

Histological study for the biological effect of Rosemary *Rosmarinus officinalis* L. essential oil on liver and kidney tissues

دراسة نسيجية للتأثير البيولوجي لزيت نبات اكليل الجبل على انسجة الكبد والكلى

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Abstract

Many herbs and plant extracts are added to the diet not only for their aromatic properties but they possess an important biological activity. The aim of the present investigation is to examine the biological activities (describes the beneficial or adverse effects of a drug and materials on living matter) of rosemary essential oil on liver and kidney tissues. The tissues treated with different doses of essential oil of rosemary (100, 200, 300, 400) ml. Histological examination of liver tissue treated with 400 ml of rosemary revealed normal architecture with rate of stimulating cells more than the other concentrations, without dilated and congested of portal vein.

المستخلص

تضاف العديد من المستخلصات النباتية والعشبية للغذاء ليس لصفاتهما الاروماتية فحسب بل كونها تمتلك فعاليات بايولوجية . الهدف الاساسى لهذه الدراسة كان لمعرفة الفعالية البيولوجية (وهي معرفة تأثير العقاقير والمواد على الانسجة الحية) لزيت نبات اكليل الجبل على انسجة الكبد والكلى . اظهرت نتائج الفحص النسيجي للانسجة المعاملة بالزيت بالتراكيز (100, 200, 300, 400) مللتر بأن الفعالية البيولوجية كانت متمثلة بتكاثر الخلايا وذلك بسبب وجود مراحل عديدة من الانقسامات الخيطية للخلايا فى التركيز 400 مللتر حيث ظهرت اكثر وضوحا مقارنة ببقية التراكيز لهذا النبات . وكانت نتيجة الدراسة ان زيت نبات اكليل الجبل يمتلك القدرة على تحفيز الخلايا الحية لانسجة الكبد والكلى والتي ربما تعود الى الفعالية المضادة للاكسدة .

Introduction

Rosmarinus officinalis L. family Lamiaceae, is also known as rosemary. This herb is an evergreen shrub, with lovely aromatic linear leaves. Colored a dark shade of green above and white below, the leaves of the rosemary give off a beautiful fragrance, and with its small pale blue flowers, the plant is cultivated extensively in many kitchen gardens across America and elsewhere.

The essence of rosemary can be taken in the form of an infusion, a tea. The aromatic herb can also be used for a bath. Rosemary is often recommended especially for cases of low blood pressure. Both the volatile oil and the medication in the rosemary have been used as emmenagogues, which would be effective in stimulating menstrual flow and as abortifacients [1].

Almost all the physiological activity of the rosemary can be attributed to the volatile oil, which is present in the rosemary leaves in concentrations ranging from (1 - 2.5)%.

Key words: essential oil; rosemary

Alpha-pinene, camphene, verbenone, camphor, cineole, bronyl-acetate and borneol are all active compounds of the rosemary and determine the biological Properties of the essential oil and can act in synergic manner or regulate one another [2]. Chemical composition of rosemary essential oil can vary between regions and it depends mostly on climate, soil composition, plant organ, age and stage of vegetative cycle, all these compounds possess an adequate amount of antibacterial properties. Furthermore, the rosemary has stimulating properties, and this becomes more evident when the oil is applied locally. In addition, the leaves of rosemary contain a number of flavonoid pigments of which diosmin, is reported to decrease capillary fragility and permeability [3]. According to German health authorities, rosemary can prove to be effective for bringing in relief from indigestion. Rosemary can also be used as a supportive therapy for rheumatic disorders, and externally, rosemary is acknowledged for its efficacy and success in the treatment of circulatory problems. Though, the actual therapeutic effectiveness of rosemary is not yet known, and until today, no real systemic studies on the leaves of the aromatic herb have been conducted [4].

Extracts containing labiatic and carnosic acids have antioxidant or food preservative properties similar to those of butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT), but it must always be remembered that large quantities of rosemary oil cannot be taken internally. The reason is that this may cause stomach irritation and disorders and can also irritate the kidneys and intestines [5].

The aim of the present investigation is to examine the biological activities (i.e. describes the beneficial or adverse effects of a drug or chemicals on living matter) of rosemary essential oil on liver and kidney tissues.

Materials and Methods

A total 10 adult albino male mice weighing (25-35) gm, were used in this study, they were isolated in a relatively controlled environmental temperature of about 25c, in the animal breeding center/ College of medicine/ Uuniversity of Baghdad. They were given food and free access to water. Mice were divided into 5 groups, 4 animals for each. Group I served as normal control mice injected with normal saline 0.9% only GroupII: the experimental groups were injected intraperitoneally with different doses of essential oil of rosemary(100, 200, 300, 400) ml. Animals were sacrificed after 3 hours by cervical dislocation, small pieces of tissues of liver, kidney, pancreas were removed for histological study by fixing in 10% formaldehyde, the specimens were dehydrated in ascending grades of ethanol, cleared with xylene and embedded in paraffin wax, sectioned to get 5 μ m sections, and stained with haematoxylin – eosin stain (H & E).

Results

In tissues treated with rosemary 100 ml

The histological (heamatoxyline & eosin stain) examination of liver tissue showed normal arcitucher of hepatocytes and sinusoids.

Kidney: Examination of the kidney revealed normal glomeruli with thin glomerular basement membranes, normal cellularity and patent capsular space surrounding by proximal and distal ducts except the enlargement of the blood vessels in this section Figure (1).

In tissues treated with rosemary 200 ml

Liver: The histological examination appeared more or less normal with activated hepatocytes cells (cell in different stages of cell division); section also showed dilated and congested portal vein.

Light microscopy of the kidney sections showed an increase in the mesangial basement membrane, increase in the matrix of the glomeruli and hyalinization of the arterioles with the enlargement of some blood vessels in this section but it was less than in animals treated with 100 ml of extract, in addition to that cell division appeared clear and more in number as compared with the tissues of animals treated with 100 ml of rosemary.

Activated cells obviously clear showed in pancreatic tissue acini Figure (2).

In tissues treated with rosemary 300 ml

Liver: Nucleus of hepatocyte cells appeared large and activated much more obviously than in other concentrations of this herb, besides the portal vein appeared less congested as compared with other concentrations above.

Sections of kidney tissue revealed an increase in the mesangial basement membrane, increase in the matrix of the glomeruli and hyalinization of the arterioles and also showed activated duct cells Figure (3).

In tissues treated with rosemary 400 ml**Liver:**

Examination of liver tissue treated with 400ml of rosemary revealed normal architecture of hepatocyte with stimulating (activated) cells more than the other concentrations, and without dilated and congested of portal vessels.

Kidney

Tissues showed an increase in the mesangial basement membrane, increase in the matrix of the glomeruli and hyalinization of the arterioles and obvious activated duct cells with enlargement of the blood vessels Figure (4).

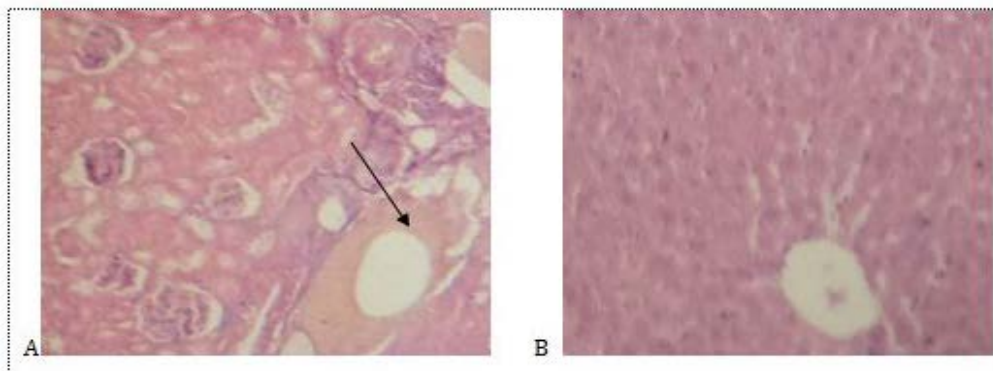


Fig. (1): In tissues treated with rosemary (100 ml): A- kidney tissue showed normal cellularity except the enlargement of the blood vessels in this section (arrow). B-Liver tissue showed normal arcitucher of hepatocytes and sinusoid..... (H.P., stain H&E)

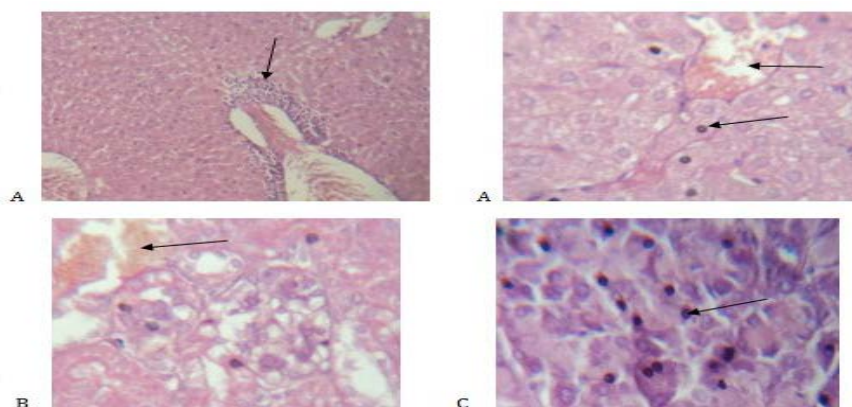


Fig. (2): In tissues treated with rosemary (200 ml): A- Tissue of liver showed active hepatocytes cells (cell division), section also showed dilate and congested portal vessel (arrow) (L.P. &H. P.). B –Kidney tissue revealed hyalinization of the arterioles with the enlargement of blood vessels in this section (H.P.). C– Pancreatic tissue showed cells in different stages of cell division (arrow) (H.P.) (H&E stain).

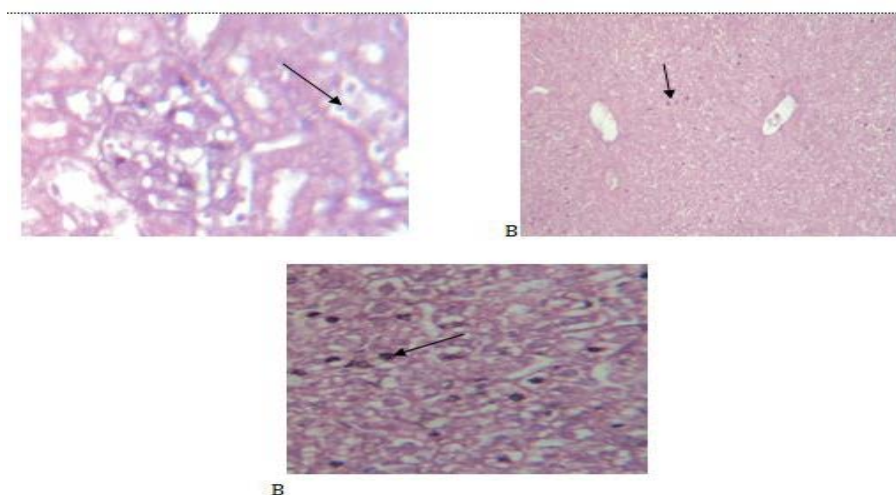


Fig. (3): In tissues treated with rosemary (300 ml): A- Sections of kidney tissue revealed an increase in the mesangial basement membrane, increase in the matrix of the glomeruli and hyalinization of the arterioles and also showed activated duct cells (arrow).B- Nucleus of hepatocyte cells appeared large and activated(arrow) much more obviously than in 100,200 ml, besides the congested portal vein appeared less as compared with other concentrations above(H&E stain) .

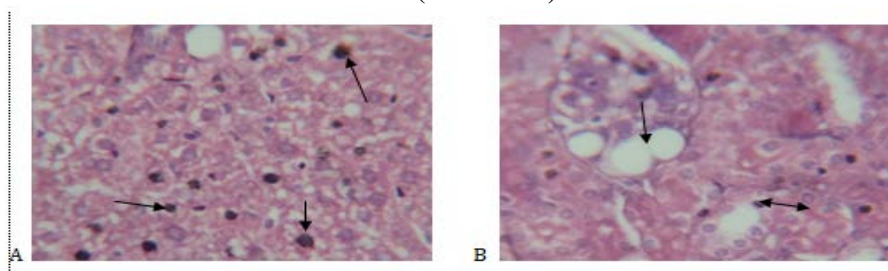


Fig. (4): In tissues treated with rosemary (400 ml): A- liver tissue revealed normal architecture of hepatocyte with stimulating cells more than the other concentrations (arrow), and without dilated and congested of portal vessels. B-Kidney tissue showed an increase in the mesangial basement membrane, increase in the matrix of the glomeruli and hyalinization of arterioles (arrow) (H&E stain) and obvious activated duct cells ←→

Discussion

Rosemary in culinary or therapeutic doses is generally safe. A toxicity study of the plant on rats has shown hepatoprotective and antimutagenic activities [6], and this

comes with the result of our study which shows that the presence of activated cells and in several stages of cell division indicated that the rosemary oil has the ability to stimulate the cells in liver and kidney tissues which it may be due to antioxidant activity of rosemary extract, and this agree with [7]. However, precaution is necessary for those displaying allergic reaction or are prone to epileptic seizures.

Rosemary essential oil may have epileptogenic properties, as a handful of case reports over the past century have linked its use with seizures in otherwise healthy adults or children [8]. Rosemary essential oil is potentially toxic if ingested. Large quantities of rosemary leaves can cause adverse reactions, such as coma, pasm, vomiting, and pulmonary edema (fluid in the lungs) that can be fatal. Avoid consuming large quantities of rosemary especially if pregnant or breastfeeding [9].

Free radicals/ reactive oxygen species are associated with many biological phenomena, such as inflammation, aging, and carcinogenesis. The antioxidant activity of polar extracts of rosemary is related to the content of polyphenols (PERP) compounds (i. e. carnosol, carnosic acid). Constituents in rosemary have shown variety of pharmacological activities for cancer chemoprevention and therapy in vitro and, in vivo models [10]. [11] reported that a single acute dose of PERP, given directly into the rumen highly susceptible to Lipoperoxidation enhanced the plasma total antioxidant status. The digestive processes of PERP in vivo are beneficial by improving the biological effect of polymeric proanthocyanidins. It was found that addition of rosemary extract delayed the oxidation of lipid fraction of minced meat balls during storage in the freezer. The antioxidative effect was related to the concentration of the ethanol rosemary extract in the product [12]. Similar results were reported by [13]. In contrast to the above, other experiments have reported little or no antioxidant activity of rosemary [14] found that dietary supplementation with 500 or 1 000 mg/kg of commercial rosemary extract had no effect on the lipid oxidative stability of eggs enriched with omega-3 fatty acids. Recent European research has shown rosemary interferes with the absorption of iron in the diet, which indicates it should not be used internally by persons with iron deficiency anemia [15].

Conclusion

Many investigations effects of rosemary essential oil in order to show that its constituents have important biological properties. Results of the relevant studies showed that there are biologically active compounds in rosemary essential oil exhibiting antioxidant properties especially with the concentration 400ml. Rosemary essential oil, however, does not enhance immune response and there are reports about its adverse effects on fertility. Essential oils, despite their wide use and being familiar to us as fragrances, constitute effective alternatives or complements to synthetic compounds produced by chemical industry without showing side effects.

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