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Effect of Thymus vulgaris on liver tissue in dexamethasone treated female adult rat

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Abstract: This experiment aimed to investigate the effect of *Thymus vulgaris* (*T.vulgaris*) on liver tissue treated by dexamethasone by long time administration.
Twenty four adult female rats divided into 4 groups: first control group, second and third groups had subcutaneous injection with Dex 0.1mg/kg 3 times/week for 60 days, then third and fourth groups received 75 mg/kg of *T.vulgaris* orally for two weeks. At the end of the experiment liver tissues were collected via scarified the rat after end of experiment. Results of Liver histopathological of Dexa groups showed degenerative necrosis with inflammatory changes, all of these pathological alterations were ameliorate by T.vulgaris administration
Key words: *Thymus vulgaris* ,dexamethasone , liver tissue

Introduction:

Thymus vulgaris (thyme), sometimes known as thyme, is a fragrant, blooming plant that normally grows as a sub-shrub. It has tiny, narrowly edging greenish-gray leaves. It has multiple stiff, branching branches and white or purple blooms with a peculiar aroma that bloom from May to September. It is extensively grown as a culinary herb because of its strong scent, which is caused by thymol (1). The plants that have historically been essential in the treatment of human illnesses are available in local markets and traditional medicinal plant shops all over the world (2,3). Natural additions, such phytogenic and therapeutic plants, as well as their derivatives, like plant extracts or essential oils, are thought to be safer, healthier, and less harmful than synthetic additives, which is why they are growing in popularity (4). Scientists are primarily focused in finding herbal extracts or pure components that may function as microbial, antifungal, or anticancer agents because medication resistance is becoming a major worldwide health concern(5). Thyme oil and thymol have been shown to have antioxidant effects by lowering the production of the lipid peroxidation byproduct malondialdehyde (MDA), enhancing glutathione reductase (GR) activity in the tissues, and raising catalase activity in the blood, *T. vulgaris* has a potent antioxidant action that protects against lipid peroxidation(6). Dexamethasone (Dex) is a class of steroid drugs (7) possesses strong anti-inflammatory and immunosuppressive effects. Inhibiting inflammatory cells and suppressing the production of inflammatory mediators play a major part in the immunosuppressive effect (8). Despite these qualities, the therapeutic benefits of this medication are limited because it has a number of side effects, including insulin resistance, skeletal muscle atrophy, liver damage, and the production of free radicals that may contribute to oxidative stress when used for a prolonged period of time (9). The liver is crucial to the metabolism of proteins, lipids, and carbohydrates. Additionally, the liver is vulnerable to the toxicity of these substances since it is the primary site of detoxification and biotransformation for a variety of metabolites and medicines (10). Different acute and chronic liver illnesses can develop when the liver is exposed to poisonous metabolites, medications, and other toxins on a regular basis (11). Treatment with glucocorticoids may enhance coagulation's activation, which would raise the risk of venous thromboembolism (12), increased circulating cortisol have been associated with severity of atherosclerosis.

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Materials And Methods

Plant material

Thymus vulgaris plant were obtained from Suliamania Province-Iraq, and identified at Agriculture College/ University of Suliamania , Iraq. Plant leaves were drying and grinding. The 10% aqueous solution prepared by extraction of 30 gm dried powder of leaves in 300 ml DW using soxhlet for 5 hours (13).

Experimental design

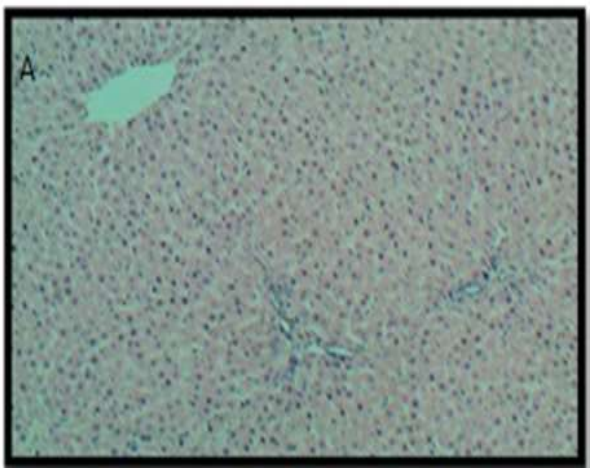
24 adult female rats (3–4 months old) were divided evenly into 4 groups and treated as follows: Rats in the first group served as the controls, receiving a standard food and tap water. The second and third groups got dexa 0.1 mg/kg three times a week for 60 days, followed by the third and fourth groups receiving *T. vulgaris* 75 mg/kg for two weeks according to (14).

Tissue sample collected

At the end of the experiment, liver tissue samples were collected from euthanized rats and preserved in formalin (10%) for histopathological examination. Paraffin fixed liver samples were sectioned at 5 µm and stained with haematoxylin and eosin for histopathological examination (15).

Liver histopathological changes:

Liver section of control group revealed normal appearance of liver tissue characterized by central vein and hepatocytes cord (Figure 1). However analysis of the microscopic images of liver section from dexa group showed loss of organization of radiating hepatocytes and marked congestion of central and portal veins contain blood and edematous fluid, the portal area infiltrate with inflammatory cells with small focal aggregation of mononuclear cells in liver parenchyma. Also, hepatocytes in liver of dexamethasone suffered from swelling, degenerative necrosis characterized by distortion of cell cytoplasm and nucleus, in addition there were signs of hepatocytes nucleoli prominent (Figure 2). On the other hand, sections of livers from rats treated with *T.vulgaris* for two weeks after dexamethasone long exposure revealed dilated blood vessels and mostly infiltrated with inflammatory cells and erythrocytes. The hepatocytes revealed enlarged hepatocytes with vacuolar degeneration and few lymphocytes (Figure 3). In liver sections from *T.vulgaris* group showed portal moderate to mild infiltrate of inflammatory hepatocytes. While maintaining the normal liver cells organization as striated and irradiated hepatocord cells, there were congestion of blood vessels and enlarged kupffer's cells (Figure 4). *T.vulgaris* maintained the normal liver cells organization as striated and irradiated hepatocord cells, there were congestion of blood vessels (16). Low dosages of corticosteroids are regarded to be safe for maintaining healthy liver function; however, high doses and/or continued use of the drug may result in steatohepatitis. It is believed that increased oxidative stress is the primary factor causing corticosteroid-induced hepatotoxicity. Additionally, hepatic steatosis caused on by steroids maybe due to metabolic disorders brought on by impaired hepatic metabolism of corticosteroids (17). Other histopathological complications, such as inflammatory cell infiltration and fibrosis, are explained by the fact that dexamethasone induced hepatocytes injury will eventually result in fatty infiltration of hepatocytes (steatosis)and then liver tissue degeneration and inflammation (steatohepatitis) (18). Several substances were employed as hepatoprotectives, however *T. vulgaris* specifically shown notable efficacy in protecting the liver tissue from numerous harmful substances including steroids, alcohol and aluminum (19,20).



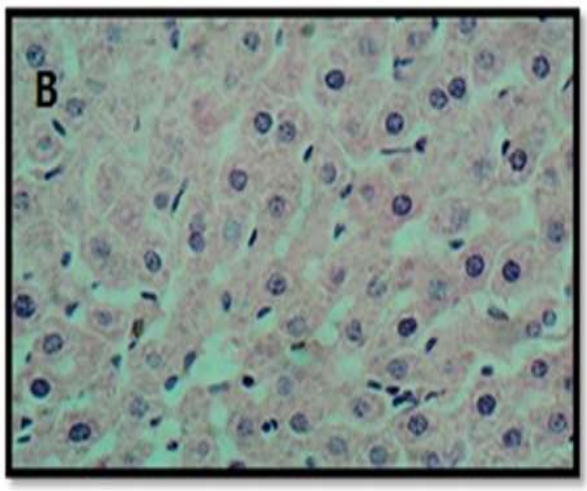


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Figure 1: Light microscopic image of liver section from control group shows normal architecture of irradiated hepatocytes cord. (H&E) A. 10X & B.40X.

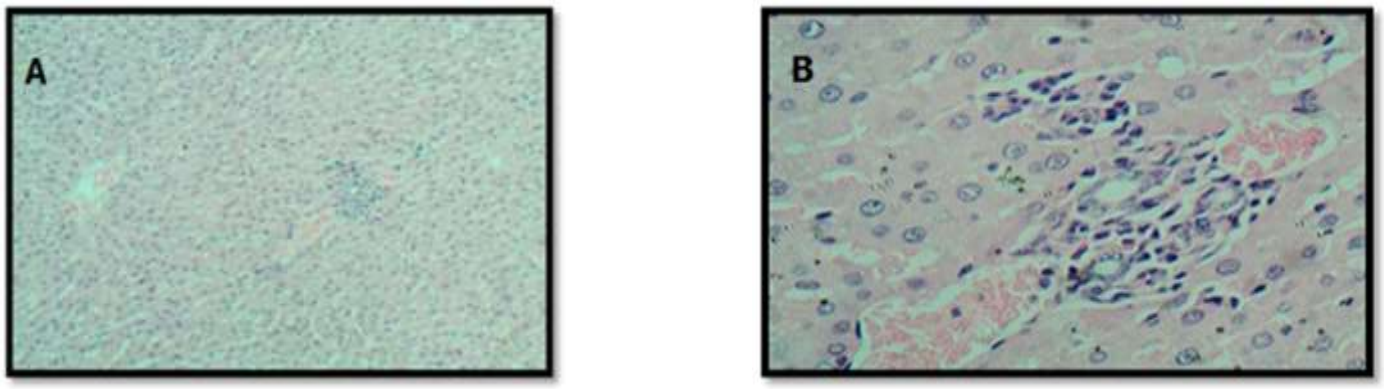

Figure 2: Light microscopic image of liver section from Dexa group show marked congestion of central and portal veins filled with blood and edematous fluid, focal aggregation of mononuclear cells around portal area.(H&E) A. 10X & B.40X.

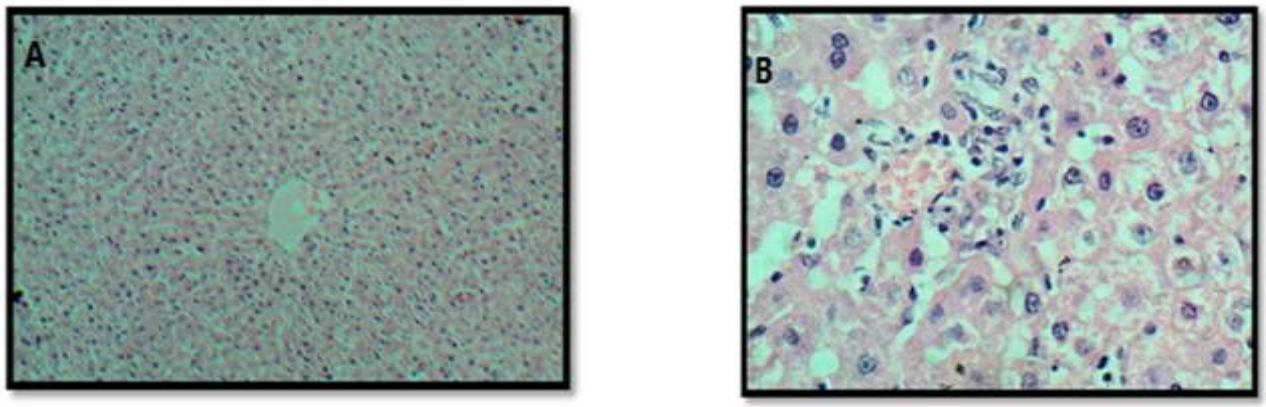

Figure 3: Light microscopic image of liver section from Dexa and *T.vulgaris* group show organization of radiating hepatocytes, congestion of sinusoids with mononuclear cells infiltration. (H&E) A. 10X & B.40X

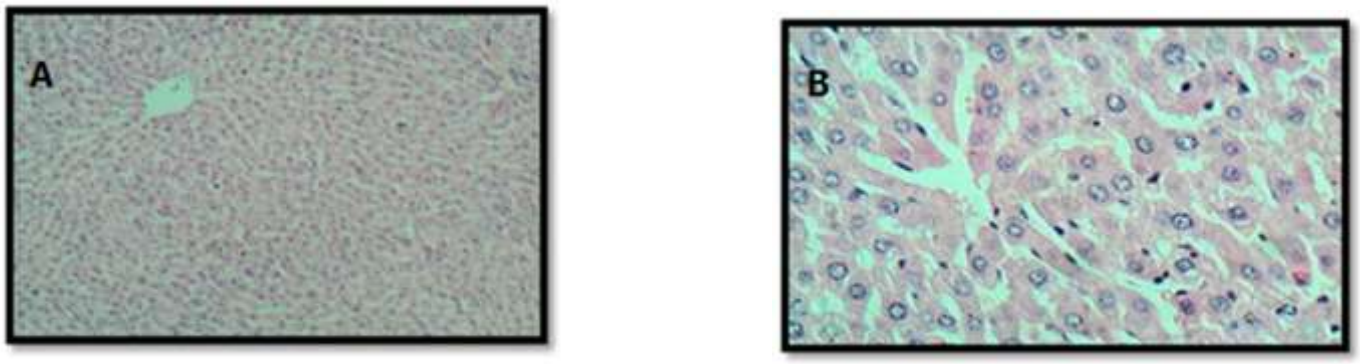

Figure 4. Light microscopic image of liver section from *T.vulgaris* group shows moderate congestion of sinusoids, normal hepatocytes architecture. . .(H&E) A. 10X & B.40X.

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