Diyala Journal for Veterinary sciences
Open Access Journal Published by College of Veterinary Medicine
University of Diyala, Iraq
P-ISSN: 2410-8863
E-ISSN:2958-6178
Vol. 2, NO. 3, September 2024

https://doi.org/10.71375/djvs.2024.02306

Histopathological Effect of Pecan Oil (*Carya illinoinensis*) against Ibuprofen induced Kidney Injury in Local Male Rabbits

Mohammed Abed Mahmood

Department of Pathology, Faculty of Veterinary Medicine, University of Diyala, Iraq

Correspondence E-mail: mohammedvet87@gmail.com

Abstract

Ibuprofen is considered one of the important medications used to relieve pain, as it belongs to non-steroidal anti-inflammatory drugs. In addition to being inexpensive, it is necessary to relieve many types of pain, especially after surgery. In current study, twenty local male rabbits, divided equally into four groups. The 1st group received normal saline orally, 2nd group received ibuprofen 20mg/kg orally, 3rd group received 40mg/kg orally and the 4th group received pecan oil extract orally, after 3 hours received ibuprofen syrup orally. The experimental study continues for 28 days. The results observed the control group which received normal saline not showed any abnormalities in structures of the kidney. The second group which received ibuprofen 20mg/kg orally for 28 days showed congestion of blood vessels, infiltration of inflammatory cells, dilated blood vessels and hydropic degeneration. The third group which received 40mg/kg orally for 28 days showed fatty changes and eosinophilic material. In addition to highly congestion of blood vessels, cloudy swelling, hemolysis of RBC and infiltration of inflammatory cells. The fourth group which pecan oil extract orally, after 3 hours received ibuprofen syrup orally for 28 days showed normal structures of rabbit kidneys. Current study exhibit agreement with other about adverse effect of ibuprofen by appeared histopathological lesion on the kidney and in same time reported the beneficial effect of pecan oil on the kidney structures.

Keywords: Pecan oil, Ibuprofen, Kidney, histopathology, Rabbits.

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Introduction

Ibuprofen is a drug that refer to the family of non-steroid anti-inflammatory drugs and effective pain relievers. It is used in the treatment of arthritis, common cold, teeth ache and pain after surgery [1]. The world wild use of ibuprofen because it is inexpensive and effective in relieving pain in patients [2]. Ibuprofen was used at the start of the Corona pandemic in 2020, which led to relieving the pain that patients were suffering from, especially joint pain [3]. Ibuprofen works to inhibit prostaglandins by inhibiting the enzymes responsible for their production, which are cyclooxygenases, which cause inflammation and pain in the body, there are two types of these enzymes: COX1 and COX2 [4]. In addition to the beneficial effects of ibuprofen, some negative effects of this drug have been observed such as interaction with aspirin that lead to effect on viscosity of blood [5]. Ibuprofen increases levels of methotrexate which used to treatment of cancer by preventing the kidneys from removing it from the body, leading to severe blood and gastrointestinal toxicity [6]. Concomitant use of ibuprofen may cause a significant decrease in kidney function and acute renal failure. NSAIDs also reduce the antihypertensive effect of ACE inhibitors [7]. Celecoxib and ibuprofen causes hepatic, cardiac and renal injury when used in rat [8]. The scientific name for pecan is Carya illinoensis. The word Carya is derived from the ancient Greek name Karyen, which means Nut. As for illinoensis, it is a Latin translation of the word illinsis, in reference to the Indian tribe of Ilinoi, who lived in one of the states of America. For this reason, the world did not know about pecans until after the discovery of the American continent [9]. Pecans contain many nutrients that are beneficial to the body, such as proteins, monounsaturated and polyunsaturated fats, which are healthy fats by all standards, in addition to carbohydrates, fiber, iron, phosphorus, zinc, potassium, vitamins E, B, C, A, and other antioxidant compounds [10]. Pecans are rich in heart-healthy fats that help lower bad cholesterol in the blood, as proven by studies in rats, they also help decrease the risk of developing type two diabetes [11]. Pecans contain more antioxidants than other nuts and contain vitamin E (tocopherols) which keep fats from oxidation and the changes in their chemical structure that result from that process. Pecans in particular are rich in gamma tocopherol [9].

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Selenium is found in pecans and is also a natural antioxidant, which helps protect the body from age-related diseases and reduce the risk of some types of cancer [12]. Therefore, this study planned to identify the outcome of pecan oil on the histopathological lesions induced by ibuprofen in local male rabbits' kidneys.

Materials and Methods

In this study, ibuprofen syrup (each 5ml contain 200mg, afros pharmaceutical, Egypt) and pecan oil extract from pecan nuts from Iraqi markets. Twenty local male rabbits (800-900 gram) exposed to suitable experimental condition of food, water and temperatures and not suffer from any disorder before established experimental study, these rabbits classified into four equal groups, each group 5 rabbits as a following:

Control group: Five rabbits received normal saline orally for 28 days.

Second group: Five rabbits received ibuprofen 20mg/kg orally for 28 days.

Third group: Five rabbits received ibuprofen 40mg/kg [13] orally for 28 days.

Forth group: Five rabbits received pecan oil extract 3 ml orally, after 3 hours received ibuprofen syrup orally for 28 days.

After ended of experimental study, the animal sedative by xylazine and anaesthised by ketamine, after that, sacrified from each animal 1 cm pieces from kidney, preserved in buffer formalin (10%) and complete the other histopathological procedures according to [14]. All histopathological slides exanimated under light microscope.

Results:

In this study, the control group which received normal saline not showed any abnormalities in structures of the kidney (figure 1). The second group which received ibuprofen 20mg/kg orally for 28 days showed congestion of blood vessels, infiltration of inflammatory cells, dilated blood vessels and hydropic degeneration (figure 2). The third group which received 40mg/kg orally for 28 days showed fatty changes and eosinophilic material (figure 3). In addition to highly congestion of blood vessels, cloudy swelling, hemolysis of RBC and infiltration of inflammatory cells (figure 4). The fourth group which pecan oil extract orally, after 3 hours received ibuprofen syrup orally for 28 days showed normal structures of rabbit kidneys (figure 5).

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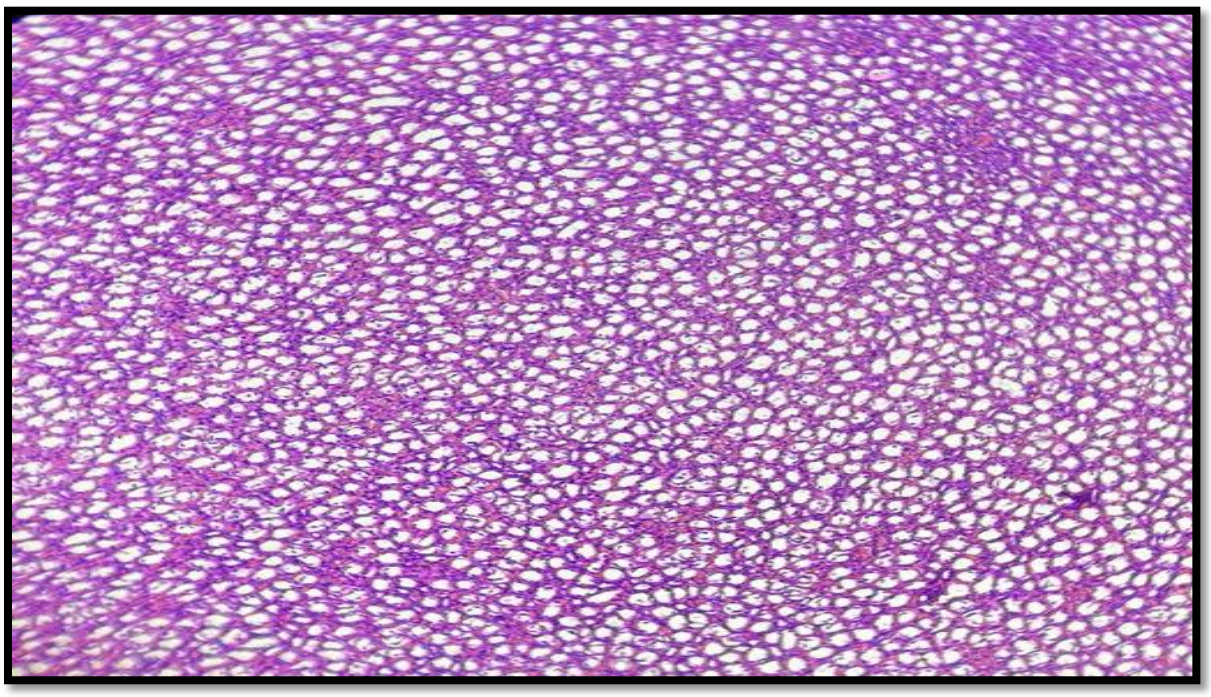

Figure (1) showed rabbit kidney histology of control group without any abnormal architectures (H&E, 10X).

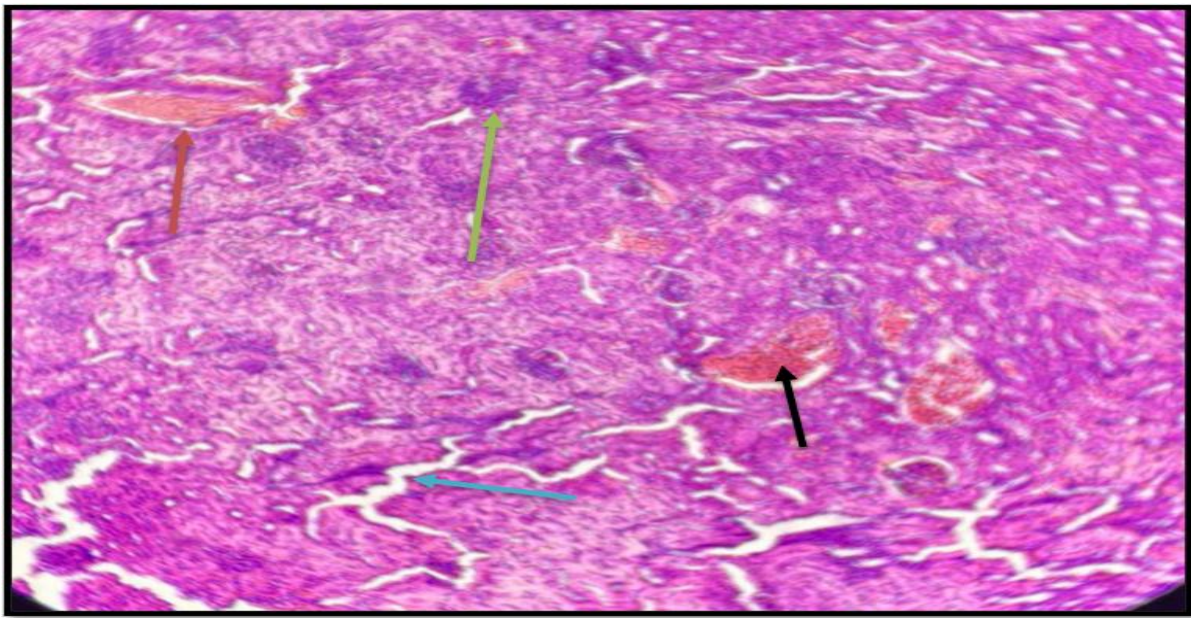

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Figure (2): Rabbit kidney histomorphology of second group showed congestion of blood vessels (black arrow), infiltration of inflammatory cells (green arrow), dilated blood vessels (red arrow) and hydropic degeneration (blue arrow), (H&E, 40X).

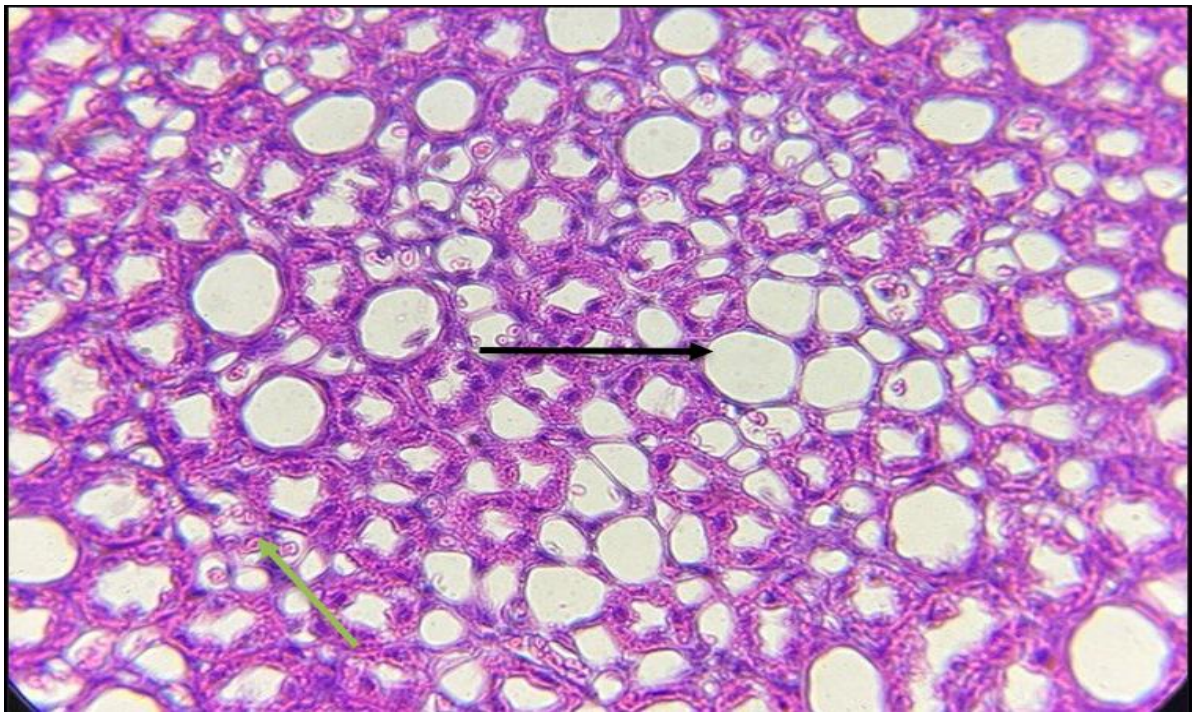
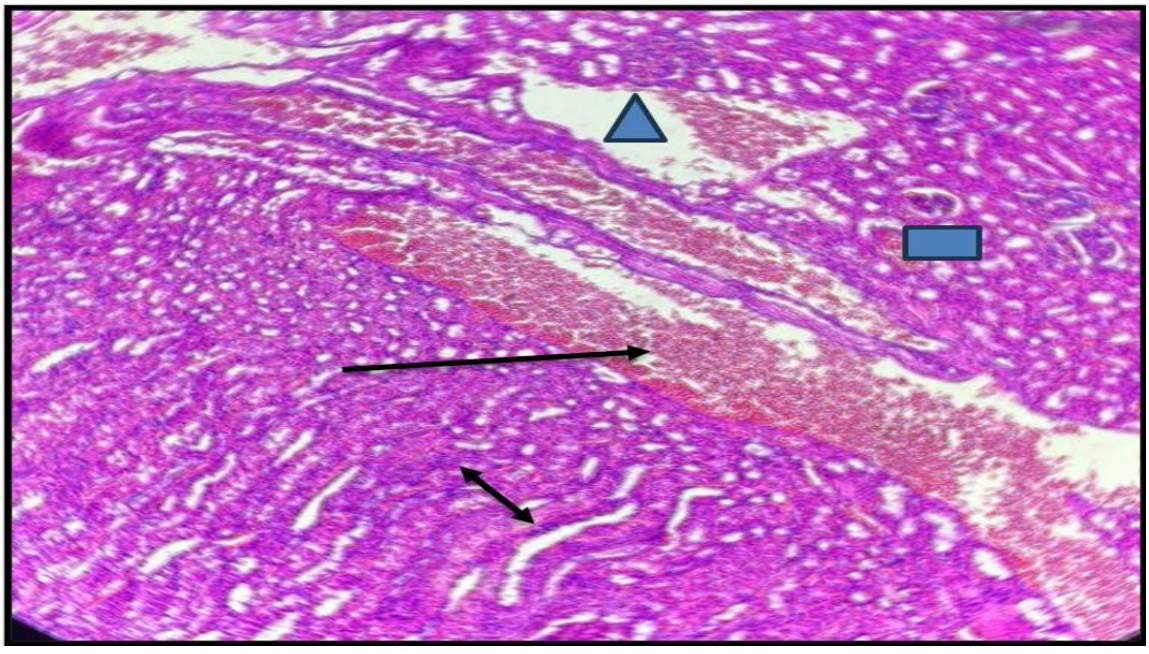


Figure (3): Rabbit kidney histomorphology of third group showed fatty changes (black arrow) and



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eosinophilic materials (green arrow), (H&E, 40X).

Figure (4): Rabbit kidney histomorphology of third group showed highly congestion of blood vessels (black arrow), cloudy swelling (two head arrow), hemolysis of RBC (triangle) and infiltration of inflammatory cells (glomerulonephritis), (square), (H&E, 40X).

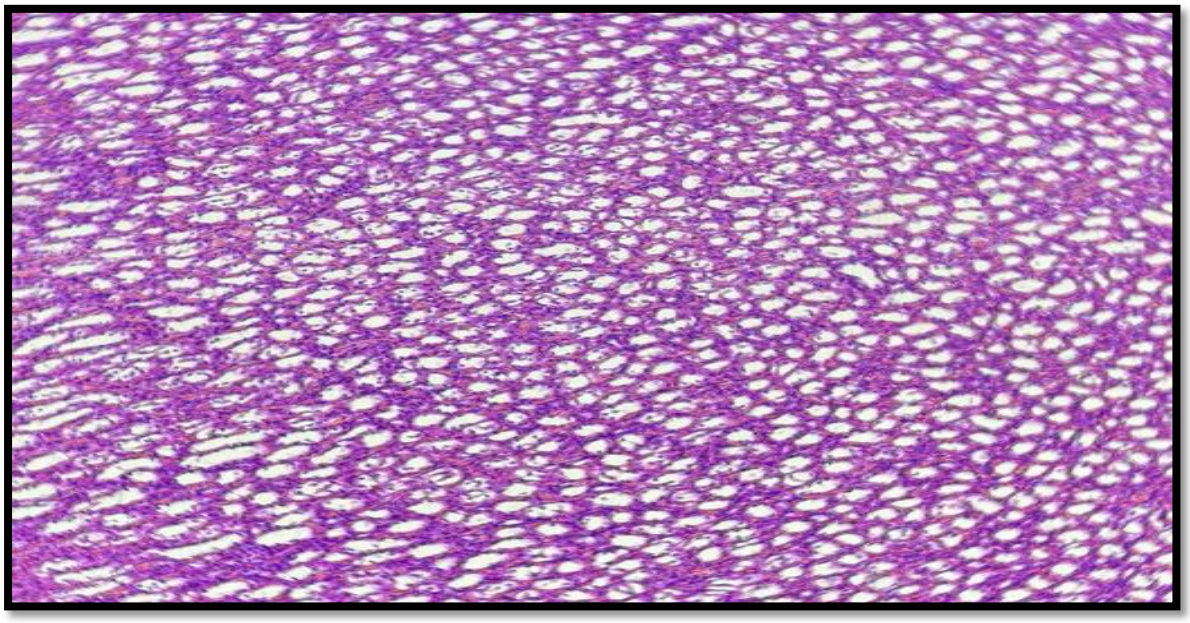

Figure (5) showed rabbit kidney histology of fourth group without any abnormal architectures (H&E, 10X).

Discussion:

This study goal to identify effect of pecan oil on histopathological changes induced by ibuprofen on male rabbits' kidney. Control group not showed any abnormalities on the kidney. Second group showed congestion of blood vessels, this caused by inflammation duo to infection and or drug [15]. Infiltration of inflammatory cells refer to glomerulonephritis, this result from hypersensitivity to ibuprofen [8]. Occur of the inflammation in the renal tubules result in destruction of cells wall and distribution the sodium potassium pump which permits to fluid to introduce inside the cells, this study agreements with other study in rats [16]. In third group, the overdose of ibuprofen showed fatty changes, the mechanisms of fatty changes may duo to increase hypertension duo to recurrent doses

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of ibuprofen and may be distribution in metabolism which lead to deposition of fat in kidney duo to kidney injury [17]. Prescence of endophilic material also occur duo to drugs [18]. Ibuprofen overdose lead to dilation of renal tubules, this permit to fluid to introduce and formation of cloudy swelling, in addition to that the excessive fluid in cell prevent any repair in cell wall and subsequently return of cell to normal state [19]. Highly congestion and few bleeding in third group result from destruction of major blood capillary in kidney and oozing of blood to other parenchymal tissue [20]. Addition doses of ibuprofen causes lysis of RBC in human which result from toxic effect of this drug on red blood cells that agreement with now study that recorded same signs [21]. Pecan oil lead to preservative the structures of kidney and this may be duo to chemical composition of it which contain monounsaturated, polyunsaturated fats, which are healthy fats by all standards, in addition to carbohydrates, fiber, iron, phosphorus, zinc, potassium, vitamins E, B, C, A, and other antioxidant compounds [22]. Zinc in pecan oil protect the kidney from CDCL2 induced damage [23]. Also, the addition of potassium which consider one of pecan composition result in protective of kidney structures from free radicles [24]. Vitamin E and C found in pecan lead to protect kidney of rat from cadmium toxicity [25]. The chemical composition of pecan oil which contain antioxidant result in protective of kidney from effect of ibuprofen in rabbits.

Conclusion:

In this study, it was shown that ibuprofen causes damage to the kidneys of rabbits, especially in high doses, and this was evident in the histopathological image of the kidneys. While pecan oil, due to its antioxidant properties, preserved the kidney tissue. Therefore, we recommend avoiding taking high doses of ibuprofen and benefiting from pecan oil due to its many medical properties.

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