HYPOGLYCAEMIC EFFECT OF ARTEMISIA HERBA-ALBA
IN EXPERIMENTAL HYPERGLYCAEMIC RATS

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Abstract

Artemisia herba-alba was investigated for its possible anti-diabetic effect in alloxan-induced diabetic rats. Oral administration of 0.39 g/kg b.w. of the aqueous solution of Artemisia herba-alba exhibited a significant reduction in blood glucose content. The same effect was also seen after administration of repaglinide (1 mg/kg b.w.) and regular insulin (0.1 IU/kg b.w.). It was demonstrated that the anti-diabetic effect of Artemisia herba-alba was similar to that of repaglinide and regular insulin. These results suggest that the Artemisia herba-alba possesses antidiabetic activity and is able to ameliorate biochemical damages in alloxan induced diabetes in rats.

Key words: rats, Artemisia herba-alba, hypoglycaemia, hyperglycaemia, alloxan, diabetes mellitus.

Diabetes mellitus is a common endocrine disorder associated with markedly increased morbidity and mortality rates. The disorder affects more than 100 million people in the world (1). Diabetes mellitus can be defined as a group of metabolic diseases characterized by chronic hyperglycaemia resulting from defects in insulin secretion, insulin action or both, leading to impaired function in carbohydrate, lipid and protein metabolism (2). The management of diabetic patients relies on four fundamental columns: education, diet, exercise, and drugs (3).

After insulin became available, evidence emerged suggesting that human diabetes mellitus has a multifactorial etiology. Insulin has been used in diabetes mellitus treatment. In order to discover other hypoglycaemic agents, many investigations (4-7) have been performed in traditional medicine testing eventual hypoglycaemic plants.

In traditional practice medicinal plants are used in many countries to control diabetes mellitus (2, 5-7). Plant drugs are frequently considered to be less toxic and induce less side effects than synthetic ones (8).

Oral hypoglycaemic agents currently used in clinical practice have characteristic profiles of serious side effects (9).

Artemisia herba-alba is a well-known medicinal plant that has been used in the Middle East traditional medicine for treating various diseases including diabetes mellitus. It is used as an anthelmintic by the local population. The plant is also used as antimicrobial, poison antidote, and emmenagogue (3, 10).

We therefore studied the effects of Artemisia herba-alba on blood glucose levels in alloxan-induced diabetes mellitus in rats. Furthermore, it was made the comparison of the effect of Artemisia herba alba, repaglinide and regular insulin in diabetic rats.

Material and Methods

Animals. Male Wistar rats with body weight of 180-200 g were obtained from the Central Animal Quarters, Ataturk University. The animals were fed on standard pellet diet and water ad libitum.

Test drugs and chemicals. The dried above-ground part of Artemisia herba-alba was provided from a herbal and folk medicine market in Erzurum city in Turkey. The plants were botanically identified in the Agricultural Faculty of Ataturk University. Plant material was prepared according to the traditional method: The above-ground parts of Artemisia herba-alba were powdered and dissolved in distilled water for 16 h with occasional shaking each 2 h. The extract was filtered. The filtrate was adjusted to concentration of 8.5 mg/ml of Artemisia herba-alba.

Experimental induction of diabetes in rats. The rats were injected intraperitoneally with alloxan monohydrate (BDH Chemicals Ltd, England) dissolved in sterile normal saline at a dose of 150 mg/kg b.w. (11). Five days later blood samples were collected and glucose levels determined to confirm the development of diabetes.
Experimental design. A total of 28 diabetic rats were used in the experiment. Diabetes was induced in rats 5 d before starting the experiment. The rats were divided into 4 equal groups after the induction of diabetes:

- group 1- diabetic control rats were given distilled water alone;
- group 2- diabetic rats were given orally water extract of *Artemisia herba-alba* (0.39 g/kg b.w.);
- group 3- diabetic rats were given orally aqueous solution of anti-diabetic drug repaglinide (1 mg/kg b.w.);
- group 4- diabetic rats were given regular insulin (0.1 IU/kg b.w.).

Blood collecting and glucose estimation.
Blood was collected from the tail, before extract administration (0) and 2, 4, 6 and 8 h after drug administration. Serum glucose level was measured with spectrophotometric method by Automatic Analyser (AU 2700 Olympus, OSR6121, Japan).

Statistical analysis. The data were analysed with one way ANOVA in SPSS 10. Duncan’s test was used in all data where appropriate.

Results
The effects of *Artemisia herba-alba*, repaglinide and insulin on the body weight of alloxan-diabetic rats are shown in Table 1 and Fig. 1.

The effects of *Artemisia herba-alba*, repaglinide and insulin on the blood glucose levels of alloxan-diabetic rats are shown in Table 2 and Fig. 2.

The hypoglycaemic effects of the various treatments of the diabetic rats were seen within 2 h and continued for about 8 h. The administration of *Artemisia herba-alba* indicates significant (P<0.05) reduction of blood glucose concentration and was found to be anti-diabetic. None of the animals treated with *Artemisia herba-alba* showed any visible serious symptoms of toxicity. But there were mild signs of respiratory distress, diarrhoea, convulsions, etc.

Table 1
Effect of various treatments on the body weight of diabetic rats

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>After 10 d of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>193.71±4.71(^a)</td>
<td>174.85±3.59(^b)</td>
</tr>
<tr>
<td>Group 2</td>
<td>198.71±3.76(^y)</td>
<td>228.57±3.40(^x)</td>
</tr>
<tr>
<td>Group 3</td>
<td>201.14±4.96(^y)</td>
<td>226.00±5.64(^x)</td>
</tr>
<tr>
<td>Group 4</td>
<td>199.18±4.56(^y)</td>
<td>223.86±6.26(^x)</td>
</tr>
</tbody>
</table>

a,b: different letters in the same column indicate difference statistically significant (P<0.05).

x,y: different letters in the same line indicate difference statistically significant (P<0.05).

Group 1- distilled water; Group 2- water extract of *Artemisia herba-alba*; Group 3- aqueous solution of repaglinide; Group 4- regular insulin.

![Fig. 1. Effect of various treatments on the body weight of the diabetic rats.](image-url)
Table 2
Effect of various treatments on blood glucose level of diabetic rats

<table>
<thead>
<tr>
<th>Group</th>
<th>Hours</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td></td>
<td>316.40±12.53</td>
<td>326.30±14.20</td>
<td>324.50±12.75</td>
<td>315.80±10.30</td>
<td>314.80±9.99</td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td>329.40±45.03</td>
<td>202.00±38.59</td>
<td>232.40±26.98</td>
<td>225.30±32.78</td>
<td>263.10±39.23</td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td>321.00±33.83</td>
<td>176.20±31.67</td>
<td>171.70±31.72</td>
<td>165.60±29.76</td>
<td>238.10±51.03</td>
</tr>
<tr>
<td>Group 4</td>
<td></td>
<td>337.20±25.83</td>
<td>175.10±32.46</td>
<td>181.40±29.99</td>
<td>192.70±29.05</td>
<td>217.80±32.54</td>
</tr>
</tbody>
</table>

a,b: different letters in the same column indicate difference statistically significant (P<0.05).
x,y: different letters in the same line indicate difference statistically significant (P<0.05).

Group 1- distilled water; Group 2- water extract of Artemisia herba-alba; Group 3- aqueous solution of repaglinide; Group 4- regular insulin.

Discussion

The blood glucose data obtained clearly indicate that aqueous extract from Artemisia herba-alba produced significant hypoglycaemic effects in alloxan-induced diabetic rats. Its hypoglycaemic effect was comparable with that of repaglinide and insulin. The hypoglycaemic effect was obtained within 2 h after the administration of Artemisia herba-alba, repaglinide, and regular insulin.

The obtained results were similar to those obtained by Marrif et al. (4) and Twaij and Al-Badr (12). It is possible that the plant may reverse the catabolic features of insulin deficiency, decrease the release of glucagon or increase that of insulin, stimulate directly glycolysis in peripheral tissues, increase glucose removal from blood or reduce glucose absorption from the gastrointestinal tract (4). Hypoglycaemic effects of Artemisia herba-alba could, possibly, be due to increased peripheral glucose utilization. Inhibition of the proximal tubular reabsorption mechanism for glucose in the kidneys, if any, can also contribute towards blood lowering effect (13). We cannot speculate about the mechanism of the action.

Body weight in all diabetic rats was increased. This is the normal effect of diabetes mellitus. After the treatment of the diabetic rats, their body weight increased again. Similar effects were also observed by other researchers (3, 12, 13).

The synthetic oral hypoglycaemic agents can produce a series of side effects. As can be seen from the study, rats treated with Artemisia herba-alba showed only mild visible undesirable clinical symptoms. Further studies are needed to know more about the mechanisms of hypoglycaemic action of the plant.

References


