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## **Therapeutic Effects of 3 New Plant Formulea Contaning Saffron As Used For Hyper Cholesterol Nolemia Hepatic Rats .**

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### **Abstract:**

This study was carried out to evaluate the anti hepatic effects ( Leading to Hypercholesterolemia ) of Saffron , Mahlab , black seed , juniper , almond , mango leaves , mugwort , Kidney beans , roasted mature date seeds and clover leaves on rats. Fifty-four male mature albino rats , weighing 150-160g per each, were used in this study and divided into 9 equal groups, the first group was kept as a control – group, while the other groups were induced by CCL4 By 2 ml/k.B.W.T.g towice per week for two weeks to induce hepatic rats. The powders were given to the rats as a percent of 5 and with and without 0.5% saffron from the basel diet for 28 days. At the end of the experiment, serum Total cholesterol (TC), triglycerides (TG) , High density lipoprotein (HDL-c) , Low density lipoprotein (LDL-c) , Very low density lipoprotein (VLDL-c) , and A.I were calculated. The results of the obtained data indicated that tested plant formulea significantly ( $P \leq 0.05$ ) decreased serum TC, TG, LDL, VLDL and A.I while increased HDL. Also, the tested plants improved liver histopathological changes. The obtained findings revealed that saffron enhanced the several compounds that were able to improve the adverse changes in hepatic rats.

**Keywords:** T.C, T.G, HDL-c, LDL-c, hepatic rats, histopathological examination.

**Introduction :**

Hepatointoxication is clinically characterized by many symptoms including the increase of the TC and LDL in plasma, and this represents that there were high risk for the development of atherosclerosis (**Pirinccioglu et al., 2010**). It has been ranked as one of the greatest risk factor to the prevalence of coronary heart diseases CHD (**Yokozawa, 2006**). Control of hypercholesterolemia plays a principal part in the protection of coronary heart disease ( CHD ) (**Hasani-Ranjbar et al., 2010**). Though there are a lot of hypolipidemic drugs used in the treatment, but they are not fully effective, safe and free from side effects. So, big efforts are needed to find out safe and effective agents that may be beneficial in correcting the lipid metabolism and preventing liver and cardiac diseases (**Sumalatha et al., 2014**). Available drugs for hypercholesterolemia treatment have been associated with many side effects. In this regard, the tendency to use medicinal plants has been doubled (**Rouhi-Boroujeni, 2015**). Plant-based foods contain significant amounts of bioactive compounds which provide desirable health benefits beyond basic nutrition. Epidemiological evidence suggests that consumption of a diet rich in some plant leaves has positive implications for human health (**Maria et al., 2011**). Herbs are used in many applications such as medicine, flavouring, nutrition, beverages and cosmetics (**Najafi and Deokule, 2010**)

*Nigellon* , is a compound found in *N. sativa* , which is also bronchodilatory and has an antispasmodic and warming effect . This is the reason why *N . sativa* can help treat respiratory disorders such as asthma and whooping cough .Research has also confirmed that it has anti-histamine qualities comparable to thymoquinone (**Babayan et al ., 1999**) .

Saffron has been used in folk medicine and Ayurvedic health system as a sedative, expectorant, anti-asthma, emmenagogue, and adaptogenic agent. Saffron was used in various preparations for pain relief (16-19<sup>th</sup> centuries) (**Schmidt et al ., 2007**) .

According to **Abd EL-Baki (1993)** almond , clover leaves , black seeds , junider, kidney beans , mango leaves , mugwort , plam date seeds and saffron where used in traditional medicine, specially for hepatointoxicated and hyperlipidemic patients .

**Materials and methods :**

Fifty four adult male albino rats, weighting 150-160g. purchased from Medical Insects Research Institute, Doki, Cairo, were used in this study.

Rats were housed in wire cages under the normal laboratory conditions (21- 23°C ) and were fed on basel diet for a week as an adaptation period. Diet was offered to rats in special feed cups to avoid loser conditions . Water was provided to the rats by glass tubes supported to one side of the cage, feed and water provided adlibitum and checked daily.

All plant parts were ground to in soft powder by using electric grinder and kept in dusky stoppered glass bottles in a cool and dry location till use according to **Rios (2001)** who reported that al herbs and plants are pest kept in a cool, dry, and dark location to reduce oxidation of their contents .

**Experimental Design:**

Rats were divided into two main groups, the first group (6 rats) fed on basal diet as a negative control (ve-) and the other main group (48rats) were CCL<sub>4</sub> in jected in paraffin in oil soy.v/v for 2 weeks to induce hepatointoxication , then all rats classified into nine groups. scientific names of plants were as follows Groups (6 ratsin esch groups divided an the following : Almond (Prinus mygdalus ) , Clover leaves ( Trifolium sativa ), Black seeds (Nigella sativa) , Juniper (Juniperus comminus ) , Kidney beans ( Phaseolus vulganis ) , Mango leaves ( Mangifera domestica ) , Mugwort (Artimesia vulganis ) , Plam date mature seeds (Phoenix dactylifera ) and saffron ( Cruns sativus).

**Group (1):** Negative control group -normal group-(6rats)

In this group rats were kept on basal diet and tap water.

**Group (2):** Positive control group (hepatic untreated group)

**Group (3):** Hepatic treated rats with 0.5% saffron in diet .

**Group (4):** Hepatic treated rats with (Mahlab, Black seed and Juniper ) by 5% without saffron.

**Group (5):** Hepatic treated rats with (Mahlab, Black seed and Juniper ) 5% , with saffron 0.5% .

**Group (6):**Hepatic treated rats with (Almond, Mango leaves and Mugwort) 5% without saffron .

**Group (7):** treated with with ( Almond, Mango leaves and Mugwort ) 5% with saffron by 0.5% .

**Group (8):** Hepatic treated rats with ( Kidney beans, roasted date seeds and Clover leaves) 5% without saffron .

**Group (9):**Hepatic treated rats with ( Kidney beans, roasted date seeds and Clover leaves) 5% with saffron by 0.5% .

**Serum lipid profile assay :**

Cholesterol, TG, HDL-c, , LDL-c and VLDL-c were determined according to **Allain *et al.*, (1974), Fossati and Prencipe (1982), Lopez (1977)** and **Lee and Nieman (1996)** respectively. Low density lipoprotein cholesterol and very low density lipoprotein cholesterol calculated according to the following equation:

LDL-Cholesterol = Total cholesterol-(HDL-c + TG/5)

VLDL-c = TG/5.

**Statistical Analysis:**

Data were expressed as mean  $\pm$  standard deviation. In order to compare the groups. analysis of variance (ANOVA) test was used. Values at  $P \leq 0.05$  were considered to be statistically significant according to **SAS (2006)**.

**Results and Discussion :**

**Effect of Saffron ,Mahlab , Black seed , juniper Almond , mango leaves , mugwort Kidney beans , roasted date seeds and clover leaves on serum total cholesterol and triglycerides (mg\dl) of hypercholesterolemic rats**

**1- Total Cholesterol (T.C) mg\dl.**

Data of table (1) Illustrate the mean value of serum (T.C.) (mg\dl) of hepatic rats fed on different diets. It could be observed that the mean value of (T.C.) of control (+) group was significantly higher than control (-) group, being  $169.966 \pm 1.950$  and  $100.366 \pm 0.814$  respectively, with percent of decrease -40.949 % of control (-) group as compared to control (+) group .All hepatic rats fed on different diets revealed significant decreases in mean values as compared to control (+) group. The values were  $129.966 \pm 1.950$  , $145 \pm 1$  ,  $121.433 \pm 1.401$  ,  $131.4 \pm 1.153$  ,  $115.067 \pm 1.101$  ,  $129.077 \pm 1.886$  and  $90.333 \pm 1.527$  mg\dl for (%0.5saffron) , (mahlab + black seed + juniper 5% without saffron) and(mahlab + black seed + juniper 5% with saffron 0.5%) , (almond + mango leaves + mugwort 5% without saffron ) and (almond + mango

leaves + mugwort 5% and with saffron 0.5%) and (kidney beans + roasted date seeds + clover leaves 5% without saffron) and (kidney beans + roasted date seeds + clover leaves 5% with saffron 0.5%) respectively. The percent of decreases were -23.534 , - 14.688 , -28.554 , -22.299, -24.057and -46.852 % for groups 3,4,5,6,7,8, and 9 respectively.

The better serum (T.C) was showed for group 9 (Hepatic rats fed on kidney beans + roasted date seeds + clover leaves 5% without saffron) when compared to control (-) group.

**He et al., (2005)** found that crocetin from saffron has strong cholesterol lowering effects. Fulther more, (**He et al., 2007**) reported that corcetin from saffron could reduce level of total cholesterol .Also, (**Sheng et al., 2006** ) reported that saffron has lipid lowering properties by inhibiting pancreatic lipase, so it leading mulabsorption of fat and cholesterol .

**Table (1):** Fasting serum total cholesterol (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by some plant diets

Variables	(1) Negative control	(2) Positive control	Only saffron	Mahlab +Black seed + juniper 5%		Almond+ mango leaves + mugwort 5%		Kidney beans + roasted date seeds + clover leaves 5%		L.S.D (p≤0.05)
			(3) Saffron 0.5%	(4) Without saffron	(5) With saffron 0.5%	(6) Without saffron	(7) With saffron 0.5%	(8) Without Saffron	(9) With saffron 0.5%	
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	
T .C (mg/dl)	100.366 <sup>h</sup> ± 0.814	169.966 <sup>a</sup> ± 1.950	129.966 <sup>b</sup> ± 1.950	145 <sup>b</sup> ± 1	121.433 <sup>f</sup> ± 1.401	131.4 <sup>c</sup> ± 1.153	115.067 <sup>g</sup> ± 1.101	129.077 <sup>e</sup> ± 1.886	90.333 <sup>i</sup> ± 1.527	0.833
%change of positive control	-40.949	-----	-23.534	-14.688	-28.554	-22.690	-32.299	-24.057	-46.852	-

Means in the same row with different litters are significantly ( $p \leq 0.05$ ) different.

### 2-Triglycerides (T.G)mg\dl

Table (2) show the mean value of serum (T.G) (mg\dl) of hepatic rats fed on different diets. It could be noticed that the mean value of (T.G.) of control (+) group was higher than control (-) group, being  $116 \pm 1$  and  $48.566 \pm 1.159$  respectively, indicating significant difference

with percent of decrease -58.132% of control (-) group as compared to control (+) group. All hepatic rats fed on different diets revealed significant decreases in mean values as compared to control (+) group. The values were  $107.533 \pm 0.650$  ,  $58.33 \pm 1.234$ ,  $51.933 \pm 1.201$ ,  $86.4 \pm 1.248$  ,  $74.5 \pm 0.953$  ,  $86.066 \pm 0.90$  and  $51.1 \pm 1.153$  mg/dl for (%0.5saffron) , (mahlab + black seed + juniper 5% without saffron) and (mahlab + black seed + juniper 5% with saffron 0.5% ) , (almond + mango leaves + mugwort 5% without saffron) and (almond + mango leaves + mugwort 5% and with saffron0.5% ) and (kidney beans + roasted plum seeds + clover leaves 5% without saffron) and (kidney beans + roasted plum seeds + clover leaves 5% with saffron 0.5%) for 3,4,5,6,7, 8 and 9 respectively. The percent of decreases were -7.299 , -49.712 , -55.230 , -25.517 , -35.775 , -25.805 and -55.948 % for groups 3,4,5,6,7,8and 9 respectively. The best serum (T.G.) was recorded for group 9 (hepatic rats fed on( kidney beans + roasted plum seeds + clover leaves 5% with saffron 0.5% ) when compared to control (-) group.

This result is in agreement with **Terra et al., (2009)** and **Carcia-Lafuente et al., (2009)** , they reported that saffron has a good effect of decreasing serum T.G.

**Table (2):** Fasting serum triglycerides (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by some plant diets

Variables	(1) Negative control	(2) Positive control	Only saffron		Mahlab + Black seed+ juniper 5%		Almond+ mango leaves +mugwort 5%		Kidney beans + roasted date seeds + clover leaves 5%		L.S.D (p≤0.05)
			(3) Saffron 0.5%	(4) Without Saffron	(5) With saffron 0.5%	(6) Without Saffron	(7) With saffron 0.5%	(8) Without Saffron	(9) With saffron0.5%		
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD		
T.G(mg/dl)	$48.566^h$ ± 1.159	$116^a$ ± 1	$107.533^b$ ± 0.650	$58.333^c$ ± 1.234	$51.933^d$ ± 1.201	$86.4^c$ ± 1.248	$74.5^d$ ± 0.953	$86.066^c$ ± 0.901	$51.1^g$ ± 1.153	0.486	
%change of positive control	-58.132	----	-7.299	-49.712	-55.230	-25.517	-35.775	-25.805	-55.948	-	

Means in the same row with different litters are significantly ( $p \leq 0.05$ ) different.

### 3- High Density Lipoprotein (HDL) mg\dl

Table (3) Indicate the mean value of serum (H.D.L.c) (mg\dl) of hepatic rats fed on different diets. It could be observed that the mean value of (HDL.c) of control (+) group was lower than control (-) group, being  $17.266 \pm 1.222$  and  $27.6 \pm 1.307$  respectively, showing significant difference, with percent of increase 59.851 % of control (-) group as

compared to control (+) group. All hepatic rats fed on different diets revealed significant increases in mean values as compared to control (+) group. The values were  $19.266 \pm 0.929$  ,  $17.4 \pm 0.781$ ,  $23.166 \pm 0.960$ ,  $17.636 \pm 0.926$ ,  $22.1 \pm 1.153$ ,  $17.45 \pm 1.0148$  and  $26.1 \pm 1.153$  mg\dl for (%0.5 saffron) , (mahlab + black seed + juniper 5% without saffron) and (mahlab + roasted plam seeds + juniper 5% with saffron 0.5%) , (almond + mango leaves + mugwort 5% without saffron) and (almond + mango leaves + mugwort 5% with saffron0.5%) and (kidney beans + roasted plam seeds + clover leaves 5% without saffron ) and (kidney beans + roasted plam seeds + clover leaves 5% with saffron 0.5%) respectively. The percent of increases were 11.583, 0.776, 34.171 , 2.142 , 27.997 , 1.65 and 51.164 % for the same above mentioned groups respectively. The best serum (HDL.c) was observed for group 9 (hepatic rats fed on kidney beans + Phoenixdacty Lifera + clover leaves 5% with saffron 0.5% ) compared to control (-) group.

**Table (3):** Fasting serum (HDL) mg\dl for negative control (1), positive control (2), and all treated groups as affected by some plant diets

Variables	(1) Negative control	(2) Positive control	Only saffron	Mahlab + Black seed+ juniper 5%		Almond+ mango leaves +mugwort 5%		Kidney beans + roasted date seeds + clover leaves 5%		L.S.D (p≤0.05)
			(3) Saffron 0.5%	(4) Without Saffron	(5) With saffron 0.5%	(6) Without saffron)	(7) With saffron 0.5%	(8) Without Saffron	(9) With saffron 0.5%	
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	
<b>HDL (mg/dl)</b>	27.6 <sup>a</sup> ± 1.307	17.266 <sup>a</sup> ± 1.222	19.266 <sup>c</sup> ± 0.929	17.4 <sup>f</sup> ± 0.781	23.166 <sup>c</sup> ± 0.960	17.636 <sup>f</sup> ± 0.926	22.1 <sup>d</sup> ± 1.153	17.45 <sup>f</sup> ± 1.0148	26.1 <sup>b</sup> ± 1.153	0.977
<b>%change of positive control</b>	59.851	-----	11.583	0.776	34.171	2.142	27.997	1.65	51.164	-

Means in the same row with different litters are significant (p≤0.05) different.

#### 4- Low Density Lipoprotein (LDL) mg\dl.

Data in table (4) illustrate the mean value of serum (LDLc) (mg\dl) of hepatic rats fed on different diets. It could be observed that the mean value of (LDL.c) of control (+) group was higher than control (-) group, being  $129.343 \pm 0.969$  and  $63.366 \pm 0.650$  respectively, showing

significant difference , with percent of decrease -51.009 % of control (-) group as compared to control (+) group. All hepatic rats fed on different diets revealed significantly decreases in mean values as compared to control (+) group. The values were  $89.8 \pm 0.8$  ,  $116.366 \pm 0.650$ ,  $87.34 \pm 1.113$  ,  $96.7 \pm 0.655$  ,  $78.18 \pm 0.830$ ,  $96.743 \pm 0.289$  and  $53.8 \pm 0.2$  mg\dl for (%0.5 saffron) , (mahlab + black seed+ juniper 5% without saffron) and (mahlab + black seed + juniper 5% with saffron 0.5%) ,(almond + mango leaves + mugwort 5% without saffron) and (almond + mango leaves + mugwort 5%with saffron 0.5% ) and ( kidney beans + roasted plam seeds + clover leaves 5% without saffron ) and ( kidney beans + roasted plam seeds + clover leaves 5% with saffron 0.5% ) respectively. The percent of decreases were -30.572, -10.033 , -32.474 , -25.237, - 39.556,- 25.204 and -58.405 % for groups 3,4,5,6,7,8 and 9 respectively. Rats fed in group 9 ( kidney beans + roasted plam seeds + clover leaves 5% without saffron) recorded the best serum (LDL.c)**Terra et al., (2009) and Garcia-Lafuente et al., (2009)** found that saffron decreased serum LDL.

This result (table 4 ) agree with **Berry man et al., (2011)**, they reported that almond rich in diatery fiber, mono unsaturated fats and poly unsaturated fats which had a good potentially effect of lowering serum LDL .

**Table (4) :**Fasting serum (LDL) mg\dl for negative control (1), positive control (2), and all treated groups as affected by some plant diets

Variables	(1)	(2)	Only saffron	Mahlab +Black seed+ juniper5%		Almond+ mango leaves +mugwort 5%		Kidney beans + roasted date seeds + clover leaves 5%		L.S.D
	Negative control	Positive control	(3) Saffron 0.5%	(4) Without Saffron	(5) With saffron 0.5%	(6) Without saffron	(7) With saffron 0.5%	(8) Without Saffron	(9) With saffron 0.5%	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	(p≤0.05)
LDL (mg\dl)	63.366 <sup>a</sup> ± 0.451	129.343 <sup>a</sup> ± 0.969	89.8 <sup>d</sup> ± 0.8	116.366 <sup>b</sup> ± 0.650	87.34 <sup>e</sup> ± 1.113	96.7 <sup>c</sup> ± 0.655	78.18 <sup>f</sup> ± 0.830	96.743 <sup>c</sup> ± 0.289	53.8 <sup>b</sup> ± 0.2	0.555
%change of positive control	-51.009	-----	-30.572	-10.033	-32.474	-25.237	-39.556	-25.204	-58.405	-

Means in the same row with different litters are significantly (p ≤ 0.05) different.



**5-Very Low Density Lipoprotein (VLDL) mg\dl**

Data of table (5 ) indicate the mean value of serum (VLDLc) (mg/dl) of hepatic rats fed on different diets. It could be observed that the mean value of (VLDLc) of control (+) group was higher than control (-) group, being  $23.366 \pm 0.862$  and  $9.566 \pm 0.450$  respectively, showing significant difference with percent of decrease -59.060% of control (-) group when compared to control (+) group. All hepatic rats fed on different diets showed significantly decreases in mean values as compared to control (+) group. The values were  $21.4 \pm 0.4$ ,  $11.466 \pm 0.513$ ,  $10.51 \pm 0.348$ ,  $17.3 \pm 0.557$ ,  $14.733 \pm 0.503$ ,  $17.2 \pm 0.9$  and  $10.31 \pm 0.356$  % for (%0.5 saffron) , (mahlab + black seed + juniper 5% without saffron) and (mahlab + black seed + juniper 5% with saffron 0.5%) , (almond + mango leaves + mugwort 5% without saffron) and (almond + mango leaves + mugwort 5% with saffron 0.5% ) and (kidney beans + roasted plam seeds + clover leaves 5% without saffron) and (kidney beans + roasted plam seeds + clover leaves 5% with saffron 0.5% ) respectively. The percent of decreases were -8.414 , -50.929, -55.020, -25.961,-36.946 -26.388 and -55.876% for groups 3,4,5,6,7,8 and 9 respectively. The best treatment was recorded for group 9 ( kidney beans + roasted plam seeds + clover leaves 5% with saffron 0.5% ) sconsidering serum (VLDLc).

**Table (5):**Fasting serum (VLDL) mg\dl for negative control (1), positive control (2), and all treated groups as affected by some plant parts

Variables	(1)	(2)	Only saffron	Mahlab + Black seed + juniper 5%		Almond+ mango leaves +mugwort 5%		Kidney beans + roasted date seeds + clover leaves 5%		L.S.D (p≤0.05)
	Negative control	Positive control	Saffron 0.5%	Without Saffron	With saffron 0.5%	Without saffron	With saffron 0.5%	Without Saffron	With saffron 0.5%	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	
VLDL (mg/dl)	9.566 <sup>g</sup> ± 0.450	23.366 <sup>a</sup> ± 0.862	21.4 <sup>b</sup> ± 0.4	11.466 <sup>e</sup> ± 0.513	10.51 <sup>f</sup> ± 0.348	17.3 <sup>c</sup> ± 0.557	14.733 <sup>d</sup> ± 0.503	17.2 <sup>c</sup> ± 0.9	10.31 <sup>f</sup> ± 0.356	0.711
%change of positive control	-59.060	-----	-8.414	-50.929	-55.020	-25.961	-36.946	-26.388	-55.876	-

Means in the same row with different litters are significantly (p ≤ 0.05)different.

**6 .Atherogenic Index (A.I) {(VLDL + LDL) / HDL} ratio:**

Data of table (6) revealed that the mean value of serum (A.I) of hepatic rats fed on different diets. It could be noticed that the mean value of (A.I) of control (+) group was higher than control (-) group, being  $8.883 \pm 0.485$  and  $2.566 \pm 0.305$  respectively, with percent of decrease - 71.113 % of control (-) group when compared to control (+) group. All hepatic rats fed on various diets showed significant decreases in mean values as compared to control (+) group. The values were  $8.5 \pm 0.25$ ,  $7.61 \pm 0.642$ ,  $5.466 \pm 0.251$ ,  $6.673 \pm 0.340$ ,  $4.3 \pm 0.360$ ,  $7.566 \pm 0.351$ , and  $2.466 \pm 0.450$  for groups 3,4,5,6,7,8 and 9 respectively. The percent of decreases were -4.311, -14.330, -38.466, -24.878, -51.592, -14.226 and -72.239 % for groups (%0.5saffron), (mahlab + black seed + juniper 5% without saffron) and (mahlab + black seed + juniper 5% with saffron 0.5%), (almond + mango leaves + mugwort 5% without saffron) and (almond + mango leaves + mugwort 5% and with saffron 0.5%) and (kidney beans + roasted plam seeds + clover leaves 5% without saffron) and (kidney beans + roasted plam seeds + clover leaves 5% with saffron 0.5%) for 3,4,5,6,7,8 and 9 respectively. Numerically, the best treatment was recorded for group 9 (kidney beans + roasted plam seeds + clover leaves 5% with saffron 0.5%) considering serum (A.I). It seems possible that the used plants could correct the changes in lipid profile due to injection of rats with C Cl<sub>4</sub> specially when saffron was added .

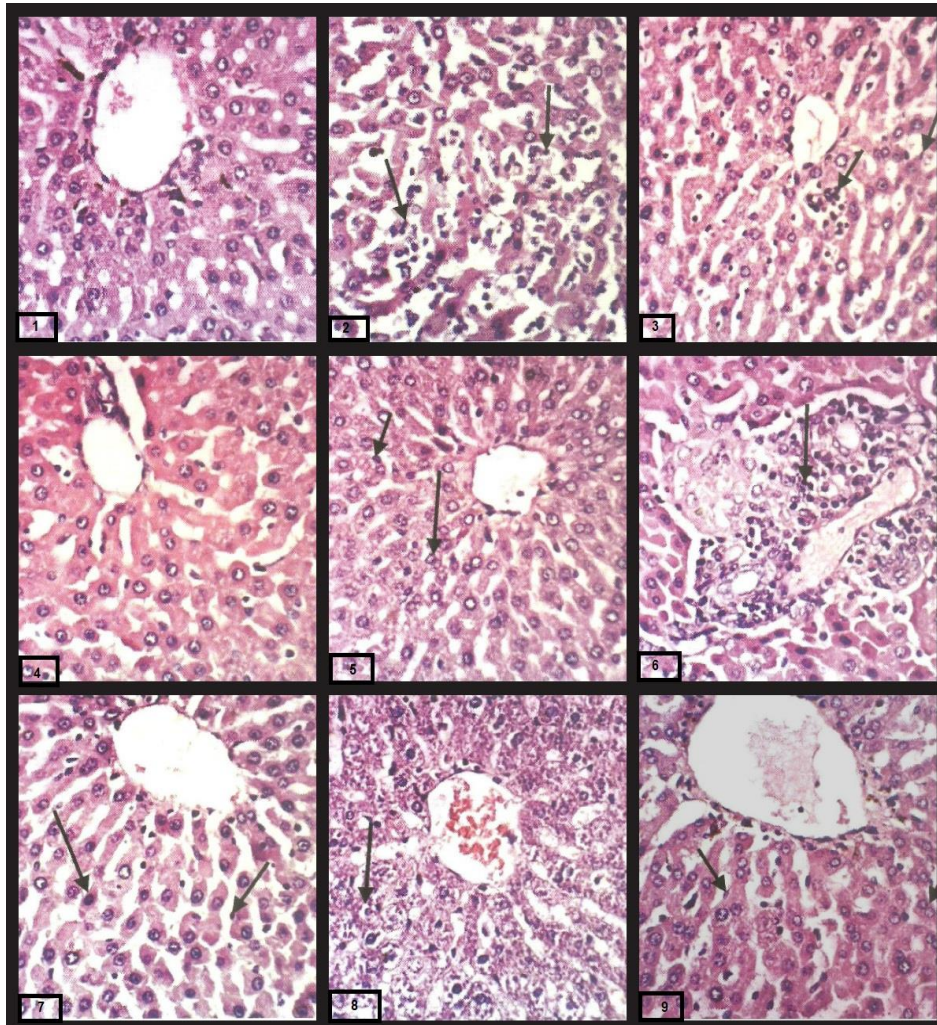
**Table (6):** Fasting serum A.I (mg\dl) for negative control (1), positive control (2), and all treated groups affected by some plant diets

Variables	(1) Negative control	(2) Positive control	Only saffron		Mahlab+ fenugreek + juniper 5%		Almond+ mango leaves +mugwort 5%		Kidney beans + roasted date seeds + clover leaves 5%		L.S.D  (p≤0.05)
			(3) 0.5% Saffron	(4) Without Saffron	(5) With saffron 0.5%	(6) Without saffron	(7) With saffron 0.5%	(8) Without Saffron	(9) With saffron 0.5%		
			Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	
A.I (mg\dl)	$2.566^t \pm 0.305$	$8.883^a \pm 0.485$	$8.5^a \pm 0.25$	$7.61^b \pm 0.642$	$5.466^d \pm 0.251$	$6.673^c \pm 0.340$	$4.3^e \pm 0.360$	$7.566^b \pm 0.351$	$2.466^t \pm 0.450$	<b>0.501</b>	
%change of positive control	-71.113	-----	-4.311	-14.330	-38.466	-24.878	-51.592	-14.826	-72.239		

Means in the same row with different litters are significantly ( p ≤ 0.05).different.

**Histopathological examination of liver :**

Microscopically, liver of rats from group 1 revealed the normal histological structure of hepatic lobule (Photo 1) . On the other hand, liver of rats( hepatic rats with Hypercholesterolemia ) from group 2 revealed focal necrosis of hepatocytes associated with mononuclear cells infiltration and sinusoidal leucocytosis (Photo2 ). Examined sections from group 3( plain saffron ) showed small focal necrosis of hepatocytes associated with mononuclear cells infiltration (Photo 3 ). However, liver of rats from group 4 revealed no histopathological changes (Photo 4 ). Meanwhile sections from group 5 showed only slight kupffer cells activation (Photo 5). Liver of rats from group 6 (almond, mango leaver + mugwort) revealed portal infiltration with inflammatory cells (Photo 6) .Moreover, liver from group 7 (almond, mango leaver + mugwort ) revealed slight Kupffer cells activation and slight necrosis of sporadic hepatocytes (Photo 7). Meanwhile , examined section from group 8 (kidney bean + date seed + clover leavers ) showed hydropc degeneration of hepatocytes (Photo 8 ). Liver of rats from group 9 (kidney bean + date seed + clover leavers ) revealed small focal hepatic necrosis associated with inflammatory cells infiltration (Photo 9). It is evident that saffron at 0.5% level improved the structure of livers of hepatointoxicated rats sullning of hypercholesterolemia which want parallel with the biochemical changes ( Tables 1-8 )



### **Conclusion**

The selected plants used in the present study were effective in protecting rats against hypercholesterolemia. These results supported our idea that tested plant due to repatointoxication formulae revealed better lowering of serum lipids of hepatic rats when combined with saffron , even at as low as 0.2y .

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## التأثيرات العلاجية لثلاثة توليفات نباتية جديدة تحتوي على الزعفران لاستخدامها لارتفاع الكوليسترول في الفئران المصابة بالكبد

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### الملخص العربي:

أجريت هذه الدراسة لمعرفة التأثير المضاد لإصابة الكبد المؤدي لارتفاع الكوليستيرول بواسطة كل من الزعفران وحبه البركه والفاصولبا واللوز و المحلب واوراق المانجو واوراق البرسيم والشيح والعرعر ونوى البلح المحمص على الفئران. لذلك تم استخدام 45 فأر من ذكور فئران الألبينو والتي تزن 150 -160 جم تم تقسيمها بالتساوى الى 9 مجموعات ، أحدهما استخدمت كمجموعه ضابطه سالبه، بينما باقى المجموعات المختبرة 48 فأر قد تم حقنهم برابع كلوريد الكربون بمعدل 2 ملليتر/كجم لاحداث ارتفاع فى الكوليستيرول للفئران . ثم تم اضافة مساحيق الأجزاء النباتيه محل الدراسه الى الغذاء الاساسي للفئران بنسبة 5% وذلك لمدة 28 يوم و فى بعض المعاملات اضيف الزعفران بمعدل 0.5% . وفى نهاية التجربه تم عمل التحاليل التاليه: تقدير الكوليستيرول الكلى، الجليسيريدات الثلاثيه ، الليبوبروتينات مرتفعة الكثافه ، الليبوبروتينات منخفضة الكثافه ، الليبوبروتينات المنخفضه جدا فى الكثافه و معامل تصلب الشرايين.و عمل فحص هيستوباثولوجى للكبد. وقد أوضحت النتائج المتحصل عليها وجود انخفاض معنوى ( $p \leq 0.05$ ) فى مستويات دهون الدم و معامل تصلب الشرايين ، بينما لوحظ وجود ارتفاع معنوى ( $p \leq 0.05$ ) فى مستوى الليبوبروتينات المرتفعة الكثافه. ويرجع هذا التحسن الى احتواء الأجزاء النباتيه محل الدراسه على العديد من المكونات الحيويه الفعاله التى تحسن من صورة دهون الدم و حالة الكبد، ولذلك نوصى بالاهتمام باستخدام هذه النباتات بكميات معتدله فى مشروباتنا ووجباتنا اليوميه علما بأن اضافة 0.5% زعفران لغذاء الفئران المصابة قد زاد من تأثير التوليفات النباتية محل الدراسة .

**الكلمات المفتاحية :** الكوليستيرول الكلى، الجلوسدرات الثلاثيه، الليبوبروتينات مرتفعة الكثافه، الليبوبروتينات منخفضة الكثافه، الفئران المصابه بالكبد و الفحوصات الهيستوباثولوجيه.

