

Anti-Diabetic Activity of Cynanchum acutum Extract in Alloxan-Induced Diabetic Rats

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Abstract: The present study investigates the anti-diabetic potential of Cynanchum acutum extract in alloxan-induced diabetic rats. The effects of an ethanolic extract of Cynanchum acutum on serum glucose, total cholesterol, triglycerides, plasma insulin and liver glycogen were examined in control and experimental groups. Cynanchum acutum extract reduced the serum glucose concentration at 24, 48 and 72 h. To verify the activity sub-chronically, the extract administered orally in the doses of 25, 50 and 100 mg/kg to diabetic rats for 30 days, that significantly reduced the level of glucose, total cholesterol and triglycerides with an increase in insulin and glycogen concentration to near normal levels in a dose-dependent manner. The results indicate that Cynanchum acutum extract possess anti-diabetic potential in alloxan-induced diabetic rats.

Keywords: Anti-diabetic activity, alloxan-induced diabetic rat, Cynanchum acutum

INTRODUCTION

Cynanchum acutum, belongs to the family Apocynaceae. This family (including Asclepiadaceae) is a monophyletic family (Judd et al., 2002) containing 355 genera and 3700 species, the majority of them are poisonous and many have medicinal uses. The plant is quiet poisonous with few medical applications. It has been used as a purgative in the French pharmaceutical Codex (Garnier et al., 1961) and its milky latex is used for skin and eye problems in Tunisian folk medicine (Sayed et al., 2003; Boukef, 1986) and its seeds are edible in some parts of Iran. The photochemical investigations on Cynanchum acutum have revealed the presence of several natural compounds including β-sitosterol, lupeol, lupeyl acetate study α-amyrin (Halim et al., 1990), sarcostine, quercetin and quercetin 3-O-β-D-galactoside (El-Sayed et al., 1994), four flavonoid glycosides: quercetin di-O-hexoside, quercetin 3-O-rhamnosyl(1→2)glycoside, quercetin 3-O-galactoside study quercetin 3-O-xylolside (Heneidak et al., 2006) and 2 simple coumarins: scofoil and scoparone (El-Demerdash et al., 2009) as well as of seven other flavonoids (Ghada et al., 2008). Studies on other species of this genus which have close affiliations with C. acutum also have been done and the following products have been distinguished: steroidal glycosides (Liu et al., 2007), carbohydrates (Yi-Bin et al., 2004), alkaloids (Tian-Ying et al., 2001), phenolic compounds (Lou et al., 1993) study triterpenes (Konda et al., 1990). This close affiliation enables us to predict the presence of these products in C. acutum, since close genotypes ends to production of similar compounds. Anti-hyperglycemic and antioxidant activity of metanolic extract of aerial parts of Cynanchum acutum has been reported and antiulcerogenic effects of ethanolic extract of the plant also have been shown in rats (Atta et al., 2005). This study was undertaken to evaluate the antidiabetic activity of ethanolic extract of Cynanchum acutum, since up to now no pharmacological evaluation has been done on Cynanchum acutum for its antidiabetic activity. This prompted us to pursue the activity and was examined for their efficacy and for determination of their possible mechanism of action.

MATERIALS AND METHODS

Alloxan monohydrate was purchased from Sigma Chemical Company, St Louis, MO, USA. Gliclazide was procured from Dr. Ahmadi Lab, Zabol, Iran. All the other chemicals used were of analytical grade and were purchased from commercial sources. Cynanchum acutum was collected during the month of April – June 2011 from Sistan and Baluchestan province, Iran. About 1 kg of Cynanchum acutum was chopped into small pieces, shade dried, coarsely powdered and exhaustively extracted with ethanol by cold percolation method. After 72 h, the solvent was decanted and distilled-off over boiling water bath. Further concentrations were done under reduced pressure using rotary flash evaporator and finally dried in a desecrator. Adult male albino rats of Wistar strain weighing 150 - 200 g used for the study were obtained from Razi Institute, Mashhad, Iran. Animals were housed in polypropylene cages and maintained under standard conditions (12 h light and dark cycles, at 25±3º C and
Table 1: The Effect of Cynanchum acutum extract on the serum glucose (mg/dL) levels in hyperglycemic rats for 24, 48 and 72 h

<table>
<thead>
<tr>
<th>Treatment (mg/kg)</th>
<th>24 h</th>
<th>48 h</th>
<th>72 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>121.00 ± 3.77</td>
<td>120.00 ± 4.12</td>
<td>121.00 ± 4.10</td>
</tr>
<tr>
<td>Group II</td>
<td>605.44 ± 8.23a***</td>
<td>617.54 ± 7.44a***</td>
<td>629.83 ± 7.78a***</td>
</tr>
<tr>
<td>Group III</td>
<td>556.25 ± 7.13b***</td>
<td>443.16 ± 8.81b***</td>
<td>314.33 ± 8.16b***</td>
</tr>
<tr>
<td>Group IV</td>
<td>535.72 ± 9.19bNS</td>
<td>372.98 ± 8.32b**</td>
<td>240.22 ± 9.82b***</td>
</tr>
<tr>
<td>Group V</td>
<td>421.73 ± 9.53b***</td>
<td>248.73 ± 9.27b**</td>
<td>168.97 ± 8.61b**</td>
</tr>
<tr>
<td>Group VI</td>
<td>282.27 ± 8.24b***</td>
<td>153.26 ± 8.17b**</td>
<td>116.61 ± 8.64b**</td>
</tr>
</tbody>
</table>

Values represent mean ± S.D. (n = 6). *p<0.05, **p<0.01, ***p<0.001 when compared to control animals; NS: Non-significant

Table 2: The anti diabetic effect of Cynanchum acutum extract treated in alloxan-induced rats for 30 days

<table>
<thead>
<tr>
<th>Treatment (mg/kg)</th>
<th>Serum glucose (mg/dL)</th>
<th>Plasma insulin (µU/L)</th>
<th>Liver glycogen (mg/gm tissue)</th>
<th>Total cholesterol (mg/dL)</th>
<th>Triglycerides (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>120.00±5.35</td>
<td>13.13±1.41</td>
<td>6.54±3.15</td>
<td>62.21±2.84</td>
<td>65.35±3.59</td>
</tr>
<tr>
<td>Group II</td>
<td>487.13±10.32a***</td>
<td>8.76±1.91a***</td>
<td>14.20±2.23a***</td>
<td>111.18±2.73a***</td>
<td>114.87±3.47b***</td>
</tr>
<tr>
<td>Group III</td>
<td>111.14±6.36b**</td>
<td>11.84±1.68b**</td>
<td>25.13±2.41b**</td>
<td>63.31±2.37b***</td>
<td>74.76±3.10b***</td>
</tr>
<tr>
<td>Group IV</td>
<td>114.18±7.14b***</td>
<td>12.05±1.17b**</td>
<td>45.91±2.11b**</td>
<td>72.71±2.89b***</td>
<td>76.81±3.41b***</td>
</tr>
<tr>
<td>Group V</td>
<td>99.35±5.12b***</td>
<td>11.23±1.44b***</td>
<td>52.16±2.45b**</td>
<td>60.83±2.01b***</td>
<td>62.19±2.97b***</td>
</tr>
<tr>
<td>Group VI</td>
<td>87.97±7.10b**</td>
<td>13.14±1.93b**</td>
<td>58.47±2.06b**</td>
<td>53.98±3.19b**</td>
<td>54.94±3.34b**</td>
</tr>
</tbody>
</table>

Values represent mean ± S.D. (n = 6). *p<0.05, **p<0.01, ***p<0.001 when compared to control animals; NS: Non-significant

RESULTS

Table 1 shows the effect of Cynanchum acutum extract on serum glucose level in hyperglycemic animals. The level of glucose in animals treated with gliclazide and Cynanchum acutum extract (25 mg/kg) for 24, 48 and 72 h showed a decrease in the level of glucose. In 50 and 100 mg/kg dose, the level of glucose further decreased with 24, 48 and 72 h, the decrease was drastic in 72 h. On observing the response with 100 mg/kg dose for 72 h the level of glucose was found near to the control value, thereby indicating the anti diabetic potential of Cynanchum acutum. Table 2 illustrates the effect of Cynanchum acutum extract for a sub-chronic period of 30 days. The diabetic control rats (Group II) showed a significant increase in glucose, total cholesterol and Triglycerides levels, while plasma insulin and liver glycogen were reduced drastically when compared to the control animals. On treatment with standard drug gliclazide, all the parameters found to attain near normal values. The animals treated with Cynanchum acutum extract in different doses (25, 50 and 100 mg/kg) showed dose-dependent decrease in levels of glucose, total cholesterol and triglycerides while increase in plasma insulin and liver glycogen were obtained when compared to the disease-control group.

DISCUSSION

The results of anti-diabetic study clearly showed that Cynanchum acutum extract produced a significant hypoglycemic action. At 25 mg/kg dose, the activity of Cynanchum acutum extract in lowering the serum glucose and promoting glycogen storage was found to

35-60% humidity). present study, thirty six rats were used. Group I: contained six animals that served as control. The remaining 30 animals were given alloxan intra-peritoneally (120 mg/kg body weight) to induce hyperglycemia. After 72 h, the hyperglycemic conditions in these animals were ensured from their blood glucose values which were above 250 mg/dL.

Further they were segregated into 5 groups containing six animals each and were treated as follows:

Standard pelletized feed and tap water were provided ad libitum. In the

Group II: Disease-control (alloxan 120 mg/kg i.p.)

Group III: Diabetic + Gliclazide (25 mg/kg of Body wt)

Group IV: Diabetic + Cynanchum acutum (25 mg/kg of Body wt)

Group V: Diabetic + Cynanchum acutum extract (50 mg/kg of Body wt)

Group VI: Diabetic + Cynanchum acutum (100 mg/kg of Body wt)

Serum glucose concentration was measured at 24, 48 and 72 h from the blood samples. The doses was continued for 30 days and on day 31, the animals were sacrificed by cervical decapitation under mild anesthesia and the blood were collected in tubes with clot activators and heparin to get serum and plasma while the liver was removed immediately, washed with ice-cold saline and stored in deep freezer at -20°C for glycogen estimation. Plasma insulin was estimated by ELISA method using Biotech-ELX-50, (U.S.), liver glycogen using UV visible spectrophotometer, Serum glucose, total cholesterol and triglycerides were estimated using Randox-daytona fully automated random axis analyzer (U.K.). Statistical evaluation of analytical data was done by Student's t-test using SPSS package. The values are expressed as the

mean=standard Deviation (S.D) and values with p<0.01, p<0.001, p<0.05 were considered significant.

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The results of anti-diabetic study clearly showed that Cynanchum acutum extract produced a significant hypoglycemic action. At 25 mg/kg dose, the activity of Cynanchum acutum extract in lowering the serum glucose and promoting glycogen storage was found to
be higher than the standard drug. The possible mechanism for this action might be due to the inhibition of the enzyme glycogen phosphorylase, an enzyme that catalyzes the process of glycogenolysis thereby inhibiting glucagon which on feedback inhibition favours the production of insulin as reported by Liu et al. (2007). This might be the cause for drastic depletion of glucose and lipid parameters such as total cholesterol and triglyceride in hyperglycemic condition. Further studies are necessary to determine the exact nature of the active principles and mechanism of action of *Cynanchum acutum* extract. From this study we can conclude that *Cynanchum acutum* extract has beneficial effects on blood glucose and lipid abnormalities. It has the potential to impart therapeutic effect in diabetes.

**REFERENCES**


