the sinusoids by arterioles (8).

The aim of this study was to carry out some anatomical and histological study description of the liver of turkey in order to show some possible difference with respect to other avian species.

MATERIALS AND METHODS

Ten adult male turkey were obtained from commercial market of Al-kut and Baghdad district at winter season. All studied birds were free of any diseases or lesions, therefore; they were considered to be apparently normal. The birds were anesthetized by intramuscular injection of a mixture of ketamine and diazepam at dose 25,5 mg/kg of body weight then killed(13). Then specimens were cut from different areas of liver. The processing of Fixation, dehydration, clearing, embedding and cutting were made, H&E were used (14). Statistical analysis was obtained by used to spss to calculate as standard deviation and standard error for anatomical parameters in liver (15).

RESULTS AND DISCUSSIONS

The anatomical result showed that the liver of the male turkey located in the right and left hepatoperitoneal cavity, it has red- brown to dark brown color (Fig. 1). This result agreed with (16) who said that the normal color of the adult male geese was red-brown to dark brown and disagree with (3) who remained that the normal color of the avian liver depends on the nutritional state of the bird and it is red-brown or it may be light brown but it is yellow if the bird is on a high-fat diet.

The liver of male turkey consisted of right and left lobes, left lobe subdivided into dorsal part and ventral part while right lobe un divided (Fig. 2), this result agreed with (5,10, 17) whom mentioned that the liver of domestic fowl consist of two lobes the left one subdivided into the dorsal and ventral parts, while there were no further lobular subdivisions in the liver of Houbara Bustards (5) and in contrast with (18 and 7) whom described that the left lobe in ostrich is subdivided into a small caudodorsal part, a large caudoventral part and a small left intermediate part.

The liver weight of the male turkey was $(1.89 \pm 0.112)\%$ in relation with the body weight. This is less than in geese that the liver weight $(2.105 \pm 0.071)\%$ relation with the body weight which reported by (16). This variation in weight was explain by (5) who remained that the type of food reception appears to have an important correlation with liver size relative to body size. Behind this, (19) was indicate the metabolism of proteins, fats , and carbohydrates is high in liver of snow geese and the weight of liver changes in relation to the level of food consumed which responsive to dietary changes.

The histological results were declared there was no clear distinct limited between lobules in the hepatic parenchyma of turkey's liver, due to paucity or absence of the interlobular connective septa, except in the portal area; each lobule has central vein (Fig. 3 and 4), this is similar to the results pointed by (20, 21) in chicken and (8) in psittacine.

The histology picture of the liver in turkey was composed of plates of hepatocytes which are usually arranged as two cell thickness between the liver sinusoids, these are hepatic cords, these cells ordered radially around the central vein (Fig. 5). This finding was in agreement with that of (22) in duck, (20) in chicken (8) and in domestic birds. (22) referred that the hepatic cords and blood sinusoids run beside each other in a continuously branching and interlocking structure, this is give the standard suitable for metabolic interchange between the two systems.

The hepatocytes are polyhedral in shape and it had cytoplasm contain many granules with their ovoid nucleus which had distinct nucleolus. The sinusoids lined by endothelial cells that are nearly flattened in shape with presence of the kupffer's cells contract with endothelial cells, last cells had large nucleus with some debris in cytoplasm, the sinusoids continued with the hepatic vein and portal vessels (Fig.6). The similar findings were previously reported by (12) in chicken and (23) in ostrich.

The portal area contained the inter lobular connective septa which composed the branches of the portal vein, branch of hepatic artery and usually 2-3 branch of bile ducts (Fig. 4). The bile duct lined by simple cuboidal epithelium, while the hepatic artery lined by endothelial cells of the simple squamous epithelium protruded into the lumen containing RBCs and a layer of smooth muscle fiber more thicker than that of the branch of the portal vein which is lined by endothelial cells, protruded into the large lumen (Fig.4, 6), this result correspond with the reported of some authors as (4) in duck, (8) in pssitacine and (20) in chicken.

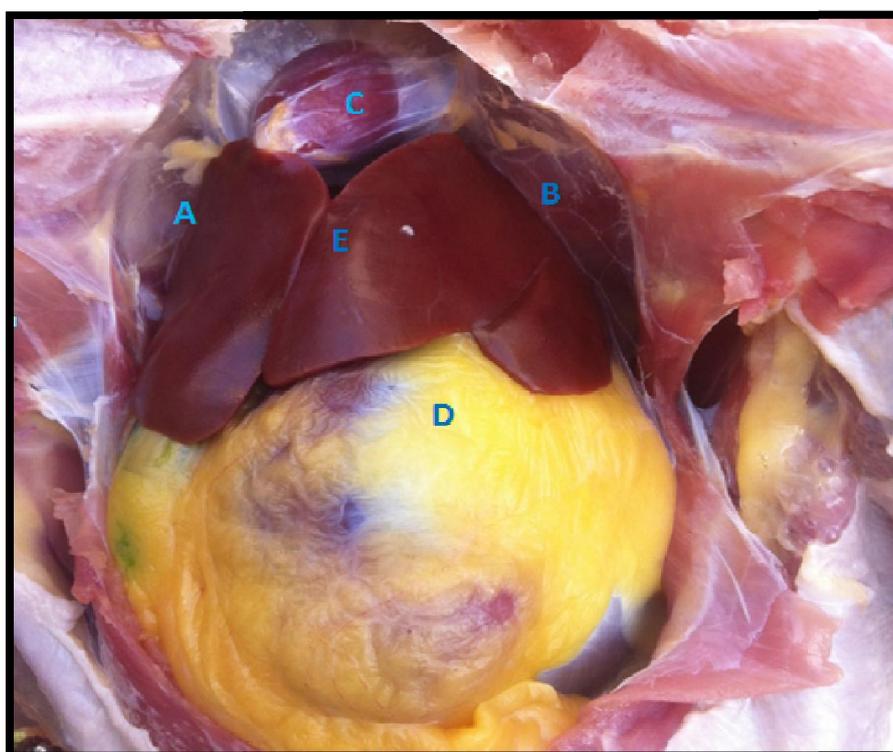


Figure (1): Photograph illustrate position of Trukeyliver . A- righthepatoperitoneal cavity. B- righthepatoperitoneal cavity. C- heart. D- gizzard. E- liver.

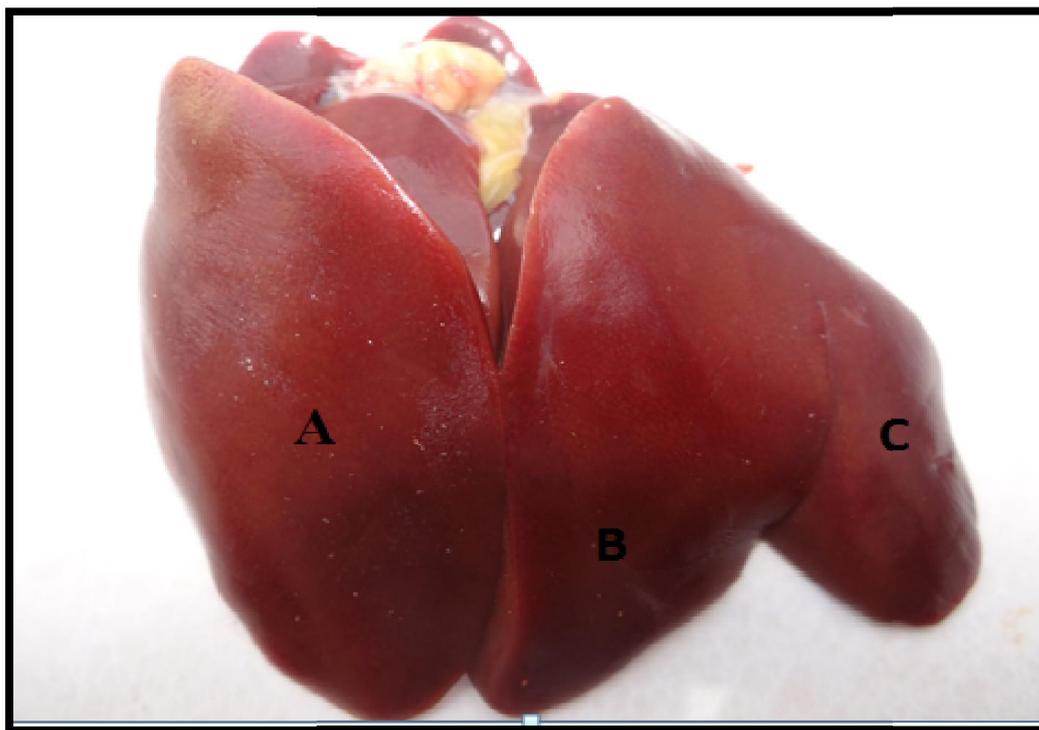


Figure (2): Photograph show parietal surface of livershow A- right lobe . B- dorsal part of left part . C- ventral part of left lobe .

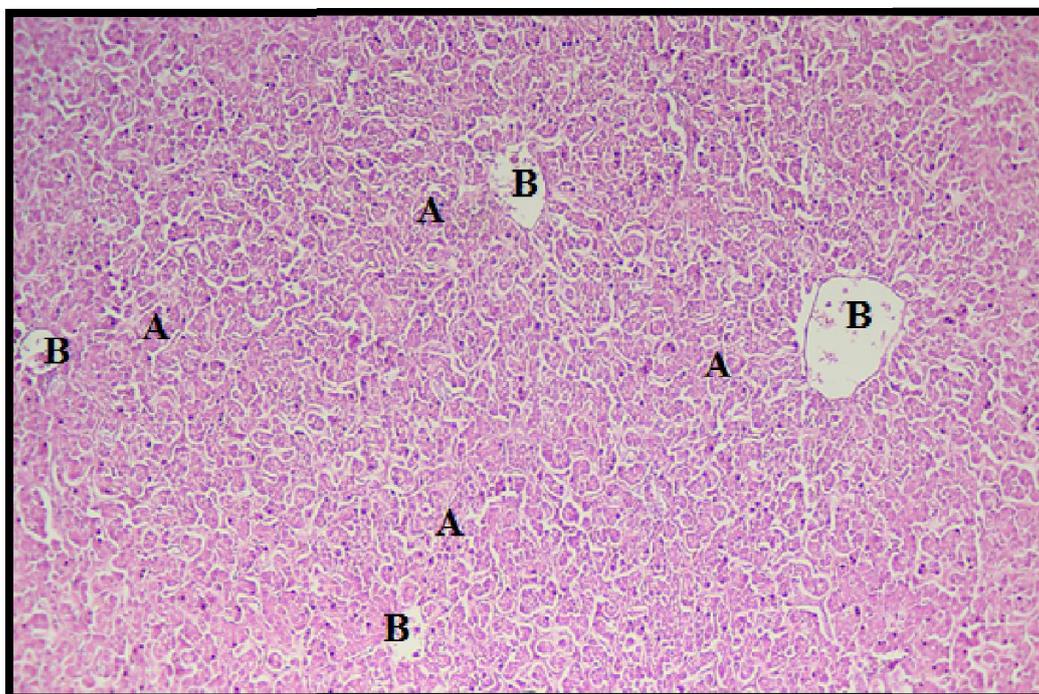


Figure (3): hepatic parenchyma of liver in turkysow A- no distinct lobules . B- central vein. H & E (4 X)

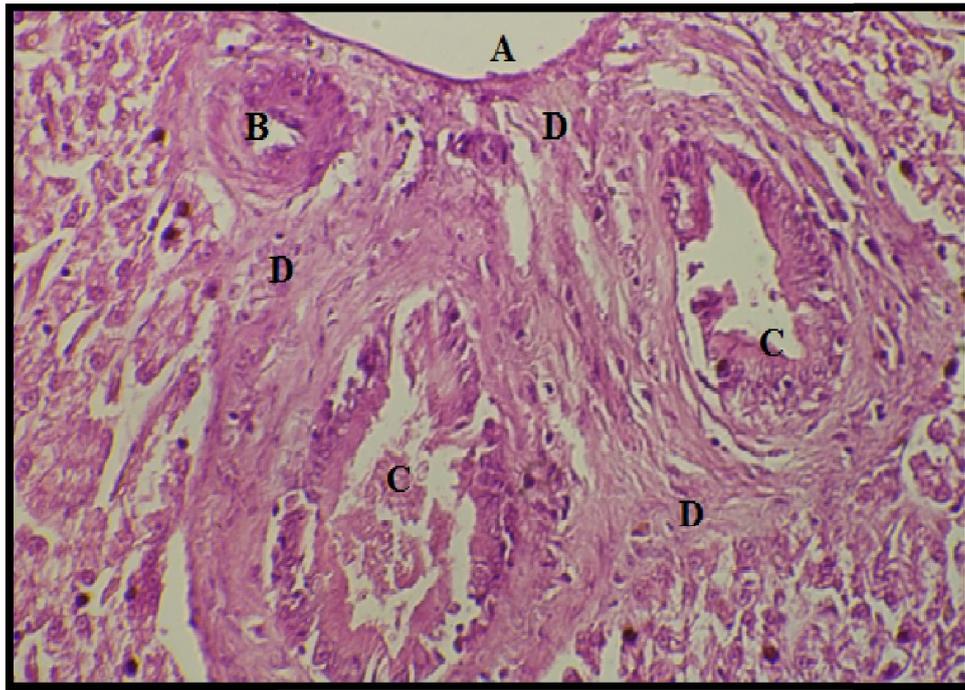


Figure (4): Portal area of the liver of turkey show A- branch of portal vein. B- branch of hepatic artery . C- branch of bile duct. D-connective tissue septa . H & E (20 X).

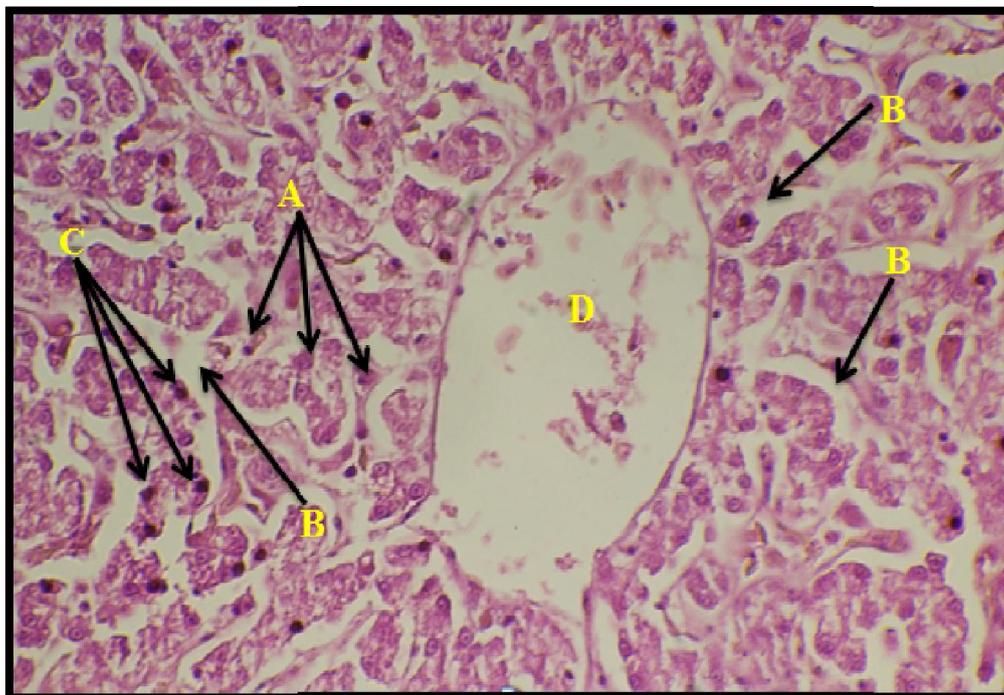


Figure (5): Histological section at liver of male turkey show A- hepatocytes . B- sinusoids C-Kupffer cells. D-central vein.H & E (40 X)

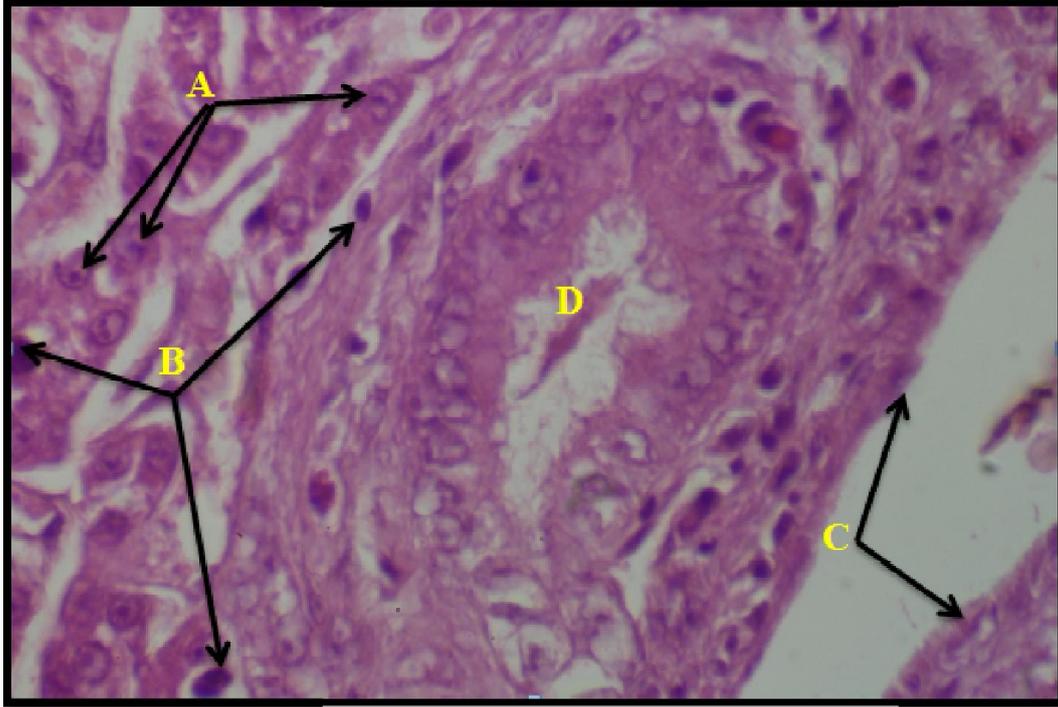


Figure (6): Histological section at liver of male turkey show A-nucleus of hepatocytes. B- nucleus of Kupffer's cells. C-endothelial of portal vein. D-endothelial of bile duct. H & E (100X)

دراسة بعض الصفات التشريحية والنسجية لكبد ذكر الديك الرومي المحلي

(*Meleagris gallopava*)

أحمد سعد الأعرجي

فرع التشريح، كلية الطب البيطري ، جامعة بغداد ، بغداد ، العراق .

الخلاصة

اجريت الدراسة الحالية لتوضيح بعض الصفات التشريحية والنسجية في كبد الديك الرومي المحلي البالغ. في هذه الدراسة تم استخدام عشرين طيرا (عشرة للدراسة التشريحية وعشرة للدراسة النسجية) من الديك الرومي البالغ الخالي من الامراض. اظهرت النتائج التشريحية لكبد الديك الرومي انه يقع في تجايف الكبد الخلفية اليمنى واليسرى وانه ذات لون بني محمر إلى بني قاني ويتكون من فص ايمن وفص ايسر، الفص الايسر مقسم الى جزء ظهري وجزء بطني. بينت الدراسة بان وزن الكبد هو $(1,89 \pm 0,112)$ % مقارنة الى وزن الجسم. تبين من الدراسة النسجية ان الحدود بين الفصيصات غير واضحة في متن الكبد ، وان الخلايا الكبدية تصطف بسمك خليتين بين الجيبانيات والجيبانيات مبطنة بخلايا بطانية وبتماس مع خلايا كوفر وان المنطقة البوابية تحتوي على فرع الوريد البوابي وفرع من الشريان الكبدي و 2-3 من القنوات الصفراء بين الفصوص.

REFERENCES

- 1- Dibner, J. J. and Richards, J. D. (2004). The Digestive system: Challenges and opportunities. Missouri, *J. Appl. Poult. Res.* 13: 86–93.
- 2- Klein, R. M. and Enders, G. C. (2007). Anatomy, Histology, and Cell Biology PreTest™ Self-Assessment and Review. 3rd Ed. McGraw-Hill Companies, New York. PP: 29-31.
- 3- Clark, F.D. (2005). Normal bird, a review of avian anatomy. *Avian Advice.* 7:1(1-3).
- 4- Campbell, T.W. (2000): Common disorders of the avian Liver. *Exotic Pet Practice.* 5 (8): 57-64.
- 5- Bailey, T.A.; Mensah, E.P.; Samour, J.H.; Naldo, J.; Lawrence, P.; and Garner, A. (1997). Comparative morphology of the alimentary tract and its glandular derivatives of captive bustards. *J. of Anat.* 191:(387-398).
- 6- Yoshida K, Yasuda M, Nasu T, Murakami T. 2010. Scanning electron microscopic study of vascular and biliary casts in chicken and duck liver. *J Vet Med Sci.* 72: 925-928.
- 7- Stornelli, M. R.; Ricciardi, M. P.; Giannessi, E. and Coli, A. (2006). Morphological and histological study of the ostrich (*Struthio Camelus L.*) liver and biliary system. *Iit. J. Anat. embryol.* 111 (1): 1-7.
- 8- Schmidt, R.E.; Reavill, D.R. and Phalen, D. N. (2003). Pathology of pet and aviary birds. 1st ed. Blackwell Publishing company, Iowa state press, Iowa. PP: 67-68.
- 9- Sivgnanam, S.; Geetha, R. (2008). Histological studies on the gall bladder and biliary system in Guinea fowl, *Indian J Vet Anat.* 20 (1): 60-61.
- 10- Dyce, K.; Sack, W.O. and Wensing, G.J.G. (2002). The digestive system: Text book of Veterinary Anatomy. 5th ed. W.B. Saunders Co. U.S.A. Pp: 806-811 .
- 11- Whitlow, G.G. (2000). Gastrointestinal Anatomy and Physiology: Avian Physiology . 5th ed. Academic Press ,Honoiula.Hawaii. Pp: 299-304.
- 12- Wong, G.K. and Cavey, M.J. (1992). Development of the liver (Hepatic cords and sinusoids) in the chicken embryo. *Anatomical Record.* 234:(555-567).
- 13- Schindala, M.K. (1999) . Anesthetic affect of Ketamine with Diazepam in Chicken . *Iraqi Vet. J. Sci.* 12 : 261-265 .
- 14- Bancroft, J.D. and Stevens, A. (2013): Theory and Practice of Histology Techniques. 8th ed. Churchill Livingstone. Pp:127-129.
- 15- Joda, M. (2008). The progressive statistical analysis by using spss. 1st ed. Wales house edition, Amman, Jordon.
- 16- Subhan, Sh. N. (2009). Anatomical, Histological and Radiological Study of the Liver, Gall bladder and Biliary Duct System of Male Local Breed Geese, *Anseranser*(Greylag Goose). Thesis of M. Sc. University of Sulaimani. college of Veterinary Medicine

- 17- Caceci , T. (2006). Avian digestive system. 3th ed. Academic Press ,Itheca ,New York. Pp;1-94.
- 18- Bezuidenhout, A.J. (1999). Anatomy of Ostrich: The Ostrich biology, Production and Health.1st ed. UK CABI Publishing, Oxon. Pp: 29- 41.
- 19- Ankney, C. D.(1977). Feeding and digestive organ size in breeding lesser snow geese. *The Auk*. 94 (2): 275-282.
- 20- Melleland, J. (1993). Pericardium, pluera and peritoneum. In: Baumel, J. J.; King, A.S.; Breazile, J. E.; Evans, H. E. and Berge, J.C.V.(eds.). Handbook of avian.
- 21- Bacha, W. J. and Wood, G.L.M. (2006). Avian Digestive System .Color Atlas of Veterinary Histology .William and Wikins .Waverlly Company .Hong Kong Pp:113-150.
- 22- Abdelwahab, E.M.(1987). Ultrastructure and arrangement of hepatocyte cords in the duckling's liver. *J. of Anat*. 150: (181-189).
- 23- Chagas, M.A.; SILVA, B.X.; BATH, F.V.; Babinski, M.A. &Figuefredo, M.A. 2007. Histologic structure of the parenchyma and stroma of the young ostrich (*Struthiocamelus*) liver. *RevistaBrasileiraMedicinaVeterinaria J.*, 29: 61-64.