Benefit effect of ethanolic extract of Bay leaves (Laura nobilis) on blood sugar level in adult diabetic rats induced by alloxan monohydrate

Salah M.M. Al Chalabi1*, Duha Mysire Majeed1, Ahmed Abdulmunem Jasim1, and Khalid Suhail Al-Azzawi1

1: Biotechnology Research Center, Al-Nahrain University, Baghdad, Iraq
*Corresponding author: salahchalabi63@gmail.com (Chalabi)

Abstract

In the present study, the effect of Bay leave ethanolic extract on blood glucose, insulin level, lipid profile, liver and kidney function and body weight in type 2 diabetic rats were investigated. Forty albino male rats(250-300) grams were divided into four groups (10 rats for each), first group treated with distilled water and served as control, second group treated with 200 mg/kg of Laura nobilis alcoholic extract, third group served as positive diabetic and the fourth group was served as diabetic and treated with 200 mg/kg b. w. of alcoholic extract of Laurus nobilis, all groups were treated orally, the following results were evaluated in diabetic rats, fasting blood glucose, triglyceride (TG), total cholesterol (TC), low density lipoprotein (LDL), very low density lipoprotein (VLDL), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), B. urea and s. creatinine levels were significantly increased while high density lipoprotein (HDL) and body weight significantly decreased as compared to control rats, after 30 days of treating by 200 mg/kg b.w alcoholic extract of Bay leave there was significant decrease in fasting blood glucose and significant increase in fasting insulin level, also there was significant decrease in TG, TC, LDL, VLDL, ALT, AST, ALP, B. urea and s. creatinine level, while HDL and body weight increased in diabetic groups compared to control not treated groups.

Key word: Diabetes, alcoholic extract, cholesterol and creatinine

How to cite this article: Al Chalabi SMM, Majeed DM, et al (2020): Benefit effect of ethanolic extract of Bay leaves (Laura nobilis) on blood sugar level in adult diabetic rats induced by alloxan monohydrate, Ann Trop Med & Public Health; 23(S16): SP231608. DOI:
http://doi.org/10.36295/ASRO.2020.231608

Introduction

The use of plants as alternative drug has act an important and active role in nearly culture on earth [1]. Herbal plant is based on the fact that plants contain different materials that can enhance health and alleviate diseases, characteristics for their pharmacological effectiveness and the speed of healing illness without complications [2]. Various activities of herbal medicine are caused by secondary metabolites contained in it, including phenolate, alkaloid, saponin, steroid, terpenoid, tannin, these compounds is a secondary metabolite group with wide distribution in plants which has several antioxidants, antibacterial, anti-inflammatory and anticancer activities and acts as natural antioxidant which can ward off various oxidants and free radicals harmful to health [3]. Diabetes is a worldwide illness, associated with impaired glucose and lipid metabolism[4], leads to many complex and severe complications, the first step for preventing this complication is control of blood sugar levels, although the treatment for diabetes consists of oral antidiabetic like metformin drug and insulin injection, there was a growing tendency to search for new natural and active antidiabetic drugs, especially in developing countries, due to the difficulty in producing current medicines in addition to bad complication of these materials [5]. Many plant spices like fenugreek, olive leaves, cloves, turmeric and Bay leaves have insulin enhancing activity in experimental studies [6].

Bay leaf is a plant often used in the community as alternative medicine, the existence of bay leaf is common, easily available and is expected to aid in education and introduction of bay leaf as an herbal alternative for health[7]. It has been used for the treatment of eructation, epigastric bloating, impaired digestion and flatulence, used as diuretic and has many analgesic effects [8]. Bay leaf can improve blood glucose metabolism in patients with diabetes not only by hypoglycemic effects but also by improving capillary function, lipid metabolism, enhance liver and kidney function and antioxidant status [9]. It also reduces triglycerides, cholesterol, LDL cholesterol, and elevates the HDL cholesterol values in people with type 2 diabetes [10]. The aim of this current paper was to estimate the beneficial effect of Bay leaf alcoholic extract on blood glucose, insulin level, lipid profile, liver and kidney function and the effect on body weight in alloxan induced diabetic rats.

Materials and methods

1. Preparation of alcoholic extract

Leaves of plant were purchased from local markets in Baghdad, the leaves were cleaned and dried at room temperature and grounded by electrical grinder. Fifty grams of ground leaves powder were mixed with 250 ethanol for 16 hours by soxhlet and filtered by using Bucher funnel and Whatman filter paper. The solvent was dried and concentrated by using rotary evaporator at 40°C the extract was kept in dark glass container at 4°C.

2. Experimental design

Forty albino male rats obtained from Biotechnology research center\Al-Nahrain University aged 5-6 months weighing (250-300) grams were used in this study, water and dry diet were supplied at libitum. The rats were divided into four groups (10 rats/group) and treated according to the experimental protocol. Twenty rats were used for induction of diabetes, first group included 10 rats treated with distilled water and served as control, the second group treated with 200 mg/kg of alcoholic extract, third group served as positive diabetic, and the fourth group was served as diabetic and treated with 200 mg/kg b.w. of alcoholic extract of Laurus nobilis, the groups were treated orally daily for 4 weeks.

3. Induction of diabetes

Diabetes was induced in overnight fasting rats using single dose of alloxan monohydrate (90 mg/kg b.w.)(BDH chemicals\England), immediately 5 ml of 5% glucose was injected to the rats in order to overcome decrease in blood glucose (hypoglycemia), after starvation for 12 hours fasting blood glucose were measured by using glucometer (Rosmax\Germany)and the rats with blood sugar over 250 mg/dl were considered to be hyperglycemic.

4. Blood collection

At the end of experiment the blood were collected and then centrifuged at 3000 r.p.m for 15 minutes to isolate serum for determined biochemical parameters that include, blood glucose was estimated by using glucose-oxidase method (Randox laboratories Ltd.Co.), fasting insulin was evaluated by using (cobas\Roche\Germany), cholesterol was enzymatically measured by using (Spinreact\Spain), triglyceride (Spinreact\Spain), HDL-C (Spinreact\Spain), (LDL-C, VLDL-C, Blood urea and serum Creatinine) were measured by enzymatic and colorimetric methods (Spinreact\Spain), ALT (Rnodo\British), AST (Rnodo\British), ALP (Biolabo\Franc), and total protein was estimated by the colorimetric test Biuret method by using human total protein liquicolor (Germany).

5. Statistical Analysis

The data of the experiment were calculated by using one-way analysis of difference and the group differences were calculated using Duncan multiple range test, data are presented as mean± SM, the different letters investigate a significant difference (P<0.05).
Results

Table 1 shows the most active compounds isolated from alcoholic extract of *Laura nobilis*

Table 1: The active compounds of alcoholic extract of *Laura nobilis*

<table>
<thead>
<tr>
<th>Chemical compounds</th>
<th>Alcoholic extracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saponins</td>
<td>+</td>
</tr>
<tr>
<td>Flavonoid</td>
<td>+</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>+</td>
</tr>
<tr>
<td>Glycoside</td>
<td>+</td>
</tr>
<tr>
<td>Phenols</td>
<td>+</td>
</tr>
<tr>
<td>Triterpenes and Steroids</td>
<td>+</td>
</tr>
<tr>
<td>Tannins</td>
<td>+</td>
</tr>
<tr>
<td>Cumarins</td>
<td>+</td>
</tr>
<tr>
<td>Fuocommarins</td>
<td>+</td>
</tr>
<tr>
<td>Resins</td>
<td>+</td>
</tr>
</tbody>
</table>

The results in table 2 illustrated a significant (P<0.05) increase in fasting blood glucose and significant decrease in fasting insulin level in diabetic groups as compared to control and groups that treated by *Laura nobilis* extract 200 mg/Kg only, but after 4 weeks of treatment by *Laura nobilis* extract, there was a significant (P<0.05) decrease in blood glucose and significant increase in insulin level in diabetic groups compared to control.

Table 2: The effect of alcoholic extract of *Laura nobilis* on glucose and insulin levels

<table>
<thead>
<tr>
<th>Groups</th>
<th>Fasting Insulin uU/ml Mean±SE</th>
<th>Fasting glucose mg/dl Mean±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>4.67±0.78 A</td>
<td>90.54±3.62 C</td>
</tr>
<tr>
<td><em>Laura nobilis</em> extract 200 mg/Kg</td>
<td>5.38±0.48 A</td>
<td>85.93±1.61 D</td>
</tr>
<tr>
<td>Diabetic</td>
<td>1.47±0.24 C</td>
<td>380.23±7.84 A</td>
</tr>
<tr>
<td>Diabetic+ <em>Laurus nobilis</em> extract 200 mg/Kg</td>
<td>3.77±0.25 B</td>
<td>185.43±4.98 B</td>
</tr>
</tbody>
</table>

Differences A,B are significant (P<0.05) as compression between columns

The results revealed a significant (P<0.05) increase in triglyceride, cholesterol, LDL, VLDL and significant (P<0.05) decrease in total protein in diabetic rats compared with control and groups that treated with alcoholic extract, but after 4 weeks of treatment by alcoholic extract there was significant decrease in all lipid profile in diabetic groups compared with control and groups that treated with alcoholic extract as shown in table 3

Table 3: The effect of alcoholic extract of *Laura nobilis* on some lipid profile and total protein in diabetic rats

<table>
<thead>
<tr>
<th>Groups</th>
<th>Triglyceride mg/dl Mean±SE</th>
<th>Cholesterol Mg/dl Mean±SE</th>
<th>HDL Mg/dl Mean±SE</th>
<th>LDL mg/dl Mean±SE</th>
<th>VLDL mg/dl Mean±SE</th>
<th>Total protein mg/dl Mean±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>80.43±4.37 C</td>
<td>85.43 ± .69 B</td>
<td>36.74± .74 B</td>
<td>32.57±2.55 C</td>
<td>16.21±1.54 B</td>
<td>6.22±0.96 A</td>
</tr>
<tr>
<td><em>Laura nobilis</em> extract 200 mg/Kg</td>
<td>70.33 ± .56 D</td>
<td>72.36 ±3.66 C</td>
<td>40.34±2.64 A</td>
<td>17.94±3.42 C</td>
<td>14.06±2.65 C</td>
<td>7.93±1.94 A</td>
</tr>
</tbody>
</table>

http://doi.org/10.36295/ASRO.2020.231608
The data in table 4 investigated a significant (P<0.05) increase in ALT, AST, ALP, B.urea and s. creatinine in diabetic rats compared with control and groups that treated with alcoholic extract, but after 4 weeks of treatment by alcoholic extract there was significant decrease in all liver and kidney function in diabetic groups compared with control.

Table 4: The effect of alcoholic extract of *Laurus nobilis* on liver and kidney function in diabetic rats

<table>
<thead>
<tr>
<th>Groups</th>
<th>ALT IU/L Mean±SE</th>
<th>AST IU/L Mean±SE</th>
<th>ALP its\100ml Mean±SE</th>
<th>B. Urea mg\dl Mean±SE</th>
<th>Creatinine mg\dl Mean±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>35.09 ±1.33 B</td>
<td>30.30± 0.52 B</td>
<td>65.03 ± 0.93 B</td>
<td>30.54±2.54 B</td>
<td>0.46±0.02 B</td>
</tr>
<tr>
<td><em>Laurus nobilis</em> extract 200 mg\Kg</td>
<td>30.66 ±0.59 C</td>
<td>25.44 ±1.76 C</td>
<td>50.75±2.97 D</td>
<td>29.53±3.84 B</td>
<td>0.43±0.01 B</td>
</tr>
<tr>
<td>Diabetic</td>
<td>45.94 ±3.54 A</td>
<td>50.32±2.32 A</td>
<td>90.44 ±3.56 A</td>
<td>36.63±1.53 A</td>
<td>0.91±0.01 A</td>
</tr>
<tr>
<td>Diabetic+<em>Laurus nobilis</em> extract 200 mg\Kg</td>
<td>29.22 ±2.70 D</td>
<td>25.09±1.13 C</td>
<td>64.33±2.09 C</td>
<td>31.21±0.79 A</td>
<td>0.85±0.03 A</td>
</tr>
</tbody>
</table>

Differences A,B are significant (P<0.05) as compression between columns

According to body weight the result reported that, there was a decrease in final body weight in diabetic group compared with initial body weight of the same group, while the body weight of diabetic group treated with *Laurus nobilis* extract obtained an improvement in final body weight compared with initial body weight after four weeks of treatment as shown in table 5

Table 5: The effect of alcoholic extract of *Laurus nobilis* on body weight in diabetic rats

<table>
<thead>
<tr>
<th>Groups</th>
<th>Initial body weight(gm) Mean±SE</th>
<th>Final body weight (gm) Mean±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>290.56±12.21 A</td>
<td>320.33±3.16 B</td>
</tr>
<tr>
<td><em>Laurus’s nobilis</em> extract 200 mg\Kg</td>
<td>238.43±18.33 A</td>
<td>275.47±10.63 B</td>
</tr>
<tr>
<td>Diabetic</td>
<td>229.54±16.65 A</td>
<td>243.62±5.14 B</td>
</tr>
<tr>
<td>Diabetic+<em>Laurus nobilis</em> extract 200 mg\Kg</td>
<td>274.32±8.14 A</td>
<td>295.12±7.17 B</td>
</tr>
</tbody>
</table>

Differences A, B are significant (P<0.05) as compression between rows.

Discussion
The results presented in this study demonstrate a significant decrease in fasting blood glucose and significant increase in insulin level in diabetic rat treated with alcoholic extract in relation with positive not treated groups (Table 2), this may be related to that, these extract contain various phenolics compounds such as flavonoids, alkaloids, glycoside, coumarins, xanthenes, and procyanidins (table 1) which able to prevent the depletion of endogenous antioxidants by scavenging free radicals and exhibits in tend to increase the amount of proteins involved in insulin signaling and glucose transport, also stimulate the insulin secretion from pancreas [11,12], the Polyphenols compound that present in Bay leaves have very active effects on insulin sensitivity and glucose metabolism [13].

The polyphenols are investigated to generate insulin-like effect in glucose metabolism [14]. These compounds have active antioxidant effect which protect cell from reactive oxygen species, regulate transcription factors and hormones, stimulate insulin secretion and regulate different inflammatory pathways for the management of diabetes complications [15]. A lot of research studies the benefits of polyphenol to humans, it enhance antioxidant action by increasing hepatic enzyme (catalase) levels in experimental diabetic rats, and reduced the damage caused by oxidative stress in hyperglycemic condition [16, 17], also reduces cholesterol levels, weight loss and increases insulin concentration in diabetic animals [18], as well as it also mentioned to have positive effects on inflammation, apoptosis, and glucose homeostasis [19], the phenolic compounds of plant extracts have an ability to inhibit α-glucosidase enzyme and leads to decrease blood glucose [20,21]. The extract of Bay leaf might possess an insulin-like effect or stimulate insulin secretion from pancreatic[b-cells [22]. Furthermore, the hypoglycemic effect of these extract may be due to inhibition of gluconeogenesis and glycogenolysis, glucose absorption and activation of peripheral glucose utilization [23].

Hyperlipidemia is the most complication of diabetes, leads to formation of atherosclerosis, neurological disorders, cardiovascular diseases and further severe complication [24,25]. The present results revealed a reduction in the concentration of cholesterol, TG, LDL and VLDL in diabetic groups treated with alcoholic extract of Bay leave (Table 3), the best explanation of this results may be due to flavonoids and derivatives present in Bay leaf, which participated in the management of lipids profile. An experimental study in diabetic rats reported that treatment rats with quercetin caused a decrease in the value of cholesterol and triglycerides [26], also this effect due to inhibition of triglycerides secretion from liver into blood [27]. Treatment rats by alcoholic extract of Bay leaf improve the insulin level in diabetic groups, reduce the activity of lipases enzyme and leads to reduction in cholesterol level [28], as well as the decrease in concentrations of triglycerides, cholesterol and low-density lipoprotein could be related to the role of laurel leaves in reducing liver enzymes that formed fatty acids or could be due to inhibiting the Acetyl-CoA Synthetase, which was an essential enzyme in the synthesis of fatty acids [29,30].

The present research also investigated that after 30 days of treatment by Bay leaf alcoholic extract there was a statistical reduction in all liver and kidney function marker that includes ALT, AST, ALP, B.urea and s. creatinine in diabetic groups compared with control (Table 4), the possible mechanism of this results due to the antioxidant compounds in this extract works as a proof of the phenomenon of fat oxidation associated with diabetes and consequential them from necrosis and damage to the cells of the liver and thus regulate liver function [31]. These compounds inhibit hepatocyte apoptosis and exerted hepatoprotective role on experimentally induced diabetic rats by the anti-apoptosis action, recover liver histopathological disturbances, prevent diabetic liver damage by elevating and improving antioxidant enzyme activity which leads to decrease the liver injury markers such as ALT, AST and ALP [32]. Different studies have explained the beneficial effect of Bay leaf extract on kidney function, it contain several antioxidant compound which reduced oxidative stress, improve kidney function marker and prevented kidney failure in type 2 diabetes rat by stimulating the antioxidant enzymes (CAT and SOD) [33].

The results in Table 5 revealed a reduction in initial body weight in diabetic groups in relation to control and diabetic alcoholic extract treated groups, this results was related to that, the slim in body weight resulting from the deficient of insulin concentration which leads to further breakdown of protein and fatty acids, the lack of insulin hormone in diabetic groups causes excessive degradation of
protein which increases amino acid levels in the blood, but after treatment by Bay leaf alcoholic extract, there was an increase in insulin concentration and body weight were obtained in diabetic groups, this results indicate that, this extract is very consequential in preventing protein degradation and weight loss by stimulating the insulin secretion [34]. The current research illustrated the important and active role of Bay leaf alcoholic extract as alternative drug for type 2 diabetic and its complication in rats.

**Conclusion**

According to the results obtained from this study, we concluded that, the alcoholic extract of *Laura nobilis* was decrease blood glucose, (cholesterol, triglyceride, LDL) level and improve insulin level, HDL level, kidney and liver function.

**References**


34. Qian, K., Zhong, S., Xie, K., Yu, D., Yang, R., & Gong, D. W. (2015). Hepatic ALT isoenzymes are elevated in gluconeogenic conditions including diabetes and suppressed by insulin at the protein level. *Diabetes/Metabolism Research and Reviews*, 31(6), 562–571.