

Evaluate the benefit effects of *Dodonaea viscosa* in kidney of infected rats with *Staphylococcus aureus*

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Abstract

The aim of current experiment is estimate the potential effects of *D. viscosa* extract to treat the kidney tissue changes of infected rats with *S. aureus*. 30 clinical samples were obtained from patients with chronic lung disease attending Al Jumhuri Hospital, at period February-April 2021. 20 adult rats were utilized in current experiment, and the rats were obtained from Science College house / Mosul University. The current findings demonstrated that the sections of infected rat with *S. aureus* show damage glomerulus, necrosis of tubules cells and infiltration of mono-nucleated inflammatory cells and thickening wall of renal vessels. After using leaves extract of *D. viscosa*, the microscopic examination show improved in histological structure of kidney. Whereas, the glomerulus back to semi normal state, provide in of tubules cells and the infiltration of mono-nucleated inflammatory cells was absent. So, the leaves extract of *D. viscosa* exhibit antibacterial activity and improvement the rat kidney structure after infected with *S. aureus*.

Keywords: *Dodonaea viscosa*; *Staphylococcus aureus*; Kidneys.

INTRODUCTION

Dodonaea viscosa (also known as called as togovao, Jamaica Switch Sorrel) is flowering medicinal plant and belonging to family Sapindaceae. The origin center of *D. viscosa* is Australia, but also it is grow throughout subtropics and tropics regions [1-3]. The prior studies demonstrated that *D. viscosa* comprise of various nitrogenous cyclic components, primary and secondary cyclic, different kinds of flavonoids, volatile oils, sakuranetin, cardiac glycosides, alizarin, saponins, acyclic phenols, tannins, isokaempferide, carbohydrate, immune modulator ingredients and sugar [4-12]. The stems of *D. viscosa* are to treat the fever, rheumatism, while the seeds are utilized to treat malaria. The leaves are utilized to itching, aches, wounds, sprains, and burns and also utilized as analgesic to headaches and toothaches agent [13-14]. *Staphylococcus aureus* is found everywhere and highly adaptive pathogen that colonizes and infect the epidermis and the mucous membrane of anterior nares, digestive system, the perineum, the genitourinary tracts and the mouth and pharynx [15], and considered as one of the multidrug resistant pathogens.[16-20].

S. aureus can prevalence from individual to individual by direct contact and with the contaminated things (such knife, mobile, the handles of door, medical equipments, etc). There is even a possibility of transmission by infected droplets inhalation that are spread at the time of coughing [21-23]. So, the aim of current experiment is estimate the potential effects of *D. viscosa* extract to treat the kidney tissue changes of infected rats with *S. aureus*.

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Materials & Methods

The sample collection

30 clinical samples were obtained from patients with chronic lung disease attending Al Jumhuri Hospital, at period February-April 2021. All specimens were cultured on mannitol salt and blood agars. All plates were incubated in incubator for 24 hrs. at 37°C. After diagnosis and identity of bacteria cultures was assured by some morphological and biochemical tests and by API Staph for specific identification. [23,24]

D. *viscosa* extract

The extraction process for ethanol was done by soxhlet apparatus [25]. The leaves powdered (20 g) were kept in soxhlet's device and 250 ml of ethanol was added to the leaves powdered (8 hours at 40°C) and evaporated by apparatus of rotary evaporator at dry extracts. Then extract was stored at 4°C.

Rat model

20 adult rats, (wt. 140-165 gm. with age 8-12 weeks), utilized in current experiment, and the rats were obtained from Science College house / Mosul University.

Experimental design

20 adult rats were utilized in current experiment and the rats were divided as following:

- A. Rats received (orally) normal saline by using stomach tube as control rats.
- B. Infected rats with (10⁴ cell/ml) *S. aureus* by using stomach tube (orally).
- C. Infected rats with *S. aureus* by using stomach tube (orally) and treated with 50mg/kg leaves extract of *D. viscosa* for 30 days.
- D. Infected rats with *S. aureus* by using stomach tube (orally) and treated with 100mg/kg leaves extract of *D. viscosa* for 30 days.

Histological process

Kidneys of all rats were washed with normal saline, 10% formalin was used to fixation the kidney specimens, the dehydrated step (graduated concentrations of ethanol) and embedded with paraffin wax. The sections (7 mm) by microtome was done, then stained with haematoxylin and eosin according to [26] and examined by light microscopy.

Results

Identification

Isolates of *S. aureus* were diagnosed according to microscopy and morphological with biochemical tests. *S. aureus* showed colonies with medium-size and yellow color as shown in figure (1).

Subsequently, biochemical tests were performed on clinical *S. aureus* isolated from wounds and burns, and then the diagnosis of *S. aureus* isolates was confirmed using API 20E kit as shown in figure (2).

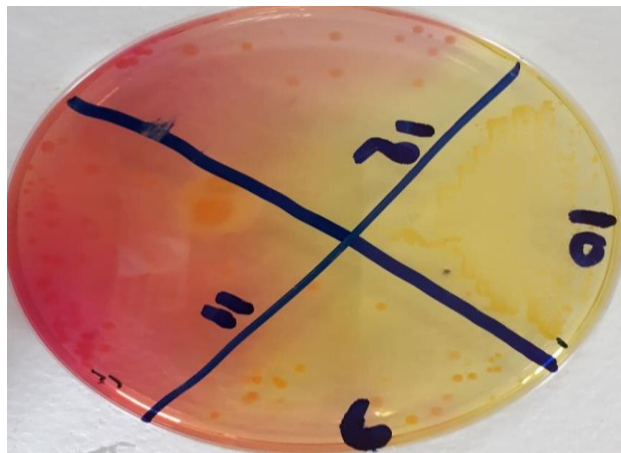


Figure (1): *S. aureus* on mannitol salt agar.



Figure (2): Diagnosis of *S. aureus* by using the API system.

Histological study

Kidney

Control group

The sections that prepared from this group show the normal form of glomerulus and the normal shapes of each tubule; proximal and distal as show in figure (3).

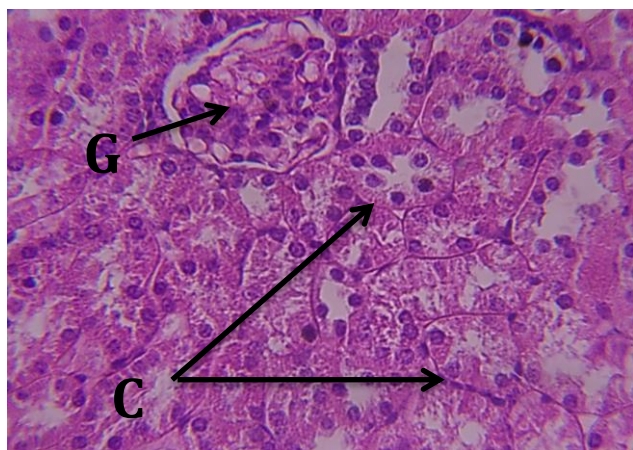


Figure (3): kidney of control group show normal glomerulus (G) and convoluted tubules (CT) H&E X400.

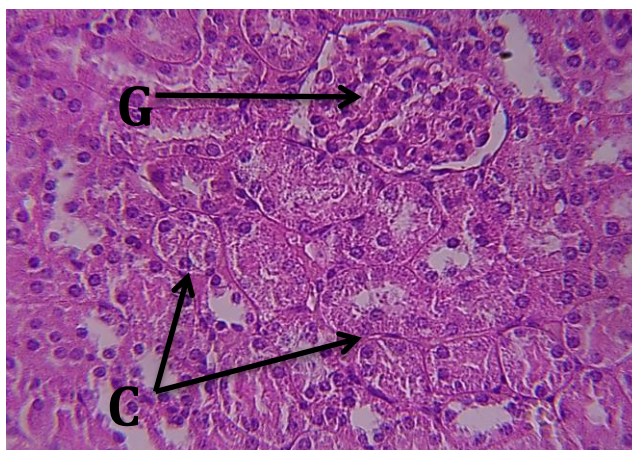


Figure (5): kidney of 50mg/kg of leaves extract group show glomerulus (G) and convoluted tubules (CT) H&E X400.

Infected group

The sections of infected rat with *S. aureus* show damage glomerulus, necrosis of tubules cells and infiltration of mono-nucleated inflammatory cells and thickening wall of renal vessels as show in figure (4).

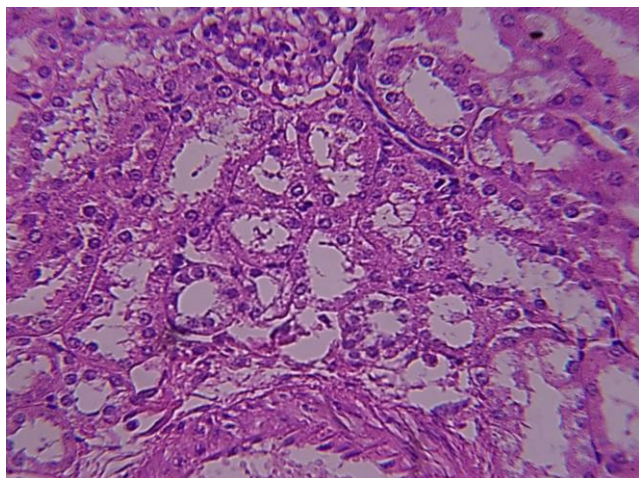


Figure (4): kidney of infected rats show damage glomerulus (DG), degeneration (D) tubule cells, lymphocytes infiltration (LI) and thickening wall (TW) H&E X400.

Treated group

The microscopic examination of treated groups show improved in histological structure of kidney. Whereas, the glomerulus back to semi normal state, provide in of tubules cells and the infiltration of mono-nucleated inflammatory cells was absent as show in figure (5-6).

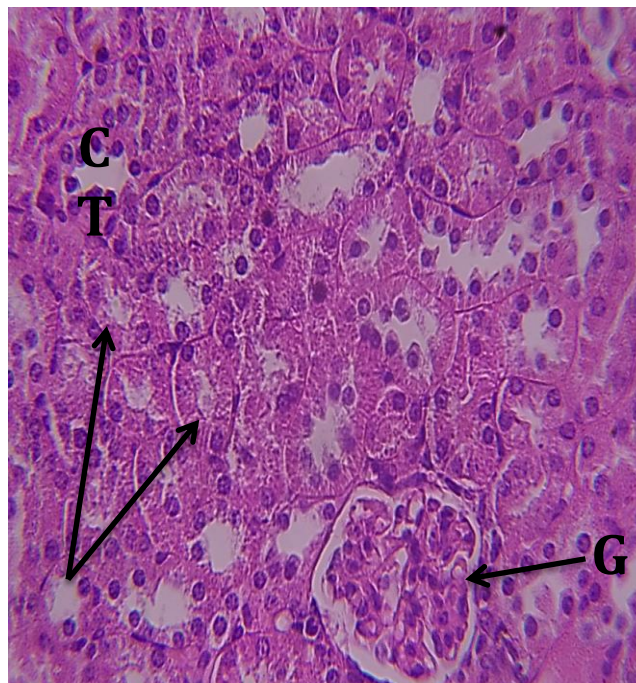


Figure (6): kidney of 100mg/kg of leaves extract group show glomerulus (G) and convoluted tubules (CT) H&E X400.

Discussion

The inhibition of growth of selected extracts of plants against various species of microbes was determined by several methods [27]. The antibacterial properties of crude extract of *D. viscosa* were studied by using a technique known as agar well diffusion versus six type of bacterial (*P. fluorescens*, *S. typhi*, *S. flexneri*, *V. cholerae*, *E. coli*, *M. tuberculosis*). The growths of these bacteria were inhibited by extracts of *D. viscosa*. The zone of maximum inhibition was obtained with methanol 80% and chloroform 20% versus

tested pathogens [28]. Otherwise, in current study, crude extract of *D. viscosa* demonstrated protective effects in treatment the kidney structure changes that caused by *S. aureus*, The prior findings demonstrated that all types of *D. viscosa* extracts showed antioxidant properties against all in vitro model studies. Most of the researches and reports, they indicated that maximum antioxidant properties was obtained in methanol extract [29]. The current study is agree with various studies that showed the carbon tetra chloride leads to damage and destruction in liver and kidney (renal fibrosis, glomerulus changes and tubular degenerative changes) [30-32]. The ethanolic extract of *D.viscosa* exhibited a high effective free radical scavenging in the DPPH assay and showed significant antioxidant (50%) impact at concentration of 50µg/ml [33], that explain the role of *D.viscosa* extract in promote the kidney structure after infection with *S. aureus*.

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