Influence of Olive Leaves and its Extracts by Two Methods on Diabetic Rats.
Dalia M. Abd El-khalik
Home Economic Dept., Faculty of Specific Education, Fayoum University.

ABSTRACT

The present review was directed to research the impact of olive leaves and its concentrates by two strategies on diabetic rats, moreover, to decide the fundamental phenolic mixes display in dried olive takes off. The results showed that, the highest concentrations of phenolic compounds in dried olive leaves were Rutin, Quercetin and Oleuropein. Liver and kidney (weights), serum glucose, lipid profile except HDL-c, kidney functions and liver enzymes increased in diabetic group, than these of the control negative group. On the other hand food intake, body weight gain (BWG%), HDL-c, superoxide dismutase (SOD) and glutathione peroxidase (GPs) decreased in diabetic group, than these of the control negative group. All treatments, with the two dosages of decoction extract, aqueous extract and olive leaves powder showed improve in all parameters, especially the groups which were treated with 4ml aqueous extract of olive leaves and 10% of olive leaves powder. In conclusion, olive leaves powder and olive leaves extracts improved the nutritional and biological status of diabetic rats.

Keywords: olive leaves – phenolic compounds – extraction - rats – diabetes.

INTRODUCTION

Diabetes is the most well-known endocrine issue influencing a huge number of individuals around the world. More than 346 million of individuals overall experience the ill effects of this ailment (Danaei, 2011). Articulated changes in the way of life, use of imperativeness rich eating routine and weight are critical reasons for the ascent of diabetes at a disturbing rate (Sikarwar and Patil, 2010). In 2010, diabetes mellitus was assessed to influence around 6.4% of the world's grown-up populace, or 285 million individuals. It is assessed that by 2030, the populace influenced by diabetes will increment to 7.7% of all grown-ups, or 439 million individuals (Al-Azzawie and Alhamdani, 2006). Then again, hindered glucose-instigated insulin emission with a lessening in pancreatic β cell mass will in the end prompt to perpetual hyperglycemia (Sebgh et al., 2009). Regardless of the hypoglycemic specialists, diabetes and the related entanglements keep on being a noteworthy medicinal issue (Srinivas et al., 2003).

Diabetes is brought about by a flat out or relative absence of insulin as well as breakdown of insulin activity (Balkau et al., 2000 and Rasineni et al., 2010). It is portrayed by hyperglycemia, aggravations in starch, protein, and fat digestion systems, notwithstanding long haul intracies influencing the eyes, kidneys, nerves, heart and veins (Hung et al., 2005, Thiripathi and Sivastava 2006 and Gupta, 2008).

Olive leaves from Oleaeuropaea, is local to the Mediterranean and has been guaranteed to have restorative qualities including hostile to diabetic and cancer prevention agent exercises (Gonzalez et al., 1992, Wojcikowski et al., 2007 and Eidi et al., 2009).

The substantial number of phenolic mixes exhibit in olive leaves stirred the enthusiasm of analysts around the globe and the reviews with creatures and people have announced helpful wellbeing impacts, for example, the limit of cell reinforcement (Benavente-Garcia et al., 2000), anti-hypertensive (Susalit et al., 2011), hipoglicemiant (Kontogianni et al., 2013), hypcholesterolenic (Jenai et al., 2009), cardioprotective (Nekoechein et al., 2014) and as co-adjuvant in the treatment of obesity (Santiago-Mora et al., 2011).

Olive leaf removes seem, by all accounts, to be very sheltered. In creature tests, specialists watched no lethality in rats, even at high dosages (1g/kg body weight) for seven days (Petkov and Manolov, 1972). In vitro considers on human cell lines found no poisonous quality at 1 mg/ml of concentrate (Lee-Huang et al., 2003). Therefore, the present study was carried out to assess the effects of olive leaves and its extractions by two methods on diabetic rats.

MATERIALS AND METHODS

Materials:
- Olive leaves (Olea europaea L.) were gotten from Agricultural Research Center, Giza Egypt.
- Casein, vitamins, minerals, cellulose, alloxan and choline chloride were purchased from El-Gomhoria Company, Cairo Egypt.
- Corn starch, soybean oil, sucrose were purchased from local market, Cairo, Egypt.
- Forty two male Albino rats (Sprague Dawley Strain) (150 ± 10g) were obtained from National Research Center, Dokki, Egypt.

Methods:
Dried olive leaves
Olive leaves were washed thoroughly with tap water dehydrated into air circulated oven at 40-50°C for 24 hrs. The dried samples were finely powdered by using a coffee grinder and stored in polyethylene bags at -20°C until used.

Preparation of decoction
First, cleaning 150 g of olive leaves with water to clear the tidy and sand, heating up the leaves in one liter and a half of water. The water bubbles for three minutes and takes the blend off and let it deplete. At that point, gather the liquid and spare the blend in a glass holder for the use (Abu-zaiton and Abu-Albasal, 2012).

Preparation of olive leaves watery extract
Watery extract was prepared by boiling olive leaves (300g) in water (3000 ml) for 60 minutes, then filtered through Whatman filter paper No.2 and the filtrate was dried, the yield of dried extract was about

Preparation of olive leaves watery extract
Watery extract was prepared by boiling olive leaves (300g) in water (3000 ml) for 60 minutes, then filtered through Whatman filter paper No.2 and the filtrate was dried, the yield of dried extract was about
30gm when dissolved in 300ml water (Hung et al., 2006).

Determination of phenolic compounds

Phenolic compounds of olive leaves was resolved by the strategy portrayed by (Crozier et al., 1997) by using High performance liquid chromatography analysis HPLC.

Growth parameters

Liver and kidney were separated from each rat and weighted to calculate the liver and kidney weights to body weights %.

Biochemical Analysis of serum

The blood tests were centrifuged and serum was isolated to gauge some biochemical parameters. The following parameters were analysed according to the methods described as follow:

- Serum glucose as portrayed by Trinder, (1959).
- Lipid profil
- Serum cholesterol was resolved as portrayed by Allain et al., (1974).
- Triglycerides was resolved as portrayed by Foster and Duns, (1973).
- High density lipoprotein HDL-c was resolved as portrayed by Lopes-Virella et al., (1977).
- Low density lipoprotein LDL-c and VLDL-c was by resolved as portrayed Friedwald et al., (1972).
- kidney functions
- Uric acid was resolved as portrayed by Fossati et al., (1980).
- Urea nitrogen was resolved as portrayed by Patton and Crouch, (1977).
- Creatinine was resolved as portrayed by Bohmer, (1971).
- Liver enzymes
- Aspartate Amine Transaminase (AST) and Alanine Amine Transaminase (ALT) were resolved as portrayed by Reitman and Frankel, (1957).
- Alkaline Phosphatase (ALP) was resolved as portrayed by Belfield and Goldberg, (1971).
- Superoxide dismutase (SOD) activity was resolved by the strategy portrayed by Kakkar et al., (1984).
- Glutathione peroxidase (GPx) activity was resolved by the strategy portrayed by Elman, (1959).

Statistical analysis

Consequences of organic assessment of each gathering were factually investigated (mean ± standard deviation and one way ANOVA test) utilizing SAS bundle and contrasted and each other utilizing the reasonable test (minimum huge contrasts at P< 0.05 (SAS, 1996).

RESULTS AND DISCUSSION

Fractionation and identification of phenolic compounds of dried olive leaves methanolic extract:

Table (1) shows the main phenolic compounds identified in methanolic dried olive leaves. Rutin was found to be the predominant compound and amounted 217.77 mg/100g, while the mediated compounds were: Quercetin and Oleuropein which amounted in 97.00 and 86.00 mg/100g, respectively. Meanwhile, Catechin, Apigenin, Hydroxytyrosol and Caffeic acid were amounted (23.50, 20.33, 16.26 and 13.97 mg/100g), respectively.

The additional virgin olive oil is created from the product of the olive tree, naturally known as Olea europaea L, rich in polyphenols and known for its cancer prevention agent limit (Soni et al., 2006). In any case, the olive leaves contain higher measure of polyphenols than olive oil. For instance, the measure of oleuropein, which is the most plentiful phenolic compound extents from 0.005% and 0.12% in olive oil, while in olive abandons it goes in the vicinity of 1 and 14% (Japon-Lujan et al., 2006).

Table 1. Main phenolic compounds identified in methanolic extract of dried olive leaves (mg /100 g).

<table>
<thead>
<tr>
<th>Compound</th>
<th>mg/100g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rutin</td>
<td>217.77</td>
</tr>
<tr>
<td>Quercetin</td>
<td>97.00</td>
</tr>
<tr>
<td>Oleuropein</td>
<td>86.00</td>
</tr>
<tr>
<td>Catechin</td>
<td>23.50</td>
</tr>
<tr>
<td>Apigenin</td>
<td>20.33</td>
</tr>
<tr>
<td>Hydroxytyrosol</td>
<td>16.26</td>
</tr>
<tr>
<td>Caffeic acid</td>
<td>13.97</td>
</tr>
</tbody>
</table>

Biological Assay:

Animals and experimental design

Forty two male Albino rats (150 ± 10g) were kept in individual stainless steel confines under clean conditions and sustained one week on basal eating routine ad libitum for adjustment as indicated by (Reeves et al., 1993). After a time of adjustment on basal eating routine (7 days), the rats were isolated into seven gatherings. The main gathering (6 rats) bolstered on basal eating routine, as a negative control amass. The six gatherings (36 rats) was infused with alloxan (150 mg alloxan/kg body weight) to incite diabetes as indicated by the technique portrayed by (Kumar et al., 2010). Following four days, blood tests were gathered from the eye of all rats to decide the levels of glucose to guarantee the enlistment of diabetes. At that point, prompted rats were isolated into six subgroups (6 rats) as per the accompanying: Group (2) bolstered on basal eating regimen, as a positive control (diabetic gathering). Assembles (3 and 4) were nourished on basal eating routine and treated with 2 and 4 ml decoction of olive leaves, separately. Bunches (5 and 6) were bolstered on basal eating routine and treated with 2 and 4 ml olive leaves fluid concentrate, individually. Assemble (7) was nourished on basal eating regimen containing 10% dried olive leaves powder. Amid the trial time frame (6 week), the eating regimens ate up and kidney weights were recorded every week. At the complete of the examination, the rats were fasted overnight, then the rats were anesthetized and surrendered, the blood tests were accumulated from the aorta of all rats.

Effect of olive leaves and its extracts on growth parameters of diabetic rats.

The effect of basal diet containing 10% of olive leaves powder or two dosage (2 and 4ml of decoction and watery concentrate of olive leaves /rat/day) on food intake (g/day/each rat), body weight gain% and (liver and kidney) weights/body weight% of diabetic rats
presented in table (2). The mean value of food intake (g/day/each rat) of the negative control group showed non-significant deference, as compared to the positive control group. Food intake of all treated groups with olive leaves powder or the tow dosage of decoction and aqueous extracts of olive leaves (2 and 4 ml /each rat/day) recorded non-significant changes, as compared to the positive control group.

The mean value of body weight gain (%) of diabetic group decreased significantly p<0.05, as compared to the negative control group. The data presented in this table revealed that, treating rats which were suffering from diabetes with 2ml (decoction or aqueous extracts of olive leaves) showed non-significant difference in body weight gain %, as compared to the positive control group, while treating diabetic rats on the decoction or aqueous extracts with 4ml recorded significant decrease p<0.05 in body weight gain %. On the other hand feeding diabetic rats on diet containing 10% olive leave decreased the mean value of body weight gain%, as compared to the positive control group. Non-significant difference in body weight gain (%) was observed between the groups treated with the high dosage of decoction, aqueous extract and olive leaves powder.

**Table 2. Effect of olive leaves and its extracts on growth parameters of diabetic rats.**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Food Intake g/day/rat</th>
<th>Body weight gain%</th>
<th>Organs weight / body weight%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group(1) Negative control group</td>
<td>12.400 ± 0.821</td>
<td>36.902 ± 0.547</td>
<td>2.686 ± 0.435</td>
</tr>
<tr>
<td>Group(2) Positive control group (Diabetic Group)</td>
<td>11.700 ± 0.758</td>
<td>14.126 ± 0.547</td>
<td>1.445 ± 0.544</td>
</tr>
<tr>
<td>Group(3) 2ml decoction extract of olive leaves</td>
<td>11.400 ± 0.547</td>
<td>13.581 ± 0.547</td>
<td>1.547 ± 0.543</td>
</tr>
<tr>
<td>Group(4) 4ml decoction extract of olive leaves</td>
<td>11.640 ± 0.482</td>
<td>11.418 ± 0.547</td>
<td>3.075 ± 0.543</td>
</tr>
<tr>
<td>Group(5) 2ml aqueous extract of olive leaves</td>
<td>11.168 ± 0.435</td>
<td>12.173 ± 0.547</td>
<td>3.204 ± 0.543</td>
</tr>
<tr>
<td>Group(6) 4ml aqueous extract of olive leaves</td>
<td>11.400 ± 0.547</td>
<td>10.601 ± 0.547</td>
<td>2.976 ± 0.543</td>
</tr>
<tr>
<td>Group(7) 10% olive leaves powder</td>
<td>11.422 ± 0.547</td>
<td>9.692 ± 0.547</td>
<td>3.072 ± 0.543</td>
</tr>
</tbody>
</table>

All results are expressed as mean ± SD. Values in each column which have different letters are significant different (p<0.05).

**Effect of olive leaves and its extracts on serum glucose of diabetic rats.**

The effect of olive leaves powder and its extractions by two methods on serum glucose of rats suffering from diabetes presented in table (3). The mean value of serum glucose increased significantly p<0.05 in the positive control group, as compared to the negative control group (164.00 ± 5.099 vs. 75.800 ± 4.381mg/dl). Serum glucose increased in the positive control group by about 116.358%, than that of the negative control group. In this respect, Kurup and Bhonde, (2000) and Szkudelski, (2001) reported that, hypo-secretion of insulin by pancreatic β-cells resulted in Alloxan-treated rats and led to reduction of serum insulin and increased of serum glucose. Alloxan selectively destroys the pancreatic insulin secreting β-cells and induces hyperglycemia. Stanely et al., (2004) reported also, Alloxan prompts diabetes by harming the insulin emitting cells of the pancreas prompting to hyperglycemia.

All treated groups with olive leaves extractions and olive leaves powder showed significant decrease p<0.05 in serum glucose, as compared to the positive control group. Serum glucose decreased gradually with increasing the dosage of decoction or aqueous extract of olive leaves. The highest decrease in serum glucose recorded for the group treated with 4 ml aqueous extract/rat/day, followed by the group which treated with 10% olive leaves powder, these treatment decreased serum glucose by about (21.585% and 19.512%), respectively. In this regard, Komaki et al., (2003) revealed likewise, the dynamic part of olive leaves, for example, luteolin and oleane-lic corrosive constituents have been appeared to inhibitorily affect postprandial glucose increment in diabetic rats.
Oral administration of decoction produced hypoglycemia in normal animals and diabetes associated oxidative stress. The method of activity of the dynamic elements of olive leaves is mostly interceded by an improved discharge of insulin, as sulphohyurenase (Al-Azzawie and Alhamdani, 2006).

### Effect of olive leaves and its extracts on lipid profile of diabetic rats.

Data presented in table (4) show the effect of olive leaves powder and its extracts by two methods on total cholesterol, triglycerides, high density lipoprotein-cholesterol (HDL-c), low, and very low density lipoprotein-cholesterol (LDL-c) and (VLDL-c). Injected rats with 150mg alloxan /kg b.w. induced significant increase p˂0.05 in serum cholesterol, triglycerides, low thickness lipoprotein. This shows, olive leaves separate cholesterol (HDL-c), low and very low density lipoprotein-cholesterol, while high density lipoprotein-cholesterol decreased significantly, as compared to the negative control group. Ravi et al., (2005) demonstrated that, all lipid profile, aside from HDL-c expanded in diabetic rats which are notable as hazard elements for cardiovascular illnesses.

All treated diabetic groups recorded significant decrease p˂0.05 in all parameters, except HDL-c, which increased significantly p˂0.05, as compared to the positive control group. The mean values of serum cholesterol, triglycerides, LDL-c and VLDL-c decreased gradually with increasing the dosage of decoction or aqueous extract of olive leaves, while HDL-c increased.

The outcomes in this table uncovered that, diabetic rats which treated with the two measurements of watery concentrate of olive leaves recorded more change in lipid divisions, than that of rats treated with the two dose of decoction of olive clear out. The outcomes uncovered likewise, non-huge changes in all lipid parameters, aside from LDL-c was seen between the gatherings treated with 10% powdered of olive leaves and 4ml fluid concentrate/rodent/day. In this way, the most astounding change of lipid profile recorded for the gathering treated with 4ml watery concentrate/n rodent/day, trailed by the gathering which treated with 10% olive leaves powder.
hydroxytyrosol in diabetic mice at centralizations of 16 and 8 mg/kg of body weight demonstrated altogether bring down groupings of TC in diabetic rats that got oleuropein and hydroxytyrosol contrasted and the control assembly. The organization of concentrates rich in phenolic mixes could reestablish the lipid profile, particularly in the gatherings that got oleuropein and hydroxytyrosol in a convergence of 16 mg/kg of body weight, demonstrating that oleuropein and hydroxytyrosol olive leaf concentrate can adjust fundamentally the hypercholesterolemia combined with hyperglycemia (Jemai et al., 2014).

The counter atherosclerotic impact of olive leaves extract was additionally exhibited in rabbits on a high-fat eating routine. Twenty-four rabbits were allocated to control, high-fat eating regimen, or high-fat eating routine supplemented with hydroxytyrosol-improved OLE for a month and a half. Creatures in the high-fat eating regimen bunch had larger amounts of cho-lesterol, triglycerides, and LDL cholesterol, and additionally a thick layer of lipid aura in the aortic intima compared to those in the OLE amass. These outcomes bolster olive leaf's hostile to atherosclerotic impact, in all likelihood identified with concealment of aggravation (Wang et al., 2008).

**Effect of olive leaves and its extractions on kidney functions of diabetic rats.**

The results in table (5) show the effect of diet containing 10% olive leaves powder and olive leaves extract by the two methods on serum uric acid, urea nitrogen and creatinine mg/dl of diabetic rats. Injected rats with 150mg alloxan /kg b.w. to induce diabetes, led to significant increase p<0.05 in all kidney parameters, as compared to the negative control group. In this respect, rise of the renal capacities might be because of metabolic unsettling influence in diabetic creatures reflected in high exercises of xanthine oxidase, lipid peroxidation, and expanded triacylglycerol and cholesterol levels (Madinov et al., 2000).

Feeding diabetic group on diet containing 10% olive leaves powder, or feeding on basal diet and treating with decoction or aqueous extract of olive leaves 2ml and 4ml/rat/day caused significant decrease in serum uric acid, urea nitrogen and creatinine, as compared to the positive control group. On the other hand, kidney parameters decreased gradually with increasing the dosage of (decoction or aqueous extract) of olive leaves.

Feeding diabetic rats on diet containing 10% olive leaves powder recorded the best results in kidney functions, followed by the groups treated with 4ml aqueous extract and decoction extract of olive leaves, respectively.

**Table 5. Effect of olive leaves and its extractions on kidney functions of diabetic rats.**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Parameters</th>
<th>Uric acid mg/dl</th>
<th>Urea nitrogen mg/dl</th>
<th>Creatinine mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group(1) Negative control group</td>
<td>1.727 ± 0.043</td>
<td>26.662 ± 1.015</td>
<td>0.518 ± 0.024</td>
<td></td>
</tr>
<tr>
<td>Group(2) Positive control group (Diabetic Group)</td>
<td>2.201 ± 0.087</td>
<td>55.215 ± 1.721</td>
<td>1.141 ± 0.098</td>
<td></td>
</tr>
<tr>
<td>Group(3) 2ml decoction extract of olive leaves</td>
<td>1.922 ± 0.080</td>
<td>49.673 ± 2.455</td>
<td>0.936 ± 0.045</td>
<td></td>
</tr>
<tr>
<td>Group(4) 4ml decoction extract of olive leaves</td>
<td>1.708 ± 0.063</td>
<td>43.484 ± 2.751</td>
<td>0.811 ± 0.025</td>
<td></td>
</tr>
<tr>
<td>Group(5) 2ml aqueous extract of olive leaves</td>
<td>1.863 ± 0.072</td>
<td>45.881 ± 3.421</td>
<td>0.867 ± 0.033</td>
<td></td>
</tr>
<tr>
<td>Group(6) 4ml aqueous extract of olive leaves</td>
<td>1.501 ± 0.065</td>
<td>35.833 ± 2.121</td>
<td>0.689 ± 0.041</td>
<td></td>
</tr>
<tr>
<td>Group(7) 10% olive leaves powder</td>
<td>1.410 ± 0.098</td>
<td>33.691 ± 2.166</td>
<td>0.614 ± 0.018</td>
<td></td>
</tr>
</tbody>
</table>

All results are expressed as mean ± SD. Values in each column which have different letters are significant different (p<0.05).

Treatment of diabetic rats with olive leaves extract reversed these parameters (uric acid, urea nitrogen and creatinine) towards normalcy which could be due to decreased metabolic disturbances of other pathways such as protein and nucleic acid metabolism as evidenced by improved glucose level (Zoair, 2014).

Abd El-Rahman, (2016) inferred that olive leaf acts in the kidney as a strong scavenger of free radicals to keep the poisonous impacts of gentamicin (GS) both in the biochemical and histopathological parameters. Al-Sowayan and Mousa, (2014) closed likewise, olive leaf separate OLE might be a remedial and nephroprotective agent against kidney disappointment incited by chemicals, for example, CCI4.

Al-Attar and Abu Zeid, (2013) assessed the impact of olive leaves extricate against diazinon poisonous quality in male mice. They showed that the concentrate of olive leaves can be considered as a promising remedial specialist against hepatotoxicity, cardiotoxicity, nephrotoxicity and metabolic issue instigated by diazinon treatment. Additionally, they recommended that the impact of olive leaves remove against diazinon was conceivably because of cell reinforcement properties of its normal synthetic constituents.

**Effect of olive leaves and its extracts on liver enzymes of diabetic rats.**

The mean values of liver enzymes including Aspartate Aminotransaminase (AST), Alanine Aminotransaminase (ALT) and Alkaline Phosphatase (ALP) of diabetic rats which treated with olive leaves powder and (decoction or aqueous extracts) of olive leaves presented in table (6).

Injected rats with alloxan to induce diabetes led to significant increase in serum AST, ALT and ALP p<0.05, as compared to the negative control group. All
treated experimental groups showed significant decrease in liver enzymes, as compared to the positive control group. The mean values of AST, ALT and ALP decreased gradually with increasing the dosage of (decoction or aqueous extracts) of olive leaves. Treating diabetic rats with diet containing 10% olive leaves powder recorded the best results in liver enzymes, this treatment decreased the mean values of serum AST, ALT and ALP by about (24.825%, 36.463% and 22.855%) than that of the positive control group, respectively.

Khalil, (2004) explored the hepatoprotective action of a fluid concentrate of olive leaves against overdose paracetamol in male pale skinned person rats. He inferred that a fluid concentrate of olive leaves has cell reinforcement property which can secure liver harm happened by overdose paracetamol in male pale skinned person rats.

Table 6. Effect of olive leaves and its extracts on liver enzymes of diabetic rats.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Parameters</th>
<th>AST IU/l</th>
<th>ALT IU/l</th>
<th>ALP IU/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group(1) Negative control group</td>
<td>56.770 ± 3.099</td>
<td>± 1.959</td>
<td>± 2.536</td>
<td></td>
</tr>
<tr>
<td>Group(2) Positive control group (Diabetic Group)</td>
<td>99.757 ± 5.538</td>
<td>± 1.978</td>
<td>± 5.811</td>
<td></td>
</tr>
<tr>
<td>Group(3) 2ml decoction extract of olive leaves</td>
<td>± 5.345</td>
<td>92.972 ± 49.588</td>
<td>± 2.371</td>
<td>± 6.266</td>
</tr>
<tr>
<td>Group(4) 4ml decoction extract of olive leaves</td>
<td>84.488 ± 43.316</td>
<td>± 2.246</td>
<td>157.610 ± 46.396</td>
<td></td>
</tr>
<tr>
<td>Group(5) 2ml aqueous extract of olive leaves</td>
<td>± 4.095</td>
<td>89.503 ± 47.170</td>
<td>± 2.226</td>
<td>± 4.763</td>
</tr>
<tr>
<td>Group(6) 4ml aqueous extract of olive leaves</td>
<td>79.456 ± 37.787</td>
<td>± 1.674</td>
<td>135.656 ± 32.545</td>
<td></td>
</tr>
<tr>
<td>Group(7) 10% olive leaves powder</td>
<td>± 3.059</td>
<td>74.992 ± 35.287</td>
<td>± 1.317</td>
<td>± 3.513</td>
</tr>
</tbody>
</table>

Table 7. Effect of olive leaves and its extracts on SOD and GPx activities in alloxan induced diabetic rats.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Groups</th>
<th>SOD u/l</th>
<th>GPx ng/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group(1) Negative control group</td>
<td>0.537 ± 0.005</td>
<td>± 0.005</td>
<td>0.420 ± 0.025</td>
</tr>
<tr>
<td>Group(2) Positive control group (Diabetic Group)</td>
<td>± 0.004</td>
<td>0.291 ± 0.036</td>
<td>± 0.016</td>
</tr>
<tr>
<td>Group(3) 2ml decoction extract of olive leaves</td>
<td>± 0.016</td>
<td>0.336 ± 0.013</td>
<td>± 0.013</td>
</tr>
<tr>
<td>Group(4) 4ml decoction extract of olive leaves</td>
<td>± 0.016</td>
<td>0.314 ± 0.037</td>
<td>± 0.004</td>
</tr>
<tr>
<td>Group(5) 2ml aqueous extract of olive leaves</td>
<td>± 0.004</td>
<td>0.367 ± 0.377</td>
<td>± 0.367</td>
</tr>
<tr>
<td>Group(6) 4ml aqueous extract of olive leaves</td>
<td>± 0.036</td>
<td>0.340 ± 0.340</td>
<td>± 0.036</td>
</tr>
<tr>
<td>Group(7) 10% olive leaves powder</td>
<td>± 0.004</td>
<td>0.340 ± 0.340</td>
<td>± 0.036</td>
</tr>
</tbody>
</table>

Values presented in table (7) showed the mean values of superoxide dismutase (SOD) and glutathione peroxidase (GPx) of negative control group, positive group and tested groups. The mean values of SOD and GPx in the positive control group revealed significant decrease p<0.05, as compared to the negative control group. Treating diabetic rats with 2 and 4ml (decoction extract or aqueous extract of olive leaves) and or 10% olive leaves powder showed significant increase p<0.05 in SOD and GPx when compared them with the positive control group. The highest increase in SOD and GPx recorded for the groups treated with 4ml aqueous extract of olive leaves and 10% olive leaves powder, these groups significant increase in these parameters, as compared to the other treated groups.

The levels of the antioxidant enzymes SOD and GPx were lowered significantly in the diabetics (p<0.05) than that of the control subjects (Briggs et al., 2013). Diabetes with Type 2 related with abatement in cancer prevention agent protein levels coming about because of expanded oxidative anxiety and lessened systemic hostile to oxidative guard in patients with Type 2 diabetes mellitus. (Djordjevic et al., 2011). Abd El-Rahman, (2016) reported that, treatment with olive leaves extricate keeps the lipid peroxidation...
by upgrading the renal SOD, CAT, and GPx exercises. Lei et al., (2008) presumed that, rats treated with STZ to actuate diabetes demonstrated a noteworthy increment in lipid peroxidation and critical lessening in the exercises of CAT, SOD and GPx in liver and kidneys contrasted and controls.

The olive leaf separate known to be effective cancer prevention agents in vivo (Jemai et al., 2008b) and additionally invitro (Bouaziz and Sayadi, 2005). The organization of oleuropein and hydroxytyrosol-rich concentrates enhanced the cell reinforcement status in liver (Jemai et al., 2009).

OLE supplementation to matured males rabbits, altogether expanded blood plasma of glutathione s-transferase (GST) action and Superoxide dismutase (SOD) action and diminished blood plasma of Thiobarbituric corrosive responsive substances (El-Damrawy, 2011).

CONCLUSION

Finally, it could be concluded that olive leaves powder and olive leaves extracts by two methods had improved the nutritional and biological status of diabetic rats.

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تأثير أوراق الزيتون ومستخلصاتها بطريقة طبيعية على الفئران المصابية بالسكري

دalia محمد طلعت عبد الخالق
قسم الاقتصاد المنزلي - كلية التربية النوعية - جامعة الفيوم

اجريت هذه الدراسة لبحث تأثير أوراق الزيتون ومستخلصاتها بطريقة طبيعية على الفئران المصابية بمرض السكر، هذا بالإضافة إلى تقييم أهم المركبات الفينولية الموجودة في أوراق الزيتون المجففة. وقد أظهرت النتائج أن أعلى تركيز للمركبات الفينولية في أوراق الزيتون المجففة سجلت لكل من ألوپورين وكيرستين ورتن. وقد ازداد كل من وزن الكيلو والكيلو ومستويات الجلوكونوزو دهنيات الدم بمستويات كيلووليات الليبريتين عالية الكثافة ووظائف الكلي، ونزيف الكبد في المجموعة المصابية بالسكر مقارنة بالمجموعة السليمة. ومن ناحية أخرى تفاقمت كل من الساريا ونسبة النسبة المنوية للزيادة في الوزن ومستويات الليبريتين عالية الكثافة وقوى أكسيد ديميثيلز وحلولياين بروكسيداز في المجموعة المصابية بالسكر. كل المعاملات سواء بجرعتين من المستخلصات (مستخلص بالغليان والمستصلح المائي) و أوراق الزيتون المجففة قد أوضحت تجانسا في كل التقديرات ونسبة المجموعات التي عاملت بجرعة 4 مم من المستخلص المائي لأوراق الزيتون ونسبة المجموعات المماثلة بنسبة 10% من أوراق الزيتون المجففة وتستخلص من هذه الدراسة أن أوراق الزيتون المجففة و مستخلصات أوراق الزيتون أدت إلى تحسن حالة الفياغانة والحيوية للفئران المصابية بالسكر.

الكلمات المفتاحية: أوراق الزيتون - المركبات الفينولية - استخلاص - فنان - مرض السكر.


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