

## MORPHOLOGY, HISTOLOGY AND HISTOCHEMICAL STUDY OF KIDNEYS IN THE IRAQI FALCON (*FALCON BERIGORA*)

Nadhim A. Shehan, Haifa A. Hussein\*, Sameera A. Da'aj and Swssen A. Ali

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

(Received 28 November 2019, Revised 7 January 2020, Accepted 25 January 2020)

**ABSTRACT :** The present study deal with Iraqi Falcon (*Falcon berigora*) showed the kidneys were dark brown color. It extended to the caudle margin of lungs to caudal end of synscurm also each kidneys consisted the three lobes cranial, middle smaller part and caudal parts. Histological study observed the kidneys were have three lobes, each lobe was subdivided into cortex and medulla con. The kidney was covered with capsule watch composed by collagen fibrous, small as cortex contain two types of renal capsules, mammalian glomeruli revealed larger also well-developed loop of henle with thick and thin segment, the second type called reptilian glomeruli was small with lacked the lope of henle. The glomeruli surrounded by Bowmen's capsule and composted of center core of masongial cells. Anther structure of cortex were proximal convoluted tubules were lined by simple cuboidal epithelium with brush border and narrow lumen, while the distal convoluted tubules lined by simple cuboidal epithelium and wide lumen. The study of medulla con showed consisted of collecting duct interweaved between the thick and thin lamb of lope heal, also the collecting tubules were lined by columnar epithelium.

Histochemical study was observed distribution of collagen fibrous on capsule, cortex and medulla con when stained by Masson's Trichotomus stain also the study showed positive reaction for proiodic acid Schiff's (PAS), where present the polyscharied granules within cytoplasm of epithelia cell of proximal convoluted tubules, lumen brush border and basement membrane, also within the basement membrane and lumen of thin and thin limb of henle lope. The cytoplasm epithelial cell of distal convoluted tube and collecting tubules showed dark blue color this indicated positive reaction for acid mucopolyscharids granules when staining by Alcian blue (2-5 ph). When stained section by Mercury Bromophenol blue for protein showed result positive reaction in the renal cortex such as in proximal convoluted tubules also within the thick and thin limb at henle loop and collecting ducts.

**Key words :** Iraqi Falcon, kidney, morphology, histology.

### INTRODUCTION

The kidneys are important organs in the body duck to many play roles function such as conserve fluid components necessary to maintain homeostasis while ridding of the body metabolic products, also excess water and electrolytes by form of urine and the ability for conserve ions or water may be relationship with the structure of nephron (Dellman and Eurell, 1998; Reece, 2004).

The kidney of bird is flatted organs embedded in ventral surface of synsacum bone and each kidney consist of three lobes, cranial middle and caudal lobe (Bachaulg and Wood, 1990; Nabippour *et al*, 2009; Batah, 2012; ALAJeely and Mohammed, 2012), when study on kidney of chicken, Avian kidney, coot bird, Racing pigeon, respectively. Notice each (Abood *et al*, 2014; Mobini and Abdllahi, 2016) the lobule kidney in some birds composite of two parts, long medulla that surrounded by

cortex and forming many renal cones and another avian kidney has no renal pelvic, this it drains throughout pair of ureter, too the structure of avian kidney has two type of nephrons, reptilian and mammalian types (Brun and Pacelli, 1991; Gasotti and Braun, 2004; Nabippour *et al*, 2009; Oliaii and Mobini, 2017) observe the difference in the pH reaction at different kidney nephron play an important role in expulsion nitrogenous waste product.

Due to play important role function of kidney, so the major aim of this study is to know morphology, histology and histochemical structure of kidneys in Fraqian Falcon (*Falcon berigora*).

### MATERIALS AND METHODS

Birds (Falcon) collected from Basrah Market. After being sure were free of any infection. The birds were slaughtered and the kidneys removed from synscurm. The specimen (kidneys) washed with physiological solution 0.9%, after washed the kidneys were placed in 10%

\*Corresponding author

Neutral Buffered formalin for 48 h. Through a series of graded ethanol alcohols, xylene and eventually into paraffin wax. Paraffin section were stained by haematoxylin and eosin (H and E), Masson trichrome, Periodic acid schiff (PAS), Alcian Blue and Mercury bromophenol blue. The examination and photo by olympus microscope (Luna, 1968; Buncroft and Stevens, 2010; Widhu and Trivedi, 2012).

## RESULTS

### Anatomical study

The anatomical study of kidneys in the falcon (*Falcon berigora*) showed the kidneys were brown dark color, each kidney composed of three parts, cranial, middle (smaller) part and caudal part. The kidney extended to the caudal Morgan of lungs to caudal end of the synsacrum (Fig. 1).

### Histological results

In present study showed the kidneys were had three lobes, each lobe was subdivide in to cortex and medulla



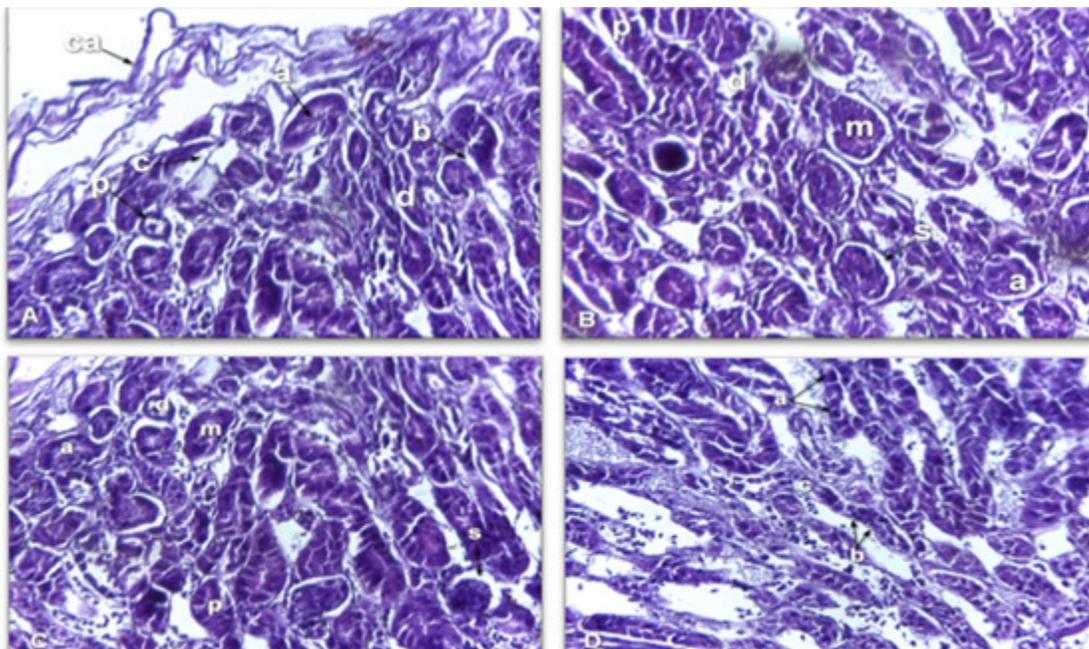
**Fig. 1 :** The kidney of falcon (a) cranial lobe (b) medium lobe (c) caudal lobe.

cone, each kidney was covered by the capsule which consist by collagen fibrous of connective tissue. The cortex contain two types of renal corpuscles the first type called mammalian glomeruli showed large and well developed loop of Henle with thick and thin segment, while another type of glomeruli called reptilian glomeruli which characterized by small renal glomeruli and lacked the looped of henle (Fig. 2A, B).

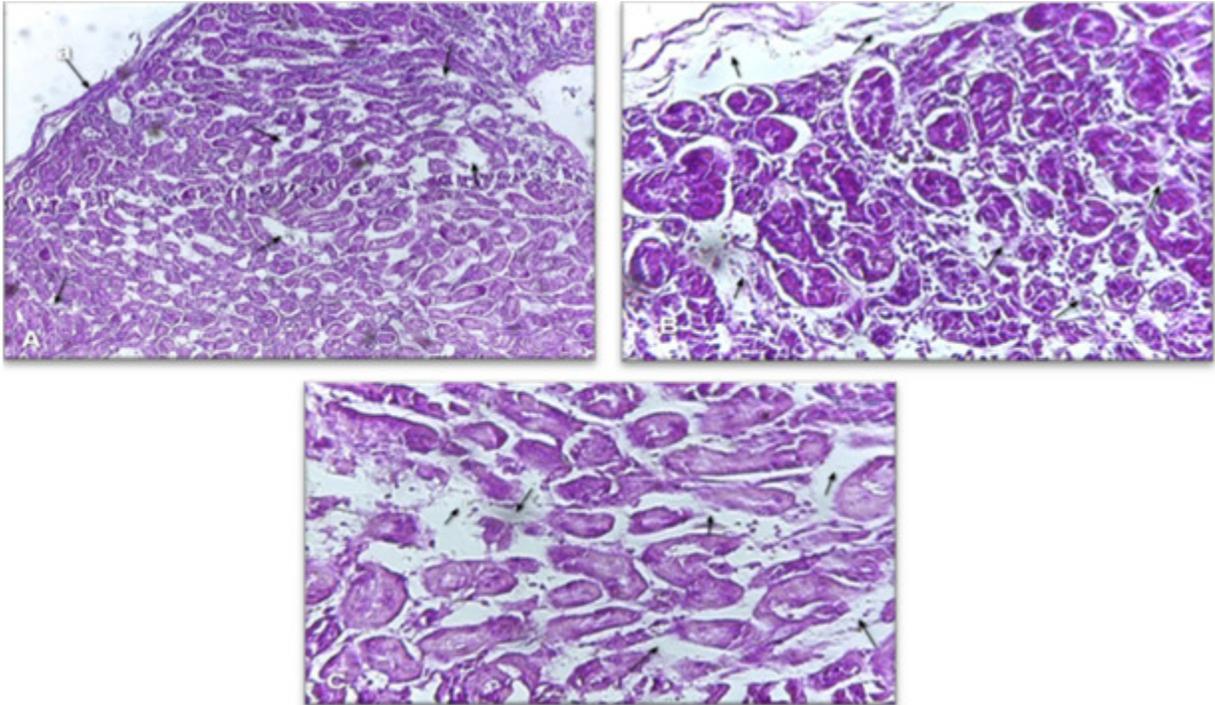
The renal corpuscle has consisted of the glomeruli which surrounded with Broman's capsule and composed of center care of masangial cell (Fig. 2 C, D). Another couponed of cortex was proximal and distal convoluted tubules. The proximal convoluted tubules were lined by a simple cuboidal epithelium showed brush border with the narrow lumen, while the distal convoluted tubules characterized by wide lumen and lined by simple cuboidal epithelium with smooth apical surfaces (Fig. 2 C, D). The medulla cone composed of the collecting duct interweaved between the thick and thin limb of lope henle. The collecting tubules were lined with columnar epithelium while the thick limbs were lined by cuboidal epithelium and thin limb of henle were lined by flat epithelium cell (Fig. 2 D).

### Histochemical study

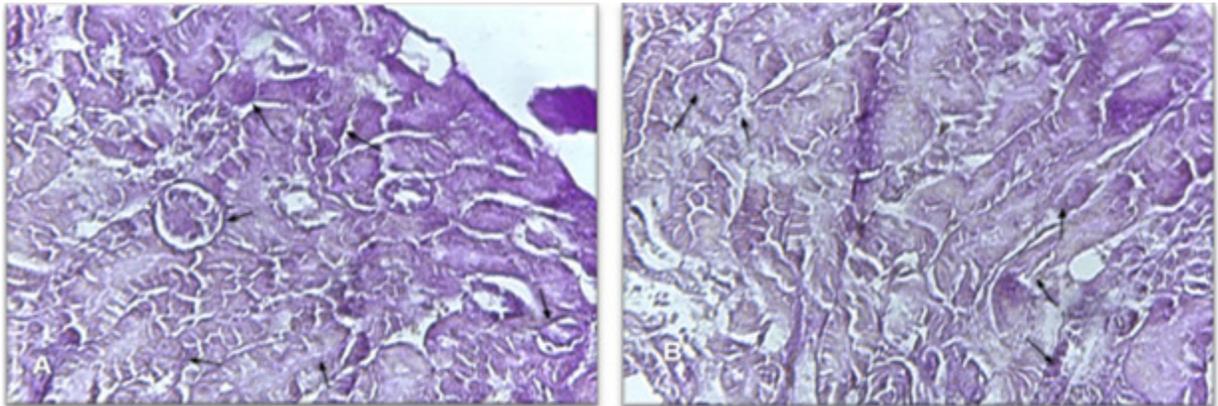
Histochemical study noticed a positive reaction for Masson Trichotoms to distribution of collagen fiber on renal capsule as well as diffused collagen fibers in all parts of the cortex and extended within the medulla cone



**Fig. 2 :** Cross sections of kidney (A) ca-capsule c-cortex p-proximal convoluted tube d-distal convoluted tube a-mammalian glomeruli b-reptilian glomeruli H & E stain 40X. (B) a-mammalian nephron, m-mesangial cell d-distal convoluted tube p-proximal convoluted tube, s-space H & E stain 40X. (C) a-glomerular nephron, m-mesangial cell d-distal convoluted tube p-proximal convoluted tube, s-space H & E stain 40X. (D) a-thick limb of henle loop-thick segment limb of henle, c-collecting duct H & E stain 40X.



**Fig. 3 :** A cross sections of kidney (A) distribution of collagen fiber in the renal capsule, cortex and medulla, Masson Trichotoms stain 10X. (B) distribution of collagen fiber in the renal capsule and cortex, Masson Trichotoms stain 40X. (C) distribution of collagen fiber in the parenchyma of medulla, Masson Trichotoms stain 40X.



**Fig. 4 :** A cross sections of kidney (A) distribution of polysaccharide granules within the renal cortex, PAS (Periodic acid Schiff's stain) 40X. (B) distribution of polysaccharide granules within medulla cone, PAS (Periodic acid Schiff's stain) 40X.

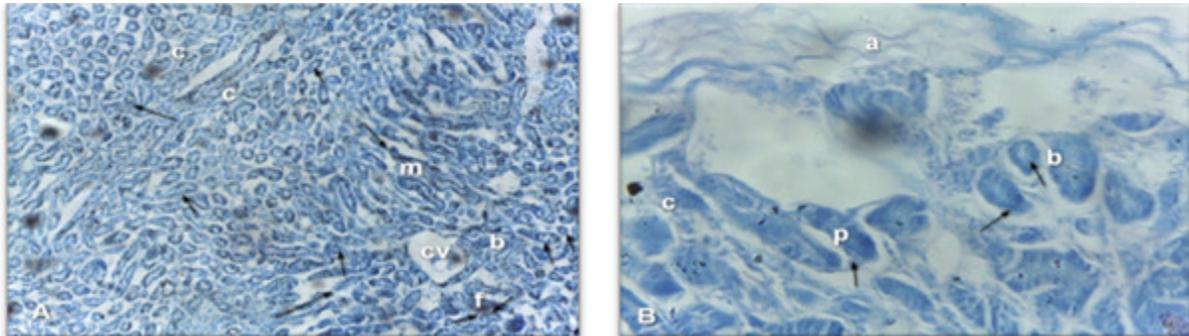
(Fig. 3 A, B, C). Elucidate result present the polysaccharides granules within the structure of renal cortex and medulla, where found the granules in the cytoplasm of lining epithelium cells of proximal convoluted tubules, lumen brush border and basement membrane, also the present granules in the basement membrane and lumen surface of thick and thin limb of henle when stained by Periodic acid Schiff's (PAS) (Fig. 4 A, B).

When stained by Alcian blue 2.5 for present the acid mucopolysaccharides, the study showed present the acid mucopolysaccharides granules within the cytoplasm of lining epithelial cells of distal convoluted tubules and collecting tubules of medulla cone (Fig. 5 A, B). When stained by Mercury Bromophenol blue revealed that the

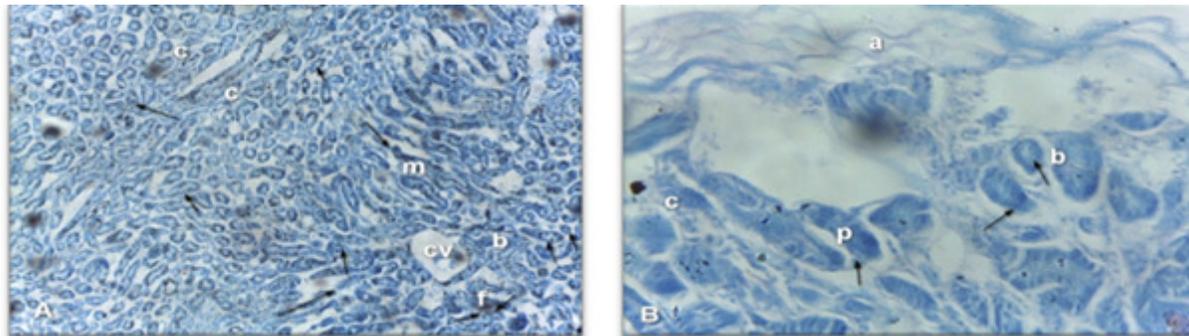
protein within the some structures of renal cortex such as present in proximal convoluted tubules mammalian Germuli which give dark blue color indicates positive reaction for protein in renal cortex, as well as the protein present in the medulla cone such as within thick and thin limb of henle loop and collecting duct (Fig. 6 A, B).

#### DISCUSSION

The kidneys in Falcon (*Falcon berigora*) brown dark color, consist three parts cranial, middle and caudal part. The middle is smaller size this result compatible with AL A Jeely and Mohammed (2012), when studies the kidneys in coot birds and vacing piyeon kidneys as well similar with Michale *et al* (2016) when study of kidneys



**Fig. 5 :** shows cross section of kidney (A) distribution of acid mucopolysaccharide granules within distal convoluted tubules and collecting tubule (Alcia blue stain) 10X. (B) distribution of acid mucopolysaccharide granules within proximal and distal convoluted tubules (Alcia blue stain) 40X.



**Fig. 6 :** Cross section of kidney (A) distribution of protein in c-cortex, b, m- medulla, collecting tube and f- thick and thin segment of henle (Mecury Bromophenol blue stain) 10X. (B) distribution of protein in the a-capsule, c-cortex, p- proximal convoluted tubules b- glomeruli (Mecury Bromophenol blue stain) 40X.

breed in emu (*Dromaius nova cholleading*) the histological of present explained the kidneys formed three lobe, each lobe was subdivide into cortex and medulla cone. The cortex larger than the medulla cone, this agree with Wurui (1987) when study on the kidneys in rock doc and mallard duck (*Anas platyrhynchos*).

The study observed the kidneys covered by collagen fibers of connective tissue, this is supported with AL A Zowy (2005) in domestic fowl's and geese and AL A Jeely and Mohammed (2012) when study of kidney in (Racing pigeon). The cortex composed to renal glomerulus, the large glomeruli called mammalian glomeruli which found sub capsular while on the glomeruli were smaller called reputation glomeruli, this result agreement with same for pointed all (Batah, 2012), when study on the kidney in coot bird and Harrier (*Circus auergionsus*), respectively. While dis agreement with Sivakumar *et al* (2012), where refers the cortex contain three glomerulus, mammalian glomeruli's, intermedial glomeruli and relation glomeruli.

The renal capsular was consisted of the glomeruli which surround by Bowman's capsule and center core of massaged cell, other parts of renal capsular proximal and distal convoluted tubules. The proximal convoluted tubules were lined by a simple cuboidal epithelium tissue

observed brush border with the narrow lumen also the distal convoluted tubules which lined by simplecuboidal epithelium, but the lumen was wider these result correspondent by the studies on the all avian kidneys such as similar with Casotti (2001), also agreement with Sreeranjini *et al* (2000), when study on kidneys of Japanese quail.

The study refers were the medulla made up the collecting duct interwove between the thick and thin limb of henle. The collect tubules were lined by columnar epithelium while the thick limbs lined with cuboidal epithelium but thin limb were lined by flat epithelial cell, this is compatible by Bachaulg and Wood (1990).

The histochemical study referred to present collagen fibrous of renal capsule which expended into the prencyema and into lobules as reported by Sivakumar *et al* (2001). The study showed the positive reaction for preiodiac acid Schiff's (PAS) around the present polysaccharidesgranules within cytoplasm of epithelial cell in proximal convoluted tubules, lumen brush border and basement membrane of lumen surface of thick and thin limb of henle. This consistent with the result of Nobipour (2008), when study on renal cortex of Guiana fowl and avian kidney respectively also reported by Sreeranjini *et al* (2000), when study on kidney in Japan's quail.

The distal convoluted tubule and collecting tubules were showed positive reaction for acid mucopolysacrids granules for three dark blue color. This agreement with Reshag *et al* (1917), while disagree with Sreeranjini *et al* (2000), Nobipour (2008), who stated the collecting duct did not give positive reaction in alcian blue (2.5) in insectivorous birds.

The study were showed positive reaction for Mercury Bromophenol blue stain when dark color appear within some structure of cortex and medulla con. This result was coincided with observation of Reshag *et al* (1917).

## REFERENCES

- Aboud A D, Ali F, Rasha S K and Myson A (2014) Comparative Feature of the kidney in Harrier (*Circus oregonus*), chicken (*Gallus domesticus*) and Mohard duck (*Anas platyrhynchos*). *Iraqi J. Vet. Med.* **38**(1), 107-113.
- AL A Zowy N H (2005) Comparative anatomical and histological study of kidney in domestic Fowls and geese. *M. Sc. Thesis*, College of Veterinary Medicine, University of Baghdad, Iraq.
- AL A Jeely R A and Mohammed F S (2012) Morph-Histological Study on the development of kidney and ureter in hatching and adulthood racing pigeon (*Columba livia domestica*). *Int. J. Sci. Nat.* **3**, 665-673.
- Bachaulg J and Wood G L M (1990) *Avian urinary system in color atlas of veterinary histology*. William and Wilkins. Waverly company, Hong Kong. 164-174.
- Batah AL (2012) Morphological and Histological study for the kidneys of coot bird (*Fulica atra*). *Basra J. Vet. Res.* **11**, 128-136.
- Brun E J and Pacelli M M (1991) The Backing of uric acid avian urine. *Fed. Am. Soc. Exp. Biol. J.* **5**, A 1408.
- Buncraft J D and Stevens A (2010) *In theory and practice of Histological Technique*. 2<sup>nd</sup> Edn. Churchill Livingstone, UK (view Article).
- Casotti G (2001) Effect of season on kidney morphology in sparrow. *J. Exp. Biol.* **204**, 1201-1206.
- Dellman H D and Eurell J (1998) *Text book of veterinary histology*. fifth Edition, Lippincott. William and Wilkins, Philadelphia. 213-217.
- Gasotti G and Braun E J (2004) Protein location and Elemental composition of urine Avian species. *J. Exp. Zool. Part A, Comp. Exp. Biol.* **301A**, 579-587. <https://doi.org/10.1002/jez.a.85>
- Lun LG (1968) *Manual of Histological staining method of armed forces institute of pathology*. 3rd edition. New York . U. S. A pp: 39-110.
- MicHALE K, Danuta S, Proteomic G and Danita M (2016) Anatomical and morphological study of the kidneys of breeding omu (*Dromedus novaehollandiae*). *Turk. J. Zool.* **40**, 314-319.
- Mobinin B and Abdllahi M (2016) Effect of sex on histological structures of different parts of the kidney in Japanese quail. *POUHYR Sci.* **95**(9), 214-550.
- Nabippour A, Alishah E and Asadian M (2009) Some Histological and Physiological Feature of avian kidney. *J. Appl. Anim. Res.* **36**, 195-198.
- Nobipour A (2008) Histological structure of the kidney insectivorous Bats. *World J. Zool.* **3**(2), 59-62.
- Oliaii A and Mobini B (2017) the Histological differences of the ureter in Japanese quail (*Coturnix japonica*) compared with some other avian species. *Int. J. Morphol.* **35** (1), 193-198.
- Reece W O (2004) *Dukes physiology of Domestic Animals*. Twelfth Edition. Cornell university press, Ithaca, 107-113.
- Reshag A F, Dhyaa A B and Ektiffa S K (1917) Histological and Histochemical characterizes of the kidneys in different Avian species. *Aust. J. Basic Appl. Sci.* **11**(16), 36-44.
- Sivakumar S A, Ushakumory S and Sabiha Hayath Basha (2012) Micro anatomical studies on the renal cortex of Guinean Fowl. *J. Vet. Anim. Sci.* **8**(1), 29-35.
- Sreeranjini A R, Lyynnyar S, Gopinath D, Pramodkumar and Haragopal V (2000) Histological and histochemical studies in kidney of Japanese quail. *J. Vet. Anat.* **12**(2), 169-173.
- Widhu D and Trivedi P (2012) Histochemical Localization of proteins and nucleic acids in healthy and meloidogyne incognita infected okra (*Abelmoschus esculentus* L). *Mooh Indian J. Fund. Appl. Life Sci.* **2**, 345-354.
- Wurui C N (1987) Light Microscopic morphometry of kidneys of fourteen avian species. *J. Anat.* **162**, 19 – 31.