Therapeutic Effects of 3 New Plant Formulae Containing 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, noasted 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 formulae significantly (P≤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 (16-19th centuries) (Schmidt et al., 2007).

According to Abd EL-Baki (1993) almond, clover leaves, black seeds, juniper, 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, weighing 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 basal 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 ad libitum and checked daily.

All plant parts were ground into a 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 all herbs and plants are best 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 (48 rats) were CCl4 injected 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 rats in each group) divided as follows:

- Almond (Prinus mygdalus)
- Clover leaves (Trifolium sativa)
- Black seeds (Nigella sativa)
- Juniper (Juniperus comminimus)
- Kidney beans (Phaseolus vulgaris)
- Mango leaves (Mangifera domestica)
- Mugwort (Artimesia vulganis)
- Palm date mature seeds (Phoenix dactylifera)
- Saffron (Crunis sativus)

**Group (1):** Negative control group - normal group (6 rats)
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 (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 ± standard deviation. In order to compare the groups, analysis of variance (ANOVA) test was used. Values at P≤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 ± 1.950 and 100.366 ± 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 ± 1.950, 145 ± 1, 121.433 ± 1.401, 131.4 ± 1.153, 115.067 ± 1.101, 129.077 ± 1.886 and 90.333 ± 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% with saffron).
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, -24.057 and -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. Further more, (He et al., 2007) reported that crocetin 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Negative control</th>
<th>(2) Positive control</th>
<th>Only saffron</th>
<th>Mahlab + Black seed + juniper 5%</th>
<th>Almond + mango leaves + mugwort 5%</th>
<th>Kidney beans + roasted date seeds + clover leaves 5%</th>
<th>L.S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>100.366 ± 0.814</td>
<td>169.966 ± 1.950</td>
<td>129.966 ± 1.950</td>
<td>145.0 ± 1.401</td>
<td>121.433 ± 1.143</td>
<td>131.4 ± 1.153</td>
<td>115.067 ± 1.886</td>
</tr>
</tbody>
</table>

Means in the same row with different litters are significantly (p ≤ 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 ± 1 and 48.566 ± 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 ± 0.650, 58.33 ± 1.234, 51.933 ± 1.201, 86.4 ± 1.248, 74.5 ± 0.953, 86.066 ± 0.90 and 51.1 ± 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 palm seeds + clover leaves 5% with saffron) 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 palm 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Negative control</th>
<th>(2) Positive control</th>
<th>(3) Saffron 0.5%</th>
<th>(4) Without Saffron</th>
<th>(5) With Saffron 0.5%</th>
<th>(6) Without Saffron</th>
<th>(7) With Saffron 0.5%</th>
<th>(8) Without Saffron</th>
<th>(9) With Saffron 0.5%</th>
<th>L.S.D (p≤0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.G(mg/dl)</td>
<td>48.566 ± 1.159</td>
<td>116 ± 1</td>
<td>107.533 ± 0.650</td>
<td>58.333 ± 1.234</td>
<td>51.933 ± 1.201</td>
<td>86.4 ± 1.248</td>
<td>74.5 ± 0.953</td>
<td>86.066 ± 0.90</td>
<td>51.1 ± 1.153</td>
<td>0.486</td>
</tr>
<tr>
<td>% change of positive control</td>
<td>58.132</td>
<td>-7.299</td>
<td>-49.712</td>
<td>-55.230</td>
<td>-25.517</td>
<td>-35.775</td>
<td>-25.805</td>
<td>-55.948</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Means in the same row with different litters are significantly (p ≤ 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 (H.D.L.c) of control (+) group was lower than control (-) group, being 17.266 ± 1.222 and 27.6 ± 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 ± 0.929, 17.4 ± 0.781, 23.166 ± 0.960, 17.636 ± 0.926, 22.1 ± 1.153, 17.45 ± 1.0148 and 26.1 ± 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Negative control</th>
<th>(2) Positive control</th>
<th>(3) Saffron 0.5%</th>
<th>(4) Without Saffron</th>
<th>(5) With Saffron 0.5%</th>
<th>(6) Without Saffron</th>
<th>(7) With Saffron 0.5%</th>
<th>(8) Without Saffron</th>
<th>(9) With Saffron 0.5%</th>
<th>L.S.D (p≤0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td></td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>27.6± 1.307</td>
<td>17.266± 1.222</td>
<td>19.266± 0.929</td>
<td>17.4± 0.781</td>
<td>23.166± 0.906</td>
<td>17.636± 0.926</td>
<td>22.1± 1.153</td>
<td>17.45± 1.0148</td>
<td>26.1± 1.153</td>
<td>0.977</td>
</tr>
<tr>
<td>% change of positive control</td>
<td>59.851</td>
<td>----</td>
<td>11.583</td>
<td>0.776</td>
<td>34.171</td>
<td>2.142</td>
<td>27.997</td>
<td>1.65</td>
<td>51.164</td>
<td>-</td>
</tr>
</tbody>
</table>

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 ± 0.969 and 63.366 ± 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 ± 0.8, 116.366 ± 0.650, 87.34 ± 1.113, 96.7 ± 0.655, 78.18 ± 0.830, 96.743 ± 0.289, and 53.8 ± 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%) 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) 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 dietary 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Negative control</th>
<th>(2) Positive control</th>
<th>(3) Only saffron 0.5%</th>
<th>(4) Mahlab + Black seed + juniper 5%</th>
<th>(5) Almond + mango leaves + mugwort 5%</th>
<th>(6) Kidney beans + roasted date seeds + clover leaves 5%</th>
<th>L.S.D (p≤0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>63.366 ± 0.451</td>
<td>129.343 ± 0.969</td>
<td>89.8 ± 0.8</td>
<td>116.366 ± 0.650</td>
<td>87.34 ± 1.113</td>
<td>96.7 ± 0.655</td>
<td></td>
</tr>
<tr>
<td>% change of positive control</td>
<td>-51.009</td>
<td>-51.009</td>
<td>-51.009</td>
<td>-51.009</td>
<td>-51.009</td>
<td>-51.009</td>
<td></td>
</tr>
</tbody>
</table>

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 ± 0.862 and 9.566 ±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 ± 0.4, 11.466 ± 0.513, 10.51 ± 0.348, 17.3 ± 0.557, 14.733 ± 0.503, 17.2 ± 0.9 and 10.31 ± 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%) considering 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>L.S.D (p&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
</tr>
<tr>
<td>VLDL (mg/dl)</td>
<td>9.566 ± 0.450</td>
<td>23.366 ± 0.862</td>
<td>21.4 ± 0.4</td>
<td>11.466 ± 0.513</td>
<td>10.51 ± 0.348</td>
<td>17.3 ± 0.557</td>
<td>14.733 ± 0.503</td>
<td>17.2 ± 0.9</td>
<td>10.31 ± 0.356</td>
<td>0.711</td>
</tr>
<tr>
<td>% change of positive control</td>
<td>-59.060</td>
<td>------</td>
<td>-8.414</td>
<td>-50.929</td>
<td>-55.020</td>
<td>-25.961</td>
<td>-36.946</td>
<td>-26.388</td>
<td>-55.876</td>
<td>-</td>
</tr>
</tbody>
</table>

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 ± 0.485 and 2.566 ± 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 ± 0.25, 7.61 ± 0.642, 5.466 ± 0.251, 6.763 ± 0.340, 4.3 ± 0.360, 7.566 ± 0.351 and 2.466 ± 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 (0.5% 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% and with saffron 0.5%) 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. Numerically, the best treatment was recorded for group 9 (kidney beans + roasted plum 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 CCl\(_4\) 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Negative control</th>
<th>(2) Positive control</th>
<th>(3) Mahlab + fenugreek + juniper 5%</th>
<th>(4) Almond + mango leaves + mugwort 5%</th>
<th>(5) Kidney beans + roasted date seeds + clover leaves 5%</th>
<th>L.S.D (p≤0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ±SD</td>
<td>2.566 ± 0.305</td>
<td>8.883 ± 0.485</td>
<td>8.5 ± 0.25</td>
<td>7.61 ± 0.642</td>
<td>5.466 ± 0.251</td>
<td>2.466 ± 0.450</td>
</tr>
<tr>
<td>% change of positive control</td>
<td>-71.113</td>
<td>-14.330</td>
<td>-38.466</td>
<td>-24.878</td>
<td>-51.592</td>
<td>-72.239</td>
</tr>
</tbody>
</table>

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 (Photo 2). 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 hydropic 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 hepatotoxicated rats suffering from 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.
References


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

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الملخص العربي:
أجريت هذه الدراسة لمعرفة التأثير المضاد لاصابة الكبد المؤدي لارتفاع الكوليسترول بواسطة كل من الزعفران وحبّ الزيتون والفاصولايا واللوز وملح البحيرة والبطاطس. لذلك تم استخدام 48 فأر من ذكور فئران الألب لناضج تزن 150-160 جم تم تقسيمها بالتساوي إلى 9 مجموعات. أخذت نتائج الدراسة في المجموعات المختبرة 48 فأر تم حقيمه براي كارورا الكربون بمعدل 2 ملليتر/كم في ارتفاعات الكوليسترول البنكرياس 140-160. ثم تم إضافة مساحيق الازهار النباتية محل الدراسة إلى الغاز الواصل للفئران بنسبة 5% ولذلك لمدة 28 يوم و في بعض المعاملات اضيف الزعفران بمعدل 0.5%. وفي نهاية التجربة تم عمل المحاكاة التالية: تدفّع الكوليسترول الكلي، الجلدي، الدماغي، الثلاثي، الكهربائي، الليبروتينات مرتفعة الكثافة، الليبروتينات منخفضة الكثافة، نسبة دهون الدم، نسبة الدهون في الكبد.

الكلمات المفتاحية: الكوليسترول، الفاصولايا، الفاصولايا منخفضة الكثافة، الليبروتينات مرتفعة الكثافة، الليبروتينات مرتفعة الكثافة، الفئران المصاب بالكبد، الفئران المصاب بالكبد، التوليفات النباتية.