University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.318*

Comparative Histomorphological study of small intestine between Harrier (Circus cyaneus) and Partridge (Alectoris chukka) in Iraq

[1] Ektifaa. S. Khayoon [2] Ali, F. Reshag

[1*2] College of Vet. Med. University of Baghdad, Baghdad, Iraq.
[1*2] *Email:* ektiffaa.s@covm.uobaghdad.edu.iq

Abstract

The current study was designed on 24 birds (12 birds for each type) In the anatomical part reported that the small intestine in both birds Harrier (Circus cyaneus) and Partridge (Alectoris chukka) consisted from 3 segments; duodenum, jejunum and ileum with no any demarcation between them. Both ratio of intestinal length to body length and of intestinal weight to body weight was higher in partridge than those in Harrier. In histological study showed in three parts of small intestine the wall was constituted of similar histological layers; these are mucosa, submucosa, muscularis and serosa. There were same in structure of these tunics but differences in several Histomorphometric measurements of each tunica. In all parts of small intestine of partridge the goblet cell more than those in Harrier and there were increasing in the number toward the end of intestine of these cell in both birds for lubricant role. Histochemically of this study showed that in crypts and villi of all small intestinal parts of both birds the secretion of goblet cell is neutral mucin in nature because it showed negative reaction to Alcian blue stain and positive to PAS stain.

Keywords: Anatomical, Histological, Harrier,partridge,Small intestine.

I. INTRODUCTION

The scientific name of Harrier is *Circus cyaneus* and its common name is northern Harrier. The bird is belonging to the Accipitridae family, while Partridge the Scientific name Alectoris chukka and its belong to the phasianidae family. The birds have high metabolism therefor consume a lot of diet to correspond with their requirements compared with their size. To complete their activity daily the body of birds need to fuel according to environment changes. The lengths of different segments of the digestive tract vary with their size of the bird, those eating grain have longer tracts than those of the carnivores while birds that eats fibrous food tend to have long digestive tract.

This food habits give this bird positive role in biological balance. It is well known that food intake which contain vital nutrient need to absorption through the intestinal epithelium after digestion in stomach. Accordingly, bird's digestive organs are different in their morphology, digestive strategy and metabolic capability. Such differences were occurred to match with foods type available in the bird's natural habitat, the differences in the shape and size of small intestine between the bird's breeds and species are closely related with the types of food and life style or management.

The small intestine divided into three parts. The first part, the duodenum, begins from the ventriculus to the pancreas and surrounding most of the pancreas by forming a loop. The second part, the jejunum, extended from the end of the duodenum loop to the third part which named the ileum, the later extends from the end of jujenum to the ileocaecal junction. According to our knowledge there were no local studies conducted to study

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main https://doi.org/10.54174/utjagr.v13i1.318

histomorphological and histochemical features of the wall of the small intestine of two different birds Harrier and partridge.

II. MATERIALS AND METHOD

Twelve of Harrier (Circus cyaneus)is awild marsh(Dhyaa,2014) in current study. They were bought from the hunters directly. The hunting was done by the local hunters working in marshes of the south region of Iraq. While the partridge(Alectoris chukka) Twelve adult were collected from the Local market in Baghdad .

The Birds after euthanized with xylazin (80 mg/ kg)(Abood,2023;Dawood,22;Altaee,2020) then dissected by surgical scissor in the abdominal wall after fixing on dissecting board to view the coelomic viscera. Identified the duodenum, jejunum and ileum of the small intestine and photographed in situ by using digital camera (Winjoe camera). Relationships of these organs and location were well illustrated in figures. Then washed by normal saline solution to this organ to remove blood or any adhering debris. The small intestine content eviscerated by pressure gentelly on each of them and then washed by normal saline again.

The specimens were fixed in formalin of 10% concentration for 48hr,For well fixation the specimens were dehydrated by using a series of ascending alcohol(ethanol)each for 2 hrs. (70, 80, 90 and 100%) and then specimens were cleared in xylene for 1 hrs. after that embedded in paraffin wax and then the blocks were sectioned at 6 µm thickness(Mirhish,2012;Reshag,2021) and stained with either one of the following stains: Mayer's hematoxylin and eosin routine stain for general features identification, Masson trichrome stain for the staining of the collagenous and smooth muscle fibers.

Histochemically The specimens were fixed in Bouin's solution and were Sectioned of 6 µm (Rotary microtome) and stained with one of stains and examined subsequently then photographed by Olympus BH-2 microscope. The PAS alone was used for the illustration of the goblet cells and the basement membranes of the epithelial lining of the small intestine,But the acidic mucin identified by using Alcian blue (AB) (pH 2.5).

III. Result and Discussion:

The present results showed in anatomical part (position and shape) that the small intestine in both birds (Harrier and partridge) was short and formed from many loops relatively that reached to most caudal area of abdomen, occupied the right side of abdominal cavity. It composed of three segments that named; duodenum, jejunum and ileum with no clear anatomical demarcation line between them (Fig.1,2).

The duodenum of Harrier appears comma or incomplete U-shape, pink in color; begins from ventricle-duodenal junction and reached caudally to right of the gizzard (Fig.1).

In Partridge the duodenum is light pink in color, attached to the abdominal wall closely from the right side and to the gizzard at very distinguished ventriculo-duodenal junction, partially covered by the right lobe of liver. It is U-shaped part shows descending limb and ascending limb that binding together by the single lobed pancreas (Fig.2). The result study were in similar with the findings of (Jacob *et al*., 2011; AL-Saffar and Al-Samawy, 2015), but un related with what found by (Igwebuike,,2010) in African Pied Crow (Corus albus) that the duodenum is located in the left side in abdominal cavity. The jejunum in Harrier is dark gray spiral loops, directed caudally,whereas,the ileum situated on the floor of abdomen, attached caudally to end at its junction with the large intestine (Fig.3). In partridge, they appear as single loop, left and closely attached to the duodenum there are no any anatomical demarcation lines that separate between jejunum and ileum(Fig.4). These findings in both birds intersected with what recorded by (Sack,2002) in pigeons and (Igwebuike,2010) the jejunum and ileum in indigenous ducks and his findings were similar to present found (Dawood,2013) The granivores and herbivores species birds have longer intestine than carnivores and the insectivorse because the digestible nature of their food highly amount of fibers.(Gelis,2012).

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main https://doi.org/10.54174/utjagr.v13i1.318

IV. Histological Results:

In both birds the small intestine wall characterized by found four tunics. tunica mucosa, tunica submucosa,tunica muscularis and tunica serosa(Aaraji,2016) in most birds species like quill, rock dove, pigeon (Columba livia) (Zaher,2012),(Albideri,2011)(Al Sheshani,2006),respectively. (Fig.5,6) Differently with (Hodges ,1974) in fowl , (Kachave et al. 2009) in broilers ,the tunica submucosa was absent . The mucosa tunicae composed of a simple columnar epithelium followed by lamina propria.Muscularis mucosa well developed into two layers, Inparallel with (Hodges, 1974), the lamina muscularis mucosae has been recorded in domestic fowl.The number of goblet cells occupied the epithelium (Fig. 7). These cells were increased toward the end of intestine gradually(Al-ghakany ,2013)higher in number inside each villus for all segments of partridge intestine ,because the nature of its food components which contain high level of fibers that is difficult in digestion unless presence of goblet cells. In current work, Crypt of Lieberkühn in lamina properia of ileum in partridge appeared deep more than that in Harrier(Fig.8), Due to rough diet which is the type of food of partridge that composed of high ratio of fibers . (Von,2013) Recorded in chicken that good amount of fibers in diet prefer height of duodenal villi in addition to depth of ileal crypts.

The consist of lamina properia dense irregular connective tissue with reticular fibers, smooth muscle fibers , numerous capillaries(Mirhish,2018) and crypts of liberkuhn which are deeper and arranged from 3-5 layers . In the mucosa of the small intestine showed villi which vary in shape and size in all segments ,The villi of duodenum finger in shape , but in jujenum appear tongue in shape ,very long, While ileum shortest and spatula like.The density of villi higher in duodenum and lower in ileum.The lamina properia of villi contained lymphocytes, plasma cells, macrophages. The submucosa constitued from dense connective tissue in duodenum while thin layer of loose connective tissue in jujenum and ileum which presented between the epithelial crypts and tunica muscularis of both birds(AL-Saffar,2016). The muscular tunica contain from the smooth muscles fibers into 2 layers (inner circular and the outer longitudinal layers) (Fig.).The inner layer was thicker than the longitudinal layer over all parts of the intestine. This result was similar with (Zaher et al. 2012) in common quail (Coturnix coturnix) and(Rodrigues et al.2012)in digestive tract of blue and yellow macaws that referred the layers in this tunic two sheets. The muscularis was covered by a thin layer of tunica serosa constructed by loose connective tissue covered by mesothelial cells (Fig.5,6). These findings were similarly recorded in other avian species such as African pied crow (Corvus albus) and pigeon (Columba livia).

Histochemically results of the three segments of small intestine in Harrier and partridge have been reported that secretion of goblet cells within epithelium of villi and the crypts of epithelial were reacted to Alcian blue stain positively (Fig.9) Which mean the secretion of these cells acidic mucupolysacchrides.The results of PAS stain in the epithelium (goblet cells) of villi at these three compartments of both birds have been given positive reaction which appear magenta in color because present of neutral mucins, while the goblet cells of epithelial crypts(goblet cell) were appeared same reactions (Fig.10). The epithelial cells of the intestine were rich in mucopolysaccharide, although which were a weaker intensity. These finding were similar with (Dawood,2013) in duck,(Suhaib,2023)in pigeon were said that the goblet cell secreting had been positive reaction to AB stain (blue color) at (2.5) pH and positive reaction to PAS stain (red color) .

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main https://doi.org/10.54174/utjagr.v13i1.318

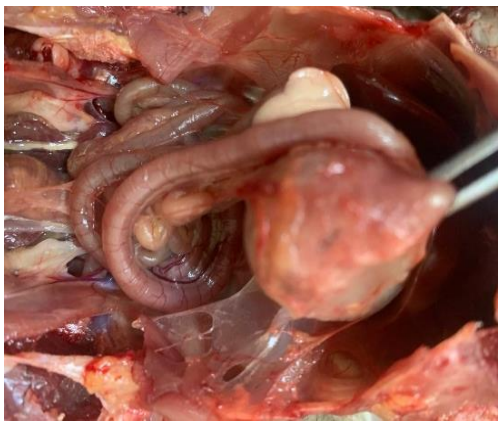


Fig.(1)macrographofDoudenuminHarriershow :Pa.pancrease,J.jejunum,D.duodenum,G.Gizzard.

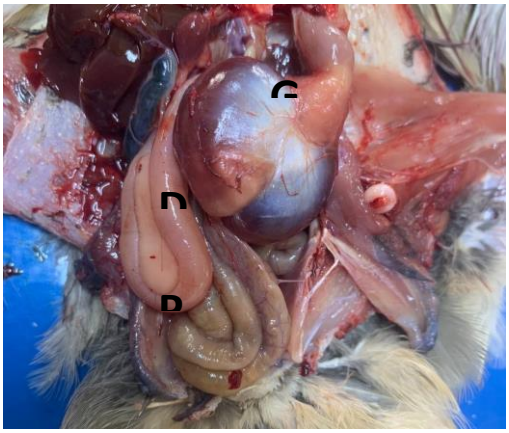


Fig.(2) macrograph of partridge show:G.gizzard,pa.pancrease,D.duodenum.

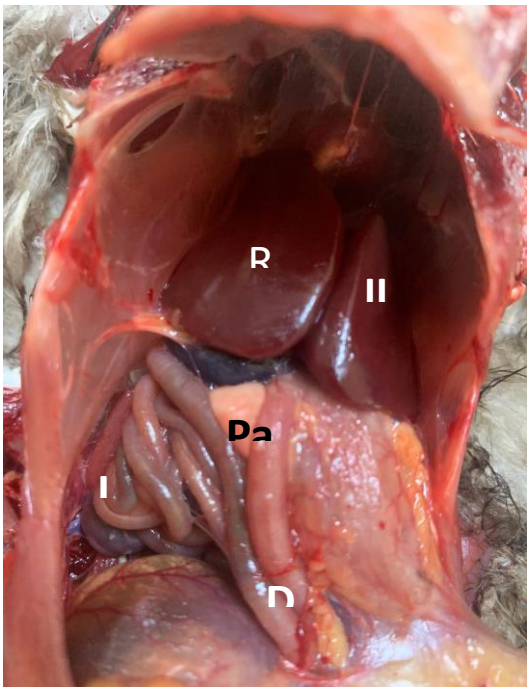


Fig.(3)macrograph of jejunum show:Rl.Rightlobe,ll.leftlobe,pa.pancrease ,j.jejunum,D.duodenum.

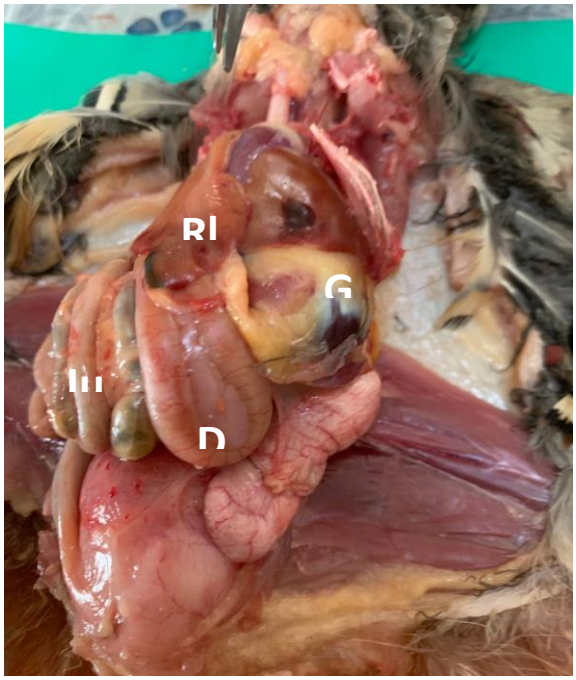


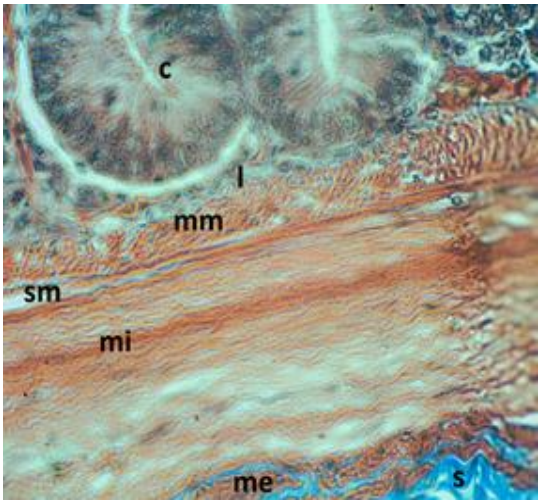
Fig.(4)macrographofjejunum show:Rl.Rightlobe,G.Gizzard,Ju.jujenum,D.duodenum.

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main https://doi.org/10.54174/utjagr.v13i1.318



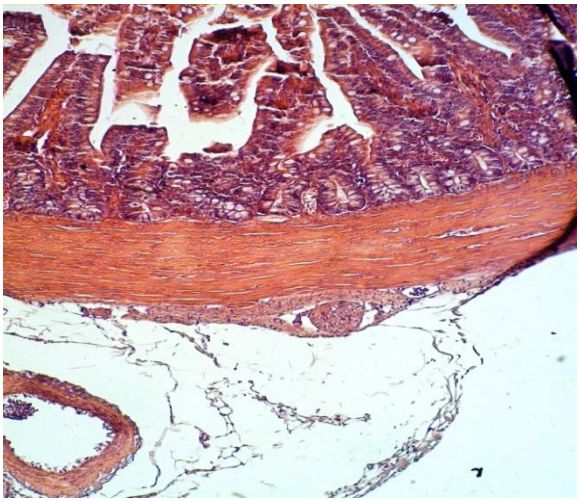


Fig.(5)micrograph of duodenum Harriershow: c.cryptofliberkuhn,l.lamina,mm .muscularismucosa,sm.submucosa,mi.internalmucosa ,me.externalmuscle,s.serosa.

In conclusion, the small intestine of Harrier and Partridge were covered by simple columnar cells with goblet cells and villi with different size and shape in the 3 different segments of intestine in two birds. The submucosa consisted from the irregular dense connective tissue in duodenum, whereas, loose connective tissue in jejunum and ileum in both birds. The muscularis mucosa composed of 2 layers of smooth muscles. Because of type of feeding of these birds as a cranivores,granivorse species, the villi and crypts gave the positive reaction with PAS, PAS-AB (pH 2.5) .These indicated for acidic mucin substances which are very important in digestion and subsequent absorption.

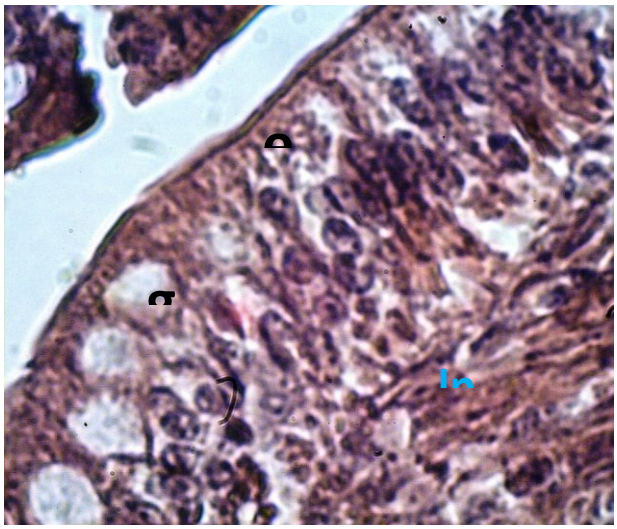


Fig.(7)micrographofduodenumshow:e.epithelium,g .gobletcell,lp.lamina properia.

Fig.(8)Micrograph of ileum in harrier shows:v.villi,c.liberkuhn crypts,l.lamina

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.318*

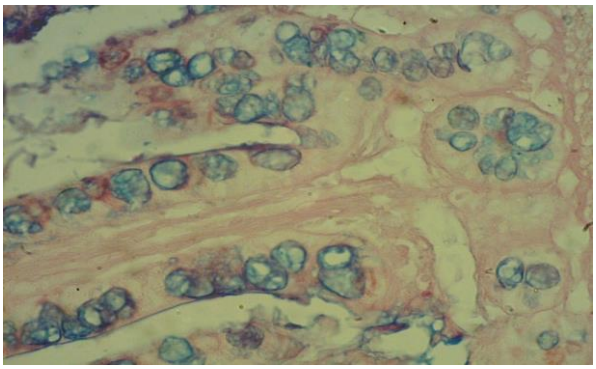
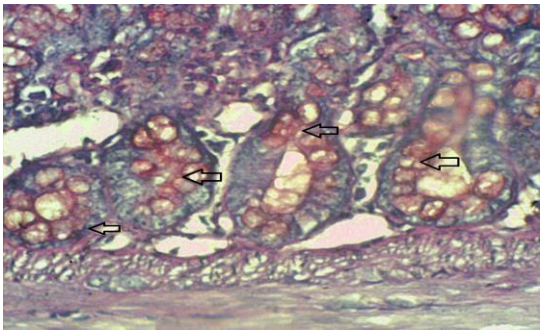


Fig.(9)micrograph of ileum in partridge shows:Alacian blue positive to goblet cell,crypt of liberkihn.alacian blue(X200).

Fig.(10) micrograph of ileum in harrier shows: The $(PAS)^{+}$ goblet cells of Lieberkühn crypts (arrows) (PAS stainX400)



University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main https://doi.org/10.54174/utjagr.v13i1.318

V. REFERENCES

Abdel-Ghani , N. A. (2000). The effect of the date, quantity and style of cuttings, leaf ratio and type of pollen on the yield and quality of Zaghloul date palm fruits. Journal of the Association of Arab Universities for Agricultural Studies and Research, 8 (1) : 317-305.

Agha , J. T. and Dawoud , A. D. (1991). Production of evergreen fruits. Part One, Mosul University Press - Mosul - Iraq: 455 – 462 .

Al-Ali , Z. S. (2006). The effect of thinning method and cultivar on the yield, quality and storage potential of date palm fruits (Phoenix dactylifera L.). Master's thesis , College of Agriculture - University of Basra : 117 .

Al-Ansari, N. A. M. and Al-Saleh , A. A. (2005). Photographer of Iraqi types from date palm. Part one - Al-Azza Press - Baghdad - Iraq.

Al-Bakr, A. J. (1972). The date palm, its past, present, and what is new in its cultivation and industry and its trade. Al-Ani Press - Baghdad - Iraq: 1085 .

Al- Ibrahimi , J. H. M. and Al - Asadi , A. D. K. (2023) . The Effect of Potassium , Microelements and Cultivar on the Activity of Invertase and Cellulase Enzymes for the Fruits of Date Palm (Phoenix dactylifera L.) Grown in Thi - Qar . IOP Conf. Series : Earth and Environmental Science : 1 - 10 .

Al-Mana , G. N. J. (2018). The effect of cultivar, irrigation, and spraying with the growth stimulant Dizli on the qualitative characteristics of fruits and date palm yield *Phoenix dactylifera* L. . Master's thesis - College of Agriculture - University of Basra : 142.

Al-Mousawi , S. J .K .and Al-Zubaidi , B .H .F (2022) . The effect of Gorogreen five fructus and the type of pollination on sugars and maturity rate of Barhi variety produced from tissue culture . International Journal of Health Sciences, 6(S3) : 6438–6445.

Al-Obaid , R. S. ; Muhammad , M. H. and Al-Fayez , N. S. (2005). The effect of bunch thinning on yield and quality of sugar date palm cultivar growing in the Riyadh region. King Saud University Journal 17(2) : 235 – 249 .

Al-Qatrani , N. A. A. (2010). The effect of potassium fertilization , thinning date, and variety on some physical, chemical, and production characteristics of date palm fruits *Phoenix dactylifera* L. the Halawi and Sayer cultivars . Doctoral thesis - College of Agriculture - University of Basra : 190 .

Al-Rawi , K. M. and Abdul Aziz , M. K. (1980). Design and analysis of agricultural experiments . Dar Al-Kutub Foundation for Printing and Publishing - University of Mosul - Iraq.

Atti , H. B. (2022). The effect of spraying with the biostimulant Biozyme and bagging on some physiological, physical and chemical characteristics of date palm fruits of the Barhi cultivar . Master's thesis - College of Agriculture and Marshlands - University of Thi - Qar - Iraq : 93 .

Cakmakc, R. ; Donmez , F. ; Aydin , A. and Sahin , F. (2006). Growth promotion of plants by growth promoting rhizobacteria under greenhouse and two different field soil conditions. Soil Biol and Biochem. 38:1482-1487.

Ghazawi, H. S. ; Al-Hajhouj , M. R. ; Abdul Qadir , S. and Muhammad , M. (2019). The effect of chemical thinning on improving the fruiting characteristics of the Al-Ikhlas date palm variety. Iraqi Journal of Agricultural Sciences: 50 (5): 1361-1368 .

Haider , N. ; Nabulsi. , I. and MirAli , N. (2012). Phylogeatic relationships among date palm (Phoenix dactylifera L.) cultivars in Syria using RAPD and ISSR Markers. Journal of Plant Biology Research ,1(2) :12 - 24 .

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 1 (2024) PP 139-146

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.318*

Ibrahim , A. O. (2008). The date palm tree of life. Arab Center for Studies of Arid Zones and Arid Lands, Damascus, Syria: 390 p .

Ibrahim, A. M. and Khalif M. N. H. (2004). The date palm, its cultivation, care and production in the Arab world . Third edition - Origin of Knowledge - Alexandria - Egypt : 509 – 530.

Jewar, A. S. and Al-Ibrahimi , M. S. A. (2018). The effect of the male pollen cultivar and spraying with chitosan on some physiological and enzymatic traits of date palm fruits, *Phoenix dactylifera* L. Thi - Qar University Journal of Agricultural Sciences , 17 (1-2) : 18 - 35.

Journal of Plant Biology Research ,1(2) :12-24 .

Kader, A.A. and Hussein, A.(2009). Harvesting and Posthaste handing dates. ICARDA, Aleppo, Syria .

Matar, A. M. (1991). Palm cultivation and production. Dar Al-Hekma Press - University of Basra. . Iraq: 420 .

Ozaga, T.A. and Reinecke , D.M. (2003). Hormonal interactions in fruit development. J Growth Reg., Plant 31: 1-15.