Iranian Biomedical Journal 11 (1): 65-68 (January 2007)

Short Report

The Effect of *Teucrium polium* (Calpoureh) on Liver function, Serum Lipids and Glucose in Diabetic Male Rats

Mohammad Reza Shahraki[*1], Mohammad Reza Arab[2], Ebrahim Mirimokaddam[3] and Mony Jey Palan[4]

[1]Dept. of Physiology, [2]Dept. of Histology, Zahedn University of Medical Sciences, Faculty of Medicine; [3]Dept. of Hematology, [4]Dept. of English Language, Zahedan University of Medical Sciences; Zahedan, Iran

Received 19 December 2006; revised 21 June 2006; accepted 17 July 2006

ABSTRACT

Background: *Teucrium polium* is an analgesic, antidiabetic and antilipeidemic herbal medicament. The aim of this survey was to evaluate the effect of aqueous extract *T. polium* on liver enzymes linked to liver dysfunction, serum lipids and glucose, in diabetic male rats. **Methods:** A total of 20 Sprague-Dawly male rats became diabetic by intraperitoneal injection of streptozotocin (60 mg/kg). the animals were divided randomly into two groups. Experimental group was fed *Teucrium polium* (50 mg/kg) for a month but control group was received the same volume of distilled water. Liver enzymes, biochemical parameters (cholesterol, triglyceride, low density lipoprotein, alanine transaminase, aspartae transaminase) and glucose were measured by kinetic (Enzymatic) and colorimetric methods. Data obtained were analyzed and mean values were compared by paired student's *t*-test. The results were expressed as mean ± SD. Significant differences were set at $P<0.05$**.** **Results*:*** Our results showed that in test group, serum glucose values decreased significantly ($P<0.05$), but cholesterol, triglyceride, low density lipoprotein, alanine transaminase and aspartae transaminase increased significantly after use of *T. polium* ($P<0.05$). This parameters value did not show any changes in control group. **Conclusion:** Although the aqueous extract of *Teucrium polium* has strong hypoglycemic properties in experimental animals, but because of some hepatotoxic effects, it is not suitable to use it in human as an antidiabetic agent. *Iran. Biomed. J. 11 (1): 65-68, 2007*

Keywords: Teucrium polium, Liver function, Blood glucse

INTRODUCTION

iver is the major organ of the body that has an important effect on carbohydrates and lipid Lmetabolism [1]. In the presence of insulin, glucose is used but lipids and proteins are stored in the body [2]. In diabetes mellitus, insulin deficiency leads to failure of glucose consumption, consequently results in breakdown of lipids and proteins [3].

In traditional medicaments, *Teucrium polium* is used as analgesic, anti-spasmodic and hypolipidemic agent [4-6]. Visceral analgesic effects of *T. polium* extract compete considerably with those of indomethacin and hyoscine [4].

Use of *T. polium* in sacharomycetes culture media *in vitro* led to decrease in fatty acids and acts as anti-fungal, anti-bacterial and anti-inflammatory agent, and blocks the peroxidation of erythrocytes [7- 9]. There is an agreement for hepatotoxicity of *T. polium* administration [10]. Administration of 150 mg/kg Teuceium polium extract was showed to act as an anti-ulcer agent [11]. Intravenouse infusion and i.p. injection of plant extract after 4 and 24 hours led to decrease of blood sugar in rats [12]. Oral and i.p. administration of dried aerial parts and bloom extract of *T. polium* decreased appetite, water and food consumption and consequently body weight in rats [13]. The side effect of *T. polium* extracts were reported in diabetic patients who used it as an anti-diabetic agent [14, 15]. Oral

*Corresponding Author;

[DOR: 20.1001.1.1028852.2007.11.1.6.2]

[DOI: -]

administration of alcoholic *T. polium* extract showed no changes in fasting and postprandial blood sugar in diabetic patient [16]. Zal *et al.* [17] reported that *the administration of T. polium* boiling extract had an anti-diabetic effect on diabetic rats [17]. With considering the controversial reports of the above studies, the prime aim of this study was to identify the the effect of *T. polium* aqueous extract on blood glucose, Liver enzymes linked to liver dysfunction and serum lipid in streptozotocin diabetic male rats.

MATERIALS AND METHODS

A total of 20 Sprague-Dawly male rats weighting 220 ± 14 g were purchased from Pasteur Institute of Tehran (Iran). Animals were housed in cages under conditions of controlled temperature (22- 28ºC) and a 12-h artificial light period for 10 days before and during of experiments) and had free access to water and standard pellet diet. The dried parts of *T. polium* were purchased from herbalists in Kerman and were authenticated by the Center for Research on Natural Resources and Livestock (Ministryof Agricultural Jahad, Isfahan, Iran) as *T. polium*; L. Every day, 120 mg of cleaned aerial parts of *T. polium* was suspended in 15 ml of water and put on a shaker for 24 hours. The suspension was cleared upon passing through several layers of chees. Animals became diabetic by i.p. injection of streptozotocin (60 mg/kg) and were divided randomly into two groups. Experimental group was gavaged *T. polium* (50 mg/kg, d = 1.09)) for 4 weeks but control group was received the same volume of distilled water. After a week that animals showed diabetic behavior such as polyuria and Polydipsia, at fasting state were anesthetized by ether and blood samples were collected from tail vein for evaluation of glucose, alanine transaminase (ALT), aspartae transaminase (AST), Alkaline Phosphatase (ALP), and lipoproteins. At the end of treatment period (after an overnight fasting), animals were anesthetized with high dose of ketamine and killed by cutis carotid vein and blood samples were collected. Glucose, ALT, AST, cholesterol (Cho), triglyceride (TG), and lipoproteins (HDL, LDL) were measured blindly by kinetic (enzymatic) and colorimetric methods. Three rats from control group died before the end of experiment.. In addition, 3 Rats were died in control group (ethic No. 136 Dated 13-5-2003, Zahedan University of Medical Sciences, Iran) and the results were expressed as mean ± SD. To confirm the normal distribution, the data were analyzed by one-sample Kolmogrov-Smirnov test, then by Levant's and compared by paired student's *t*-test. Significant differences were set at $P<0.05$. All statistical analyses were performed using SPSS (v.11).

RESULTS AND DISCUSSION

Our results revealed that serum glucose value was significantly decreased but cho, TG, ALT, AST and lipoproteins were significantly increased after *T. polium* administration however these parameters did not show any changes in control group (Table 1 and 2, $P\leq0.05$). The comparison of mean weights in test group before (221.1 ± 16.14g) and after use of *T. polium* (219.6 ± 14.29 g) did not show any significant changes but the mean weights in control group before (221.28 ± 11.95 g) and after the study (191.85 ± 18.15 g) of the test were significantly decreased (Table 3, $P = 0.01$). The comparison of water consumption in test (145.88 ± 28.79 cc) and control groups (154.61 ± 21cc) did not show any significant changes.

Table 1. Comparison of AST, ALT, ALP, HDL, LDL, triglyceride, cholesterol, and glucose before and after *T. polium* administration in test group.

Biochemical parameters	**Before** *T. polium* **administration**	**After** *T. polium* **administration**
Cholesterol (mg/dl)	64.00 ±14.90	*94.20 ± 5.73
Triglyceride (mg/dl)	85.10 ± 17.18	*146.00 ±15.51
HDL (mg/dl)	33.10 ± 10.70	41.00 ± 11.03
LDL (mg/dl)	13.91 ± 7.80	*23.96 ± 11.30
AST (U/L)	86.80 ± 25.70	*383.10 ± 196.10
ALT (U/L)	118.10 ± 18.57	355.60 ± 259.80
ALP (U/L)	936.00 ± 255.57	970.40 ± 275.60
Glucose (mg/dl)	283.61 ± 22.13	*96.22 ± 11.90

N =10; values are mean ± SD; *$P<0.05$.

Our results are in part in accordance with Rasaekh *et al.* [12] which showed that *T. polium* decreased the serum glucose level of diabetic rats. Although we did not show any antilipidemic effect for *T. polium* aqueous extract, Rasaekh *et al.* [12] reported antilipidemic effect of alcoholic *T. polium* extract; this difference in our results may be due to the difference in method of *T. polium* administration. We used oral method whereas they used i.p. method. Some of the parameters such as AST and ALT values increased after *T. polium* administration in

[DOR: 20.1001.1.1028852.2007.11.1.6.2]
[DOI: -]

Table 2. Comparison of AST, ALT, ALP, HDL, LDL, triglyceride, cholesterol and glucose before and after period of experiment in control group.

Biochemical parameters	Before period of experiment	After period of experiment
Cholesterol (mg/dl)	61.28 ± 12.86	104.00 ± 18.22
Triglyceride (mg/dl)	76.14 ± 15.51	163.85 ± 48.05
HDL (mg/dl)	34.86 ± 8.45	38.00 ± 8.16
LDL (mg/dl)	13.62 ± 9.21	33.00 ± 12.60
AST (U/L)	83.85 ± 20.43	165.71 ± 34.52
ALT (U/L)	107.28 ± 20.68	195.14 ± 73.09
ALP (U/L)	1234.70 ± 313.19	1307.71 ± 317.51
Glucose (mg/dl)	270.40 ± 41.20	283.14 ± 46.71

N = 7; values are mean ± SD; **P*<0.05.

this survey, which bears similarity with those of Polymeros [14] and Mezokopakis [15]. The reported decrease of blood glucose levels in this study may not be due to increase in insulin secretion because raised insulin secretion not only improve glucose metabolism but also improve that of lipoproteins. Our results did not show any significant improvement in lipid metabolism. It seems that hypoglycemic effect of aqueous extract *T. polium* may be attributed to some of components in the extract such as iridoids, flavonoids and cirsiliol [18]. Previous studies showed that pharmacological and physiological effects of *T. polium* extract act nonspecifically and future studies will probably show the extract role of each of these components in reducing serum glucose level. This indicates a major problem for using *T. polium* extract for specific medical treatment. Ramesh [19] showed that weight loss in diabetic rats is due to the decrease of food intake. It is probable that absence of weight loss in treatment group may be attributed to some of components of *T. polium* extract. Although the *T. polium* extract have some good propertis such as reducing serum glucose level, it is not suitable as an antidiabetic agent because of hepatotoxic effects.

Table 3. Comparison of weight between control and test group before and after experiment period.

groups	Weight (g)	
	Before period of experiment	After period of experiment
Test group (n = 10)	221.10 ± 16.14	219.60 ± 14.29
Control group (n = 7)	221.85 ± 11.95*	191.85 ± 18.15

N = 17; values are mean ± SD; **P*<0.05.

ACKNOWLEDGMENTS

This study was supported by a grant from Undersecretary for Research of Zahedan University of Medical Sciences and Health Services (Zahedan, Iran) (grant No: 136).

REFERENCES

1. Lavoie, J.M., Bergeron, R. and Latour, M.G. (2005) Regulatory impact of intra-hepatic carbohydrate and lipid metabolism. *Can. J. Appl. Physiol. 30: 282-291*.
2. Gagliardino, J.J. (2005) Physiological endocrine control energy homeostasis and postprandial blood glucose levels. *Eur. Rev. Med. Pharmacol. Sci. 9: 75-92*.
3. Lernmark, A. (1999) Type I diabetes. *Clin. Chem. 45: 1331-1338*.
4. Abdolahi, M., Karimpour, H. and Monsef-Esfahani, H.R. (2003) Antinonciceptive effects of *Teucrium polium* total extract and essential oil in mouse writhing test. *Pharmacol. Res. 48: 31-35*.
5. Sajjadi Ebrahim, S., Movahedian, M., Attar, A.M. and Yektaian, A. (1998) Anti hyperlipidemic effect of hydro alcoholic extract and polyphenolic fraction from Dracocephalum kotschyi Boiss. *Pharm. Acta Helv. 73: 167-170*.
6. Autore, G., Capasso, F., De Fusco, R., Fasulo, M.P., Lembo, M., Mascolo, N. and Menghini, A. (1984) Antipyretic and antibacterial actions of *Teucrium polium (L.). Pharmacol. Res. Commun. 16 (1): 21-29*.
7. Aggelis, G., Athanassopoulos, N., Paliogianni, A. and Komaitism, M. (1998) Effect of Teucrium polium extract on the growth and fatty acid composition of saccharomyces cerevisiae and yarrowia biolytic. *Antonie van Leeuwenhoek 73 (2): 195-198*.
8. Tariq, M., Ageel, A.M., Al-Yahya, M.A., Mossa, J.S. and Al-Said, M.S. (1989) Anti-inflammatory activity of *Teucrium polium*. *Int. J. Tissue React. 11 (4): 185-188*.
9. Suboh, S.M., Bilto, Y.Y. and Aburjani, T.A. (2004) Protective effects of selected medical plants against protein degeneration lipid peroxidation and deformability loss of oxidatively stressed human erythrocytes. *Phytother. Res. 18 (4): 280-284*.
10. Larrey, D. (1994) Liver involvement in the course of phyto therapy. *Presse Med. 23: 691-693*.
11. Twaij, H.A., Albadr, A.A. and Abul-Khail, A. (1987) Anti-ulcer activity of *Teucrium polium*. *Int. J. Crude Drug. Res. 25: 125-128*.
12. Rasekh, H.R., Khoshnood Mansourkhani, M.J. and Kamalianejad, M. (2001) Hypolipidemic effects of

Teucrium polium in rats. *Fitoterapia 72 (8): 937-939*.

13. Gharaibeh, M.N., Elayan, H.H. and Salhab, A.S. (1989) Anorexia effect of *Teucrium polium* in rats. *Dept of pharmacol. 27: 201-210*.
14. Polymeros, D., Kamberoglou, D. and Tzias, V. (2002) Acute cholestatic hepatitis caused by *Teucrium polium* (golden germander) with transient appearance of anti mitochondrial antibody. *J. Clin. Gastroenterol. 34 (1): 100-101*.
15. Mazokopakis, E., Lazaridou, S., Tzardi, M., Mixaki, J., Diamantis, I. and Ganotakis, E. (2004) acute cholestatic hepatitis caused by *Teucrium polium L. Phytomedicine 11 (1): 83-44*.
16. Ansari Asl, A., Soveid, M., Azadbakht, M., Omrani, G.R., Solimani, S.M. and Samani, M. (2002) The effect of extract of Teucrium polium on blood sugar and insulin levels of type 2 diabetic patients. *Shiraze E-Medical Journal http://www.sums.ac.ir/~semj/vo13 /mar /rTP&NIDDM.htm*.
17. Zal, F., Vasi, M., Rasti, M. and Vessal, M. (2001) Hepatotoxicity associated with hypoglycemic effects of *Teucrium polium* in diabetic male rats. Arch. *Iran. Medicine 4 (4): 188-192*.
18. Shakhanbeh, J. and Atrouse, O. (2001) *Teucrium polium* inhibits nerve conduction and Carrageen an induced inflammation in the rat skin. *Turk J. Med. Scin. 31(1): 15-21*.
19. Ramesh, B. and Pugalendi, K.V. (2005) Antihyperlipidemic and antidiabtic effects of umbelliferone in streptozotocin diabetic rats. *Yale J. Biol. Med. 78 (4): 189-196*.

[DOR: 20.1001.1.1028852.2007.11.1.6.2]

[DOI: -]