

Antidiabetic Effect of *Otostegia persica* Oral Extract on Streptozotocin-Diabetic Rats

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Abstract: Antidiabetic effect of the alcoholic extract of *Otostegia persica* was investigated on 40 streptozotocin diabetic rats in four equal groups. Animals in first group did not receive any extract and were as a control for other groups. Rats in group II, III and IV received 200, 350 and 500 mg kg⁻¹ daily administration of *Otostegia persica* oral extract, respectively for three weeks. Blood glucose level was estimated three times a day (8:00, 11:00 A.M and 5:30 P.M) in all groups. Statistical analysis of the results by t-test showed that the extract produced a dose-dependent decrease in the blood glucose level especially in fourth group (p<0.0001) in comparison with first group. Thus, study indicate that *Otostegia persica* has a strong antidiabetic action and can decrease the blood glucose level.

Key words: Antidiabetic effect, *Otostegia persica*, streptozotocin, blood glucose level, rats, Iran

INTRODUCTION

It must be pointed out that diabetes mellitus is a common and serious problem of the many people in all over the world. So any investigation about diabetes mellitus is important and can play a helpful role in improvement and treatment of the patients. There are several types of diabetes mellitus including type one. In type I, level of blood glucose increases because of some problems in enough secretion of insulin in pancreas gland (Guyton and Hall, 2005). Ordinary treatment for these patients is daily subcutaneous injection of insulin (Anthony *et al.*, 2008). Also other kinds of treatments such as medicinal plants are using traditionally for treatment of the diabetes. In drug discovery and development, medicinal herbs have consistently been considered the leading source of pharmaceuticals, employed in the treatment of various human diseases due to their high chemical diversity and broad biological functionality. This study focuses on the effects of *Otostegia persica* oral extract on blood glucose level in male diabetic rats. No previous investigation on antidiabetic effects of this plant have been reported. Just, there is some investigations on antimicrobial (Asghari *et al.*, 2006) and antioxidant activity (Sharififar *et al.*, 2003) of *Otostegia persica*. However, there is traditional usage in some regions of Iran

especially in Sistaan and Baluchestan and kerman and people in these regions deeply believe in antidiabetic effects of this plant. *Otostegia persica* grows in south of Iran in Fars Province between Shiraz and Jahrum, also in south east region mainly in Sistaan and Baluchestan and kerman (Ghahraman, 1996).

MATERIALS AND METHODS

Plant: The plant materials were collected in April 2009 from Dehbakri in Kerman Province. The plant was identified by the Department of Botany of the Research Institute of Forests and Rangelands (TARI), Tehran. A voucher specimen has been deposited at the Herbarium of TARI.

Ethanol extract preparation Aerial parts of *Otostegia persica* were finely powdered in a mill. Total 1000 g of sample were selected and raised the volume to 2 L by ethanol (96%). The solution percolated after 48 h, then the solvent was removed under reduced pressure at low temperature and finally about 20 g concentrated extract was prepared. Doses of the extract were prepared using normal saline.

Animals: About 40 male adult Sprague Dawely rats (180-230 g) aging 16-19 weeks were selected from animal

house of Kazeroun University and transferred to Shiraz University. At the next step, rats randomly divided to four equal group. Rats were put into 40 glassy cages separately and spent one week in new condition for better accommodation.

Chemicals: Streptozotocin (STZ) was obtained from Sigma Chemical Co., St. Louis, MO, USA.

Stereptozotocin induced diabetes mellitus: Diabetes mellitus was induced by single injection of 60 mg kg⁻¹ streptozotocin intraperitoneally. Blood glucose level was estimated prior to injection of the streptozotocin and also 24 h and one week later for confirmation of the diabetes. Only those animals which showed hyperglycemia (blood glucose levels >250 mg dL⁻¹) were used in the experiment.

Estimation of the blood glucose level: Blood sampling was taken through a small vertical incision on superficial veins of the tail. Afterwards, blood glucose levels were measured using a Glucometer (Accu-chek active, USA). Meanwhile, giving extract the blood glucose level was estimated three times a day. Firstly, at 8:00 (A.M) before giving extract. Next, at 11:00 (A.M) 2 h after the morning giving extract. Finally, at 5:30 (P.M) before the evening administration of extract.

Daily administration of *Otostegia persica* oral extract: Rats in group I, the control did not receive any daily oral extract during this study but was fed 0.2 mL of normal saline. While, rats in groups II, III and IV were orally dosed daily for 21 days with 200, 350 and 500 mg kg⁻¹ of the extract dissolved in 0.2 mL of saline, respectively. Extract was given to rats twice a day by middle in the morning (at 9:00 A.M) and in the evening (at 6:00 P.M) equally.

Statistically analysis: Student's t-test was used for statistical analysis and p<0.05 was considered to be significant.

RESULTS AND DISCUSSION

General finding: Diabetes in rats resulted in rising of urination level so that the cages had to be cleaned two to three times a day because of offensive smell. Drinking of water was increased in rats in all groups. These signs appeared about 24 h after induction of diabetes mellitus by streptozotocin. Upon the introduction of the extract, the signs subsided especially in fourth group i.e., the urination level and its offensive smell dropped so that there was no need for the daily cleansing of the cages, particularly in the fourth group.

Especial finding: Compare group II-I and show that the mean blood glucose level at 8:00 O'clock had not significant decrease in comparison with the same time in first group. At 11:00 (A.M) and 5:30 (P.M) O'clock level of the blood glucose decreased significantly in comparison with the same time in first group (p<0.05) (Table 1). Compare group III to group I and show that the mean blood glucose level decreased significantly at 8:00 (p<0.01), 11:00 (p<0.001) and 5:30 (p<0.01) O'clock in comparison with the same times in first group (Table 2). Compare group IV with group I and show that the mean blood glucose level decreased significantly at 8:00, 11:00 and 5:30 O'clock in comparison with the same times in first group (p<0.0001) (Table 3).

The hypoglycemic plant extract has both organic and inorganic constituents, further it is important to note that the inorganic part of the medicinal plant containing mainly mineral elements, sometimes play a contributing role in enhancing medicinal properties (including hypoglycemic activity) of the plant (Kar and Choudhary, 1994; Kar *et al.*, 1999). A number of essential minerals are found to be present in *Otostegia persica* (Ayatollahi *et al.*, 2007).

These mineral elements may be associated with the mechanism of insulin release and its activity or glucose tolerance factor as described in different laboratory animals and in human beings (Castro, 1998; Mertz, 1981; Chen *et al.*, 1995; Niewoehner *et al.*, 1986). Antihyperglycemic effect which may be caused in part by the reduction of intestinal glucose absorption or increase in circulating insulin level (hyperinsulinemia) or by enhancing peripheral utilization of glucose. Further pharmacological and biochemical investigations are

Table 1: Comparison of the effect *Otostegia persica* oral extract on Blood Glucose Level (BGL) in group II with group I (control)

Groups	Dose of extract	8:00 A.M	11:00 A.M	05:30 P.M
I	0	407.7±18.2	405±17.1	420±20.8
II	200 mg kg ⁻¹	389±32.2	350.8±59.4*	365.8±29.6*

Values are mean±SD, *p<0.05, when compared with diabetic control. "Given by oral route at a dose of 200 mg kg⁻¹"

Table 2: Comparison of the effect *Otostegia persica* oral extract on Blood Glucose Level (BGL) in group III with group I (control)

Groups	Dose of extract	8:00 A.M	11:00 A.M	05:30 P.M
I	0	407.7±18.2	405±17.1	420±20.8
III	350 mg kg ⁻¹	334.4±42.3*	224.8±62.2**	313.5±22.6**

Values are mean±SD, *p<0.01, when compared with diabetic control, **p<0.001 when compared with diabetic control. "Given by oral route at a dose of 350 mg kg⁻¹"

Table 3: Comparison of the effect *Otostegia persica* oral extract on Blood Glucose Level (BGL) in group IV with group I (control)

Groups	Dose of extract	8:00 A.M	11:00 A.M	05:30 P.M
I	0	407.7±18.2	405±17.1	420±20.8
IV	500 mg kg ⁻¹	231.2±91.8***	170.1±94.4***	218.4±76.06***

Values are mean±SD, ***p<0.0001, when compared with diabetic control. "Given by oral route at a dose of 500 mg kg⁻¹"

underway to identify the active principle (s) and to elucidate the mechanism of the antidiabetic effect of *Otostegia persica* oral extract.

CONCLUSION

In this study, it can be concluded that the oral extract of the *Otostegia persica* possess antihyperglycemic action against streptozotocin induced hyperglycemia. These results seem to confirm the alleged antidiabetic activity by the traditional medicine.

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