دراسة تأثير اللبان الذكر علي الوذمة المخلبية للقدم الخلفية للفار

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Study of the Effect of Frankincense on the Hind Paw Edema of Rats

دراسة تأثير اللبان الذكر علي الوذمة المخلبية للقدم الخلفية للفأر

By

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ABSTRACT:

Edema, also spelled oedema, dropsy, is the build-up of fluid in the body's tissue, most commonly, the legs or arms. This study aimed to evaluate the effect of frankincense in different concentrations on adult male albino rats on anti hind paw edema. Thirty white male albino rats were divided into 6 groups (5 rats each) weighing 220 ± 5g. The first and second groups fed on standard diet the third, fourth, fifth and sixth groups fed standard diet containing 5,10,15 and 20% frankincense powder respectively .After 28 days rats second to sixth groups were injected by 0.1 ml /kg formalin to cause hind paw edam, after 28 days from injection of formalin and ingesting diet supplemented with 5,10,15 and 20% frankincense the results recorded .The highest ESR reduction and hind paw edema weight levels recorded for group fed on frankincense powder (20%) while, the lowest value recorded for group fed on frankincense (5%) with significant difference. The highest reduction of cholesterol , triglycerides ,AST ,ALT, Urea, Creatinine and Uric acid levels recorded for on frankincense powder (20%) with significant difference .From the results, it could be recommended that (20%) leve of frankincense is effective in improving lipid metabolism and preventing ESR increise in hind paw edema.

Key words*:* Hind paw edema, Frankincense and Biochemical analysis.

INTRODUCTION

Edema, also spelled oedema, and also known as fluid retention, dropsy, hydropsy and swelling, is the build-up of fluid in the body's tissue, most commonly, the legs or arms are affected **(Houghton, 2009),** symptoms may include skin which feels tight, the area may feel heavy, and affected joints may be hard to move. Other symptoms depend on the underlying cause **(Henry, 2019).**

Causes may include venous insufficiency, heart failure, kidney problems, low protein levels, liver problems, deep vein thrombosis, infections, angioedema, certain medications, and lymphedema **(Houghton, 2009).** It may also occur after prolonged sitting or standing and during menstruation or pregnancy, the condition is more concerning if it starts suddenly, or pain or shortness of breath is present **(Toscano *et al.*, 2019).**

Treatment depends on the underlying cause, the underlying mechanism involves sodium retention, decreased salt intake and a diuretic may be used, elevating the legs and support stockings may be useful for edema of the legs, if older people are more commonly affected. The word is from the Greek οἴδημα oídēma meaning 'swelling **(Ferrero-Miliani *et al.*, 2020).** Causes of edema which are generalized to the whole body can cause edema in multiple organs and peripherally. For example, severe heart failure can cause pulmonary edema, pleural effusions, ascites and peripheral edema. Such severe systemic edema is called anasarca. In rare cases, a Parvovirus B19 infection may cause generalized edemas **(Wiggli *et al.*, 2019).** As well as the previously mentioned conditions, edemas often occur during the late stages of pregnancy in some women. This is more common with those of a history of pulmonary problems or poor circulation also being intensified if arthritis is already present in that particular woman. Women who already have arthritic problems most often have to seek medical help for pain caused from over-reactive swelling. Edemas that occur during pregnancy are usually found in the lower part of the leg. **(Ferrero-Miliani *et al.*, 2020).** Edema can occur as a result of gravity, especially from sitting or standing in one place for too long. Water naturally gets pulled down into your legs and feet. Edema can happen from a weakening in the valves of the veins in the legs (a condition called venous insufficiency). This problem

makes it hard for the veins to push blood back up to the heart, and leads to varicose veins and a buildup of fluid in the legs.Certain diseases — such as congestive heart failure and lung, liver, kidney, and thyroid diseases — can cause edema or make it worse .An allergic reaction, severe inflammation, burns, trauma, clot(s), or poor nutrition can also cause edema .The signs of inflammation are heat, pain, redness, swelling, and loss of function. Too little inflammation could lead to progressive tissue destruction by the harmful stimulus (e.g. bacteria) and compromise the survival of the organism. In contrast, chronic inflammation may lead to a host of diseases, such as hay fever, periodontitis, atherosclerosis, rheumatoid arthritis, and even cancer **(Abbas and Lichtman 2009).** There are various components to an inflammatory reaction that can contribute to the associated symptoms and tissue injury. Edema, leukocyte infiltration, and granuloma formation represent such components of inflammation. Though, it is a defense mechanism. Edema is the abnormal accumulation of fluid in certain tissues within the body. The accumulation of fluid may be under the skin - usually in dependent areas such as the legs (peripheral edema, or ankle edema), or it may accumulate in the lungs (pulmonary edema). Which can cause severe pain. The affected area is swollen, the skin over the swollen area might look stretched and shiny, gently pressing on the swollen area with your finger for at least 5 seconds and then removing your finger will leave a dimple in the skin ,you may have trouble walking if your legs are swollen, you may be coughing or have trouble breathing if you have edema in the lungs. Paw edema is a symptom of inflammation to study inflammation , Inflammation is a reaction of living vascularized tissues to endogenous and exogenous stimuli. The term is derived from the Latin "inflammation are" meaning to burn. Inflammation is fundamentally destined to localize and eliminate the causative agent and to limit tissue injury. The, inflammation is a physiologic (protective) response to injury. Inflammation is itself not to be consideredas a disease but as a salutary operation consequent either to some violence or to some diseases **(Ali, 2016).** The purpose of inflammatory is to localize and eliminate the injurious agent and to remove damaged tissue components so that the body can begin to heal. The

response consists of changes in blood flow, an increase in permeability of blood vessels, and the migration of fluid, proteins, and white blood cells from the circulation to the site of tissue damage **(Ferrero-Miliani *et al.*, 2020)**. According to WHO, 1 - 3% of the world population inflammatory is affected from and among them females are three times more prone to the disease as compared to males inflammatory, with systemic autoimmune disease **(WHO, 2016).** Inflammation has a role in a lot of diseases, including arthritis, cancer, diabetes and heart disease. inflammation cause the following symptoms redness, swelling, heat, pain, and frankincense is one of the most widely used food ingredients. Frankincense contains about30-60% resin, 5-10% essential oils, which are soluble in the organic solvents, and the rest is made up of polysaccharides. **(Abdel-Tawab *et al.*, 2017).** Frankincense used in folk medicine for centuries to treat various chronic inflammatory diseases. The resinous part of frankincense possesses monoterpenes, diterpenes, triterpenes, tetracyclic triterpenic acids and four major pentacyclic triterpenic acids i.e. β-boswellic acid, acetyl-β-boswellic acid, 11-keto-β-boswellic acid and acetyl-11-keto-β-boswellic acid, responsible for inhibition of pro-inflammatory enzymes and paw edema . Out of these four boswellic acids, acetyl-11-keto-β-boswellic acid is the most potent inhibitor of 5-lipoxygenase, an enzyme responsible for inflammation and paw edema **(Ali, 2016).** Therefore, the aim of this study was to determine the effect of frankincense as paw edema alleviation.

MATERIAL and METHODS

Materials:

Frankincense is purchased from local market in Shibin El-kom, casein, corn oil, vitamins mixture and minerals, were obtained from Morgan Co. Cairo, Egypt. Chemical kits used in this study (TG, HDL-c, LDL-c, VLDL-c, ALT, WBC, Hb, RBC, AST, creatinine, urea , uric acid and ESR) were purchased from Al-Gomhoria Company for Chemicals and Medical Instruments, Cairo, Egypt.

Preparation of frankincense

The frankincense was obtained at dried form and then milled to obtain powder form and stored in freezer until used

Experimental design (220±2g).

Thirty white male ***(220±2g)*** were obtained from research Institute Ophthalmology, Medical Analysis Department used in laboratory of the Faculty of Home Economics Menoufia University .Rats were kept in wire cages. The diet was introduced in special feed cups to avoid scattering of feed, also water was provided to the rats by glass tube through the wire cage. The animals were housed individually in well aerated cages under hygienic laboratory condition and fed basal diet according to AIN-93 guidelines **(Reeves *et al.*, 1993)** for 7 days as an adaptation period.

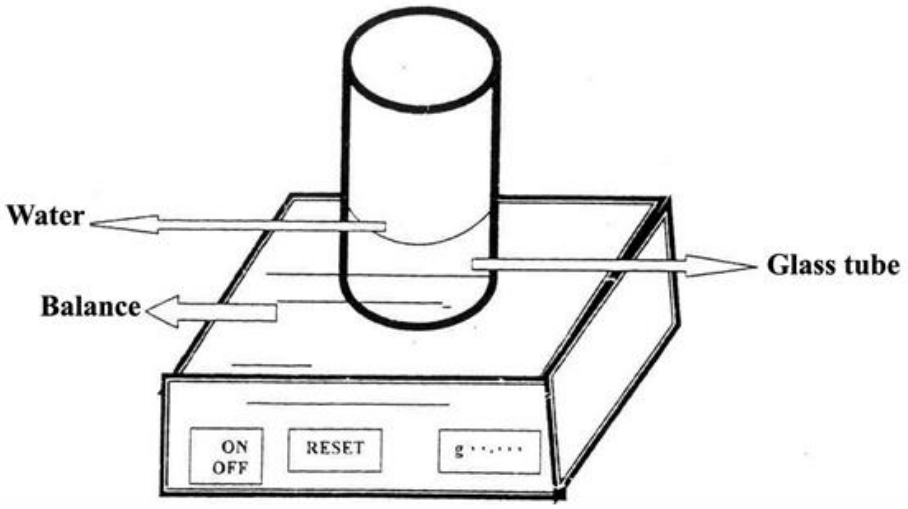

Fig (1): Determination of hind paw volume, Fereidonia *et al.*, (1999).

A diagram describes the apparatus used for determining edema as follow. A5cm glass cylinder with 4 cm water content was used, the paw weight was measured by immersing the animal paw in to a predetermined depth of water. The displaced water was receipted in a petri dish placed on electronic balance, then the reading recorded in the balance was taken as indication of animal edema, the paw weight was measured after. after 0h, 2h, 4h, 8h, 4h, 8 day 12, 14, 19, 21, 24 and 28 days injection formalin according to **Fereidonia *et al.*, (1999).**

Rats were fasted overnight (12 hours), and anesthetized with diethyl ether. Blood samples were divided into portions, part1 collected into a dry clean centrifuge glass tube. Serum was

separated by centrifugation at 3000 r.p.m for 10 minutes at room temperature. Serum was carefully aspirated and put into clean quiet fit plastic tubes and kept frozen at (-20°C) until analysis. Part 2 collected in tube contained ethylene di amine tetra acetic acid (EDTA) to estimate ESR.

Analytical method

Erythrocyte Sedimentation Rate (ESR).

Erythrocyte S–Rate was determined according to the method **of Bogdaycioglu *et al.*, (2014).**

Measurement instrument of paw edema.

Paw edema was determined according to **Fereidonia *et al.*, (1999).**

Complete Blood Count (CBC) test

That test included WBC count, Hb, RBC count, platelet count (PLC), The results of CBC are generated by highly automated electronic and pneumatic multichannel analyzers based on aperture - impedances and/or laser beam cell sizing and counting according to **Jacobs *et al.*, (2001).**

Serum cholestrol: Serum triglyceride was determined by enzymatic method using kits according to the **Fossati (1982).** Serum total cholesterol and HDL-c were determined according to the methods described by **Thomas (1992) and Grodon and Amer (1977).**VLDL-c was calculated in mg/dl according to the equation with **Lee and Nieman (1996)** as follows:

VLDL-c (mg/dl) = Triglycerides / 5. The low density lipoprotein cholesterolLDL-c was calculated in mg/dl according to the equation with **Lee and Nieman (1996)** as follows:

LDL-c (mg/dl) = Total cholesterol – HDL-c – VLDL-c.

Liver functions

Determination of serum alanine amino transferase (ALT), serum asparatate amino transferase (AST) were carried out according to the method of **Hafkenscheid (1979), Clinica Chimica Acta (1980), and Moss (1982)**, respectively.

Kidney functions as serum urea and serum creatinine were determined by the method according to **Henry (1974)** and **Patton & Crouch (1977)**.

Statistical Analysis

The results recorded as mean ± SD and were subjected to analysis of variance (ANOVA) for a completely randomized design using a statistical analysis system **SPSS (2000)**. Duncan's multiple range tests were used to determine the differences among means at the level of 95%.

RESULTS AND DISCUSSION

Table (1): Effect of frankincense on body weight gain, feed intake and feed efficiency ratio of of rat of hind paw edema groups:

Data presented in show the effect of frankincense on body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER) of rats of hind paw edema groups. The results showed that the body weight gain (BWG) % of negative positive control recorded the highest value when compared with positive control with significant difference which were 17 and 14g %, respectively. for rats of hind paw groups, it is clear to notice that the lowest (BWG) recorded for group fed on 20 % frankincense powder, while the highest BWG% recorded for group fed on frankincense powder (5%) with significant difference ($P \leq 0.05$). The mean values were -17.3g and-15.7g %, respectively frankincense powder supplementation showed decreased body weight gain. these results are in agreement with those reported by **Gomaa, (2018),** who found that frankincense can facilitate digestion by speeding up the rate at which bile and gastric juices are secreted which positively affects the metabolic rate and helps weight loss. This loss weight may be attributed to the high amount of resin and a mixture of volatile oil. It can also stimulate peristaltic motion which helps food move properly through the intestines, improving overall digestion. Frankincense oil brings a different setting to the weight loss table. It not only kills cravings for sugar but it also reduces body inflammation which have to do with weight loss. Because to lose weight it's critical to lose body inflammation as well. You also need to support digestion and absorption of nutrients. By following this activity, you can guarantee to lose weight and do it in a healthy manner **(Jane *et al.*, 2007) & (Pooja *et al.*, 2012).** .In case of feed intake; it could

be notice that the feed intake (FI) of negative control recorded the highest value when compared with positive control with significant difference. The mean values were 19.33 and 17.88 g, respectively while, 20% frankincense recorded the highest FI while the lowest value recorded for 5 % frankincense with significant difference (P≤0.05). The mean values were 19.33 and 18.9 g, respectively. On the other hand, feed efficiency ratio (FER) of negative control recorded the highest value when compared with positive control with no significant difference (P≤0.05). The mean values were 0.9 and 0.77, respectively. In case of treated rat groups, it clear to mention that 20% frankincense recorded the highest FER while, the lowest value recorded for 5 % frankincense with significant difference. The mean values were -0.9 and -0.83, respectively.

Table (1): Effect of frankincense on body weight gain, feed intake and feed efficiency ratio of rat of hind paw edema groups

Treatment/Parameter	BWG (g/28 days)	FI (g/28 days)	FER (g/28 days) (%)
	M ±SD	M ± SD	M ± SD
Control group (-)	17^{a}±5.05	19.33^{a}±1.2	0.9^{a}±0.26
Control group (+)	14.1^{b}±1.6	17.88^{c}±1.5	0.77^{a}±.09
Rat of hind paw edema			
frankincense 5%	**-15.7^{c} ±1.7**	**18.9^{b} ±1.3**	**-0.83^{b} ±.1**
frankincense 10%	**-16.67^{c}±1.06**	**$19.12^{a\,b}$ ±1.3**	**-0.87^{b} ±.05**
frankincense 15%	**-16.93^{c} ±1.3**	**19^{b} ±1.2**	**-0.9^{c} ±.05**
frankincense 20%	**-17.39^{c}±0.73**	**$19.33^{a\,b}$±.8**	**-0.9^{c} ±0.04**

Values are expressed as means ± SD; Means in the same raw with different letter are significantly different (P < 0.05. BWG; body weight gain.

Table (2): The effect of frankincense on erythrocyte sedimentation rate of negative and rat of hind paw edema groups .

The results showed that ESR of positive control rats recorded the highest value when compared with negative control with significant difference (P≤0.05). The mean values were 21.4 and 5.9 (mm/h) respectively.While, the highest ESR value recorded for positive control when compared with rat of hind paw groups but the lowest value recorded for frankincense 10% it was 6.9 (mm/h) with significant difference (P≤0.05)..Also it was observed that ESR decreasing agrees with **Saha *et al.*, (2018)**,

who reported that the natural frankincense has been shown to reduce erythrocyte sedimentation rate in ratswhich may be attributed to the high amount of resin and a mixture of volatile oil **(Tradit, 2013).** The reason for the rise (ESR) in inflammatory conditions, fibrinogen, other clotting proteins, and alpha globulin, are positively charged, thus increasing the ESR and begins to rise at 24 to 48 hours after the onset of acute self-limited inflammation. Level decreases slowly as inflammation resolves, and can take weeks to months to return to normal levels **(Saha *et al.*, 2018).**

ESR is decreased in polycythemia, hyper-viscosity, sickle cell anemia, leukemia, low plasma protein (due to liver or kidney disease) and congestive heart failure. Although increases in immunoglobulins usually increase the ESR, very high levels can reduce it again due to hyper-viscosity of the plasma **(Tradit, 2013).**

Table (2): The effect of frankincense on erythrocyte sedimentation rate of negative and rat of hind paw edema groups

Variables	Negative control	Rat of hind paw				
		Positive control	Frankincense 5%	Frankincense 10%	Frankincense 15%	Frankincense 20%
ESR (g/60day)	5.9^{b} ±0.54	21.4^{a}±7.4	7.9 ^{b} ±0.53	6.9^{b} ±.82	7.7^{b} ±.82	7.5^{b} ±.82

Values are expressed as means ± SD; Means in the same raw with different letter are significantly different (P < 0.05) ESR; Erythrocyte sedimentation rate.

Table (3): Indicated the effect of frankincense on hind paw edema weight of negative with rats hind paw .

Injection rats with formalin caused edema which is resulted of inflammatory. However ,supplementation rats diets with frankincense at doses 5,10,15and 20%. Was fealing Frankincense was found to have significant (P≤0.05) antinflammatory acuity compared with positive control groups . Also feeding rats on diets replaced with different incen concentrations frankse cased decreasing in hind paw, the result agreed with **Houghton (2009).**

The results of this study showed that frankincense suppressed the rat hind paw edema induced by formalin, indicating marked anti-acute inflammatory efficacy. In the current study, the anti-inflammatory effect of frankincense was further evaluated to elucidate the underlying mechanisms involved in this animal model. We demonstrated that the effect may be due to

inhibition of the pro-inflammatory cytokines release, inflammatory enzymes (iNOS and COX-2) expression and also their products (NO and PGE2). Furthermore, we showed that frankincense could prevent liver damage induced through the anti-oxidative mechanisms. Paw edema is a well-defined model of acute inflammation that a variety of inflammatory mediators involves in its development and has wildly been used to evaluate the anti-edematous effect of natural products. In the present study, the authers showed that frankincense produced anti-inflammatory effects in formalininduced rat paw edema dose-dependently. Our results confirmed previous findings that frankincense exhibit a noticeable anti-inflammatory effect in experimental models **(Mansouri *et al.*, 2014)**. On the other hand, it is well characterized that neutrophil infiltration plays a key role in the inflammation induced by carrageenan in hind paw.A growing lines of evidence have demonstrated that flavonoids, phenolic acids, and triterpenoid possessed antinociceptive and anti-inflammatory effects in animal models. Studies have also reported that flavonoids such as rutin, quercetin, luteolin produced significant antinociceptive and anti-inflammatory activities. Hence, it was suggested that the antioxidant and anti-inflammatory activities of frankincense may be related to its phenolic content. **(Melina, 2020).**

Table (3): Indicated the effect of frankincense on hind paw edema weight of negative & rats with hind paw

Variables	Negative control	Rat of hind paw				
		Positive control	Frankincense 5%	Frankincense 10%	Frankincense 15%	Frankincense 20%
E.T (0h)	0.47 ^{c}±0.08	.69 ^{b}±.08	0.6 ^{a} ±.07	0.67^{b}±0.1	0.59 ^{b} ±.03	0.59 ^{b} ±.02
E.T (2h)	0.47 ^{d}±0.08	1.3 ^{a} ±.24	0.83 ^{b} ±.15	0.69 $^{b c}$ ±.07	0.66^{c} ±.05	0.63 $^{c d}$ ±.04
E.T (4h)	0.47 ^{d} ±.083	1.6 ^{a} ±.11	1.1 ^{b} ±.13	0.8 ^{c} ±.07	0.84^{c} ±.05	0.81 ^{c} ±.4
E.T (8h)	0.47 ^{d} ±0.08	1.7 ^{a} ±.08	1.0 ^{b} ±0.14	1.0 $^{b c}$±0.14	0.91^{c} ±0.04	0.87 ^{c} ±0.4
E.T (4d)	0.47 ^{d} ±0.08	1.7 ^{a}±.08	1.2 ^{b} ±0.1	1.0 ^{b} ±0.1	0.95 ^{c} ±0.05	0.91 ^{c} ±0.04
E.T (8d)	0.47 ^{d} ±0.08	1.6 ^{a} ±.08	1.0 ^{b}±0.07	0.93 ^{b} ±.11	0.81 ^{c} ±.04	0.93 ^{b} ±.05
E.T (12d)	0.47 ^{d} ±0.08	1.4 ^{a}±.08	0.87 ^{b}±0.07	0.87 ^{b}±0.11	0.73 ^{c}±0.04	0.81$^{b c}$ ±.04
E.T (14d)	0.47 ^{c} ±0.08	1.2 ^{a}±.17	0.7 ^{b} ±.07	0.81 ^{b} ±.08	0.67 ^{b} ±.08	0.67 ^{b} ±.08
E.T (19d)	0.53 ^{c} ±.054	1.1 ^{a} ±.17	0.7 ^{b} ± 0.07	0.71 ^{b} ±0.08	0.61 ^{b} ±.04	0.63 ^{b} ±.05
E.T ((21d)	0.53 ^{d}±.054	.97 ^{a} ±.17	0.6 ^{b} ±.07	0.67$^{b c}$ ± .08	0.66 ^{c} ±.04	0.63$^{b c}$ ±.04
E.T (24d)	0.53 ^{d} ±.054	0.97^{a}±.04	0.6 ^{b} ±.07	0.67 $^{b c}$ ±0.1	0.60 ^{c} ±.0	0.61 ^{c} ±.1
E.T (28d)	0.53^{d} ±.054	.97^{a} ± .04	0.6 ^{b} ±.07	0.67$^{b c}$ ±.1	0.58 ^{c} ±.0	0.59 ^{c} ±.1

Values are expressed as means ± SD; means in the same row with different letter are significantly different (P < 0.05. ET :Evaluate Time.; h : hour .;d: day.

Table (4): Effect of frankincense on lipids profile of negative and rat of hind paw edema groups .

The effect of frankincense on the serum total cholesterol and triglycerides of rat of hind paw groups are shown in table(4). The obtained results indicated that the cholesterol levels of positive control group recorded the highest value when compared with negative control group with significant difference ($p < 0.05$). The mean values were 1-6.9 and 56.0 mg/dl, respectively. While, the lowest cholesterol levels recorded for group fed on 5 % frankincense and for 20 % frankincense. The mean values were 82.5 and 82 mg/dl, respectively. On the other hand, the triglyceride of positive control group recorded the highest value when compared with negative control group with significant difference ($P<0.05$). The mean values were 82 and 52 mg/dl, respectively. While, the lowest triglyceride recorded for group fed on 20 % frankincense while the highest value recorded for 5 % frankincense with significant difference ($P<0.05$). The mean values were 66 and 56 mg/dl, respectively .On the other hand, the HDL-c of negative control rats group recorded the highest value when compared with positive control group with significant

difference (P<0.05). The mean values were 10.5 and8.7 mg/dl, respectively. While, the highest HDL-c of treated group recorded for group fed on 20% frankincense but, the lowest value recorded for group fed on 5 % frankincense with significant difference (P<0.05). The mean values were 10.5and 10.9 mg/dl, respectively . On the other hand, the LDL-c of positive control rats group recorded the highest value when compared with negative control group with significant difference (P<0.05). The mean values were 81.8 and 36.8 mg/dl, respectively. previously, the highest LDL-c of treated group recorded for group fed on 1.5 % frankincense but, the lowest value recorded for group fed on 6% frankincense with significant difference (P<0.05)(table 4). The mean values were 61 and 48.8 mg/dl, respectively. In case of VLDL-c, the positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 15.3 and 10.5 mg/dl, respectively. While, the highest VLDL-c of treated group recorded for group fed on 5 % frankincense but, the lowest value recorded for group fed on 20 % frankincense with significant difference (P<0.05). The mean values were 11.50 and 11.4 mg/dl, respectively The result are in agreement with that of **Chen *et al*., (2012).**

The obtained results indicated that, VLDL of positive control group recorded the highest value when compared with negative control group frankincense. Their would probably reduce hypertension, cardiovascular diseases, obesity and heart diseases by decreasing cholesterol levels, it is reported also the decrease in plasma cholesterol **(Tradit, 2013)**. Effects of ***Boswellia serrata*** rats have been shown in other studies as well, moreover, a study showed that ***Boswellia serrata*** has protective effects on low-density lipoprotein (LDL), and high-density lipoprotein (HDL) of diabetic patients with the daily dose of 900 mg without any important side effect, According to increase in serum insulin of patients who received ***Boswellia serrata***, low-density lipoprotein effect is through increase in insulin secretion **(Ahangarpour *et al*., 2014).**

Table (4): Effect of frankincense on lipids profile of negative and rat of hind paw edema groups.

Variables	Negative control	Rat of hind paw				
		positive control	Frankincense 5%	Frankincense 10%	Frankincense 15%	Frankincense 20%
CH (mg/dl)	56.0^{e}±1.7	106.9^{a}±1.1	82.5 ^{b} ±1.7	78.5^{c} ±0.5	75.0^{d} ±1.1	82 ^{b} ±0.57
TG (mg/dl)	52 ^{d} ±5	82 .5^{a}±7.5	66 ^{b} ±1.7	61.0^{c} ±5.7	59^{c} ±6.9	56 ^{d} ±1.7
HDL (mg/dl)	10.5^{a} ±0	8.7 ^{c} ±.05	10.4 $^{a\,b}$ ±.57	10.1^{b} ±0.9	10.4^{a} ±.05	10.5 $^{a\,b}$ ±.57
LDL (mg/dl)	36.8^{d}±2.7	81.8^{a}±1.7	61.0 ^{b} ±3.4	56.5^{b} ±1.0	52. 1 ^{b} ±1.1	60.1c ±1.4
VLDL (mg/dl)	10.5 ^{c}±0.1	15.3^{a} ±1.5	11.5 ^{c} ±1.1	11.5 ^{b} ±0.34	12.5 ^{b}±0.34	11.4^{b} ±0

Values are expressed as means ± SD; means in the same raw with different letter are significantly different (P < 0.05).

Table (5): Effect of frankincense on blood analyses CBC of negative and rat of hind paw edema groups.

The obtained results indicated that hemoglobin of negative control rats group recorded the highest value when compared with positive control group with significant difference (P≤0.05). The mean values were 13.2and 11.8 mg / dl, respectively. While, the highest hemoglobin of treated group recorded for group fed on frankincense 20%, it was 12.5g, but the lowest value was group fed on frankincense 5%, it was 12.1g, with significant difference (P≤0.05). These results are in agreement with **Mohammad (2018),** say hemoglobin is an iron-containing compound found in the red blood cells, which transports oxygen around the body. Measuring the concentration of hemoglobin in the blood can help diagnose anemia, a condition caused by a deficiency of hemoglobin, Hemoglobin in negative control rat increased in groups study as compared with positive control significantly. In case of red blood cells count RBC's of negative control rats group recorded the highest value when compared with positive control group with significant difference (P≤0.05). The mean values were 6.1 and 5.2 mm3, respectively. While, the highest RBC's of treated group recorded for group fed on frankincense 20% it was 5.9 but the lowest value recorded for positive control with no significant difference (P≤0.05) RBCs in rats increased significantly in groups study (frankincense) as compared with positive. These results are in agreement with **Mohammad (2018).** Red blood cells indicator for healthy liver as if it is important for erythropoietin which activates the formation of RBC 's and globin

part of hemoglobin RBC stores vitamin B12 and iron which are essential for erythropoietin, therefore, liver, diseases are associated with anemia **(Hamdy and Nadia, 2004).** On the other hand, the hematocrit % of negative control rats recorded the highest value when compared with positive control with significant difference (P≤0.05). The mean values were 42 and 32 %, respectively. While, the highest HCT of treated group recorded for group fed on frankincense 20% it was 39.5 % but the lowest value recorded for group fed on frankincense 5% it was 36.5 % with significant difference (P≤0.05). In case of treated groups results are in agreement with, **Xuesheng *et al*., (2017).** The obtained results indicated that platelets of positive control recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 677 and 405 mm, respectively. While, the lowest value platelets of treated group recorded for group frankincense 20% it was 450 mm^3 but the highest value recorded for group fed positive control with significant difference (P≤0.05). In case of lymphocytosis 's of positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 44.75 and 24.2 mm3, respectively. While, the highest lymphocytosis of treated group recorded for group fed on frankincense 5% but the lowest value recorded group fed on frankincense 20 % The mean values were 70.7 and 50.9 mm3 with no significant difference (P≤0.05) .On the other hand, the WBC's of positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 16 and 10 mm3, respectively. While, the highest lymphocytosis of treated group recorded for group fed on frankincense 5% but the lowest value recorded group fed on frankincense 20 %. The mean values were 14 and 10.5 mm3 with no significant difference (P≤0.05).

Table (5): Effect of frankincense on blood analyses CBC of negative and rat of hind paw edema groups

Variables	Negative control	Rat of hind paw				
		positive control	Frankincense 5%	Frankincense 10%	Frankincense 15%	Frankincense 20%
HGB (mg / dl)	13.5^{a} ±0.3	11.8^{d}±.2	12.1^{bc} ±0.1	12.5^{b}±.1	12.4^{bc} ±0.1	12.5^{cd} ±.05
RBC (mm3)	6.1^{a} ±.1	5.2^{c}±.12	5.5^{b} ±.05	5.6^{b} ±.1	5.7^{b} ±0	5.9^{b} ±.27
HCT(%)	42^{a} ±.46	32^{d} ±.92	36.5^{c} ±.4	38^{b} ±.17	38.5^{b} ±.44	39.5^{b} ±.1
PLT(mm3)	405^{d} ±7.5	677^{a}±1.2	531^{b} ±2.8	501^{c} ±5.7	455.1^{d} ±8.6	450^{d} ±7.5
Lymphocytes (%) (mm3)	24.2^{e}±12	44.75^{e}±16	70.7^{a} ±7.5	63.5b ±7.6	57.1^{c} ±18.1	50.9^{d} ±10.8
WBC (mm3)	10^{d} ±1.1	16^{a} ±.09	14^{b} ±0.44	13.5^{c} ±.57	12^{c} ±0.42	10.5^{c} ±.28

Table (6): Effect of frankincense on liver functions level of negative and rat of hind paw edema groups.

Data given in table (6) show the effect of frankincense on liver functions (AST and ALT) of rat of hind paw groups. The obtained results indicated that the ALT liver enzyme of positive control rats group recorded the highest value when compared with negative control group with significant difference (P<0.05). The mean values were 75.4 and 43.2U/L, respectively. While, the highest ALT liver enzyme of treated group recorded for group fed on 5% frankincense but, the lowest value recorded for group fed on 5% frankincense with significant difference (P<0.05). The mean values were 72.6 and 54.4 U/L, respectively. In case of AST liver enzyme of positive control rats group recorded the highest value when compared with negative control group with significant difference (P<0.05). The mean values were 84 and 54 U/L, respectively. While, the highest ALT liver enzyme of treated group recorded for group fed on 5% frankincense but, the lowest value recorded for group fed on 20% frankincense with significant difference (P<0.05). The mean values were 81 and 61 U/L, respectively. Krankincense has improved the course and macroscopic findings of induced inflammation for groups studies 5%, 10%, 15% and 20% frankincense according to **(Sferra, 2012).**

Shi *et al*., (2002) illstrated the impact frankincense of liver function in biochemical analysis from serum and liver tissue rats. In serum, no significant reduction in AST activity was observed at 15 days, but the reduction in AST activity was significant at 30 days In ALT activity, a significant decrease was observed at 15 and 30 days .

Table (6): Effect of frankincense on liver functions of negative and rat of hind paw edema groups

Variables	Negative control	Rat of hind paw				
		positive control	Frankincense 5%	Frankincense 10%	Frankincense 15%	Frankincense 20%
ALT (U/L)	43.2^{d} ±1.1	75.4^{a}±1.7	72.6^{ab} ±1.2	62.2^{bc} ±.3.27	61.4^{c}±.3.28	54.4^{cd} ±2.5
AST (U/L)	54^{d} ±1.3	84^{a}±1.8	81^{ab} ±1.2	71^{bc} ±.3.9	64^{cd}±2.1	61^{b} ±2.4

Table (7): Effect of frankincense on kidney functions of negative and rat of hind paw groups:

Data presented in table (7) show the effect of frankincense on the kidney functions (uric acid, urea and creatinine) level of rat of hind paw groups. The obtained results indicated that the creatinine level of positive control rats group recorded the highest value when compared with negative control group with significant difference (P<0.05). The mean values were 1.1a and 0.50 mg/dl, respectively. While, the highest creatinine level of treated group recorded for group fed on 5 % frankincense but, the lowest value recorded for group fed on 20% frankincense with significant difference (P<0.05). The mean values were 0.8 and 0.6 mg/dl, respectively. On the other hand, the urea level of positive control rats group recorded the highest value when compared with negative control group with significant difference (P<0.05). The mean values were 51 and 26.2mg/dl, respectively. While, the highest urea level of treated group recorded for group fed on 5% frankincense but, the lowest value recorded for group fed on 20% frankincense with significant difference (P<0.05). The mean values were 37.33 and 33.6 mg/dl, respectively. In case of uric acid, the level of positive control rats group recorded the highest value when compared with negative control group with significant difference (P<0.05). The mean values were 9.5 and 2.5 mg/dl, respectively. While, the highest uric acid level of treated group recorded for group fed on 5% frankincense but, the lowest value recorded for group fed on 20% frankincense with significant difference (P<0.05). The mean values were 6.9and 3.6 mg/dl, respectively. These results are in agreement with reported that frankincense supplemented diet significantly lowered the plasma level of kidney functional markers including urea, uric acid and creatinine in hypertensive rats, when feeding with cholesterol-

enriched diet that caused a significant increase in serum urea **(Moreillon *et al.*, 2013).**

Table (7): Effect of frankincense on kidney functions level of negative and rat of hind paw groups.

Variables	Negative control	Rat of hind paw				
		positive control	Frankincense 5%	Frankincense 10%	Frankincense 15%	Frankincense 20%
Creatinine (mg / dl)	0.5^{d} ±.05	1.1^{a}±0.01	0.8^{b}±0.1	0.77^{bc}±0.5	0.72^{bc}±0.1	0.6^{cd}±0.04
Urea (mg / dl)	26.2^{d} ±.9	51^{a}±1.3	37.33^{b} ±1.5	33.6^{bc} ±.0.5	34^{bc} ±2.2	33.6^{cd} ±1.3
Uric acid (mg /dl)	2.5^{f} ±.1	9.5^{a}±.1	6.9^{b} ±.5	5.8^{c} ±.4	4.4^{d} ±.2	3.6^{e} ±.3

CONCLUSION: Frankincense showed potentially beneficial effects on inflamed rats and on serum lipids in inflamed rats. Therefore, it could be recommended that the diseased rat groups fed on frankincense 20% diet for lowering inflammation and improving lipids profile and kidney function.

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دراسة تأثير اللبان الذكر علي الوذمة المخلبية للقدم الخلفية للفار

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الملخص العربى

تم تقييم تأثير التركيزات المختلفة من (5، 20,15,10%) فى صورة مسحوق من اللبان الذكر بعد الخلط مع العليقة جيدا و الاضافة مع وجبة الفئران المصابة بالا وديما المخلبية كنموذج من نمازج دراسة الالتهاب وقد تم استخدام 30 فأر في هذه الدراسة وتم تقسيمها إلى 6 مجموعات كل مجموعة تحتوي على 5 فئران ذكور وتم اصابة الفئران بالاوديما بحقن الفئران من المجموعة الثانية إلى السادسة بمادة الفور مالين بتركيز 0.1 مل / كجم المتسبب في حدوث الوذمة الخلفية لمخلب الفأر. وأظهرت النتائج أن اقل قيم للزيادة فى وزن الجسم، واعلي قيم في كمية الغذاء المتناول و اعلي قيم في كفاءة استخدام الغذاء سجلت مع تركيز 20% من خليط من مسحوق اللبان الذكر في العليقة اعلي مع وجود فروق ذات دلاله معنوية اعلي انخفاض في سرعة الترسيب ووزن مخلب الفأر سجلت مع تركيز 20٪ مسحوق اللبان الذكر مع وجود فرق معنوي بالإضافة اعلى انخفاض لدهون الدم ولإنزيمات الكبد AST,ALT كذلك اليوريا والكرياتينين وحمض اليوريك سجلت مع مجموعة الفئران التي تغذت على اللبان الذكر بتركيز 20% مع وجود فروق ذات دلاله معنوية و وجد أن مجموعة الفئران المصابة بالا وديما والتي تغذت على مسحوق اللبان الذكر بتركيز 20% سجلت أفضل النتائج فى تحسين صورة الدم وايضا تم التحسن في الكولسترول المفيد وقلت دهون الدم الخطرة

الكلمات الافتتاحية: اللبان الذكر - الفئران ـ الاوديما المخلبية ـ التحاليل الكيميائية الحيوية.