

Effect of *Urtica Dioica* Decoction on Serum Glucose and Lipid Profile in Stereptozytocin Induced Diabetic Male Rats

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Article information	Abstract
<p>Article history: Received: 1 July 2012 Accepted: 17 Nov 2012 Available online: 10 Feb 2013 ZJRMS 2013; 15(11): 15-18</p> <p>Keywords: Urtica dioica Lipid profiles Rat Glucose Diabetes</p> <p>*Corresponding author at: Department of Physiology, Zahedan University of Medical Sciences, Zahedan, Iran. E-mail: m_shahrakim@yahoo.com</p>	<p>Background: Since <i>Urtica dioica</i> is a traditional treatment plant and is used for antihypertensive, antilipidemic and antidiabetic agents, this survey was carried out to evaluate the effect of <i>Urtica dioica</i> decoction on serum glucose and lipid profile in diabetic male rats induced by streptozotocin (STZ).</p> <p>Materials and Methods: This experiment was performed on 30 Wistar-Albino male rats, weighing 200-250 g, which were divided in sham control (A), diabetic control (B) and diabetic test groups (C) randomly (N=10). Type I diabetes was induced by single intraperitoneal injection of STZ (65 mg/kg). Test group received 0.40-0.60 ml of <i>Urtica dioica</i> decoction for a month by gavages, control group (B) received the same volume of distill water. Group (A) did not receive any agent during the experiment period. Finally, animals were anesthetized, sacrificed and blood samples were collected from the cervical vein. Then, serum glucose and lipid profiles were measured by ordinary methods. Data were analyzed by SPSS-11, using ANOVA and post hoc Tukey tests. Results were expressed as mean±SD, and statistical difference was considered significant by $p<0.05$.</p> <p>Results: Results in the present study showed that fasting blood glucose (FBS), total cholesterol (TChol), triglyceride (TG), LDL, food and water intake were significantly decreased in group C compared with those of group B, but body weight gain was significantly increased compared with that of control group (B).</p> <p>Conclusion: These results indicated that <i>Urtica dioica</i> decoction caused decreased FBS and improved serum lipids in diabetic male rats. Some more studies have shown the same mechanism.</p>

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Introduction

Diabetes mellitus is a major endocrine disorder that is a growing health problem in most countries [1]. It is an important cause of prolonged illnesses and early death [1-3]. Diabetes mellitus is clinically recognized by chronic elevation of the glucose level in the blood and is often accompanying by symptoms of the severe thirst; polyuria, polyphagia and weight loss [4]. The prevalence and incidence of diabetes is increasing in most populations, being more prominent in developing countries [5, 6]. Prevalence of diabetes mellitus in all countries is growing [7, 8]. More than 100 million people suffer from diabetes mellitus, and it is anticipated that their number may get to 5 times [9-11]. Many herbal products have been described as a prevention of diabetes mellitus [12]. Plant products are frequently considered to be less toxic and have less side effects than those of synthetic ones [13]. *Urtica Dioica* is an herbal medicine used as expectorant, diuretic, hemostatic, and it is also used for the treatment of eczema and rheumatism. It is used as an anti-diabetic drug, too [14-16]. Farzami et al. reported that UD leaves extract in perfuse islet of langerhans induced insulin secretion in normal and streptozotocin diabetic rats and caused reduced blood

glucose [17]. In addition, Bnouham et al. investigated that aqueous extract of *Urtica dioica* has an antihyperglycemic activity [18]. Moreover, Avci et al. reported that *Urtica dioica* extract has antilipidemic effects in the mice fed with high cholesterol diet [19]. *Urtica dioica* aqueous and petroleum ether extracts improved lipid profile in normal and high fat diet rats [20, 21]. Since, in traditional medicines, plants decoction always are used, this survey was to evaluate the effect of *Urtica dioica* decoction on serum glucose and lipid profile in induced-streptozotocin diabetic male rats.

Materials and Methods

This experiment was performed on 30 adult Wistar-Albino male rats, weighing 200-250 g which were separately housed in cages (one rat in each cage) and had free access to water and food. Animals were maintained in a room at $22\pm 3^{\circ}\text{C}$ with a fixed 12h artificial light period, (Timer Model: SUL180a, AC220V. China, 6 am to 6 pm), humidity of 45-70% and the air was adequately recycled. All animals were fed with a standard rodents' diet. After a week, habituated animals were randomly

divided into three groups (N=10): sham controls (A), diabetic control (B) and diabetic test groups (C). In fasting situation (14-16 h), animals were given intra peritoneal (IP) injection of 65 mg/kg STZ (the solution was prepared in cold citrate buffer, pH=4.5). Streptozotocin purchased from sigma was dissolved in citrate buffer immediately before using [15]. Diabetic test group (C) received 0.4-0.6 ml decoction solution of *Urtica Dioica* per day by gavages. Diabetic control group (B) received the same volume distilled water in treatment duration. Sham control group (A), received rodent's diet and tap water, but not any agents during experiment treatment.

All of the test animals were diabetic and showed diabetic symptoms by polydipsia, polyuria and polyphagia. After 5 days, the diabetic condition was found to be established when fasting blood sugar (FBS) was higher than 126 mg/dl.

Urtica Dioica was collected from around Tabriz in northwest of Iran in the month of May, 2008. *Urtica Dioica* leaves were then identified in the department of biology in Faculty of Science, Sistan and Baluchestan University, Zahedan, Iran. After that, the leaves were separated, dried at room temperature and ground into powder. Ten grams of leave powder was boiled with 200 ml of distilled water for 15 minutes. The decoction preparation was filtered through a gauze cloth followed by filtration through a regular filter paper (Watman No.1). Then, the extract was evaporated to one-fifth of its original volume and kept at 4°C until its use within 1 week [21].

At the end of treatment, the rats were fasted for 12-14 hours and the body weight of all the rats was measured (final weight), all animal were anesthetized under high dose of ether anesthesia and sacrificed by cervical decapitation. Blood sugar, serum, HDL, LDL, total cholesterol (TCho) and triglyceride (TG) were measured using standard methods (Technicon, USA). Afterwards, blood samples were collected from cervical vein. Serum HDL was measured by precipitation of non-HDL lipoproteins with dextran/MgSO₄ followed by enzymatic

cholesterol assay. LDL was finally calculated by Friedewald formula [22].

This experiment was carried out for a month, and water intake and food consumption were carefully measured during the treatment duration. Data were analyzed by SPSS-11. Variance analysis was used for the comparison of the groups. Tukey, test as a post hoc multiple comparison test, was applied to compare healthy control and diabetic groups. Data were expressed as mean±SD, and *p*-value less than 0.05 was considered significant.

Results

The results obtained from this survey showed that FBS, total cholesterol (TCho), triglyceride (TG), LDL, food and water intake significantly decreased in group C compared with those of group B (diabetic control group, Table 1). Initial body weight was similar in all the three groups, but final weight was lower in the diabetic groups compared with that of A, the normal group. At the same time in group C (*Urtica Dioica* decoction) body weight average was much higher than group B (*p*=0.03, Table 1). Fasting blood glucose (FBS) concentration increased in diabetic (B and C) groups compared with that in (normal) group A after STZ injection and continued the same until the end of the treatment duration, but FBS in group C significantly decreased compared with that of group B (Table 1).

The amount of food and water intake was higher in diabetic (B and C) groups compared with those of normal group (A), but these values were lower in group C compared with that of group B (*p*=0.02, *p*=0.01, Table 1).

Low density lipoprotein (LDL) concentration value was higher in diabetic groups (B and C) compared with that of group (A), but this value was lower in group C compared with that of group B (*p*=0.01, Table 1).

Total cholesterol (TCho) and triglyceride (TG) concentration in diabetic (B and C) group were higher than those of group A, but these values were significantly lower in group C compared with those in group B (*p*=0.001, *p*=0.03, Table 1).

Table 1. The effect of *Urtica Dioica* decoction on FBS and lipid profile in diabetic mal rat (N=10)

Parameters	Glucose(mg/dl) Mean ±SD	LDL(mg/dl) Mean ±SD	TCho(mg/dl) Mean ±SD	TG(mg/dl) Mean ±SD
Sham control group (A)	84.4±5.5	7.29±12.5	62.9±12.2	49.16±11.3
Control group (B)	262±21.4	121.9±12.5	81.6±9.5	64±11.4
Test group (C)	196.8±22.1a	102.52±8.4 b	74.63±8.9 c	59.1±8.2d
<i>p</i> -Value	0.014	0.001	0.04	0.03

Based on ANOVA and Tukey tests FBS, cholesterol, triglyceride and LDL value in C were significantly decreased compared with those of control group A: FBS, *p*<0.01 vs. B group. B: LDL, *p*<0.02 vs. B group. C: Cholesterol, *p*<0.001 vs. B group. D: Triglyceride, *p*< 0.03 vs.

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Table 2. The effect of *Urtica Dioica* decoction on body weight food and water intake in diabetic mal rat (N=10).

Parameters	Body weight (g) Mean ±SD	Food intake (g) Mean ±SD	Water intake (ml) Mean ±SD
Sham control group (A)	245.1±15.5	22.1±2.03	65.2±10.3
Control group (B)	204.8±17.4	25.9±7.3	112.6±19.2
Test group (C)	223.2±13.1a	24.6±4.7 b	82.6±8.9 c
<i>p</i> -Value	0.14	0.04	0.02

Based on ANOVA and Tukey tests FBS, cholesterol, triglyceride and LDL value in C were significantly decreased compared with those of control group A: Body weight, *p*<0.001 vs. B group. B: Food intake, *p*< 0.02 vs. B group. C: Water intake, *p*< 0.01 vs. B group

Discussion

In the present study, all the test animals were diabetic by single dose of intra peritoneal injection of streptozotocin (STZ, 65 mg/kg IP). The diabetic symptom were detected and observed with polyuria, polydipsia, polyphagia and hyperglycemia. Diabetic condition was established in the tests groups with high FBS measurement (more than 126 mg/dl) [16].

Farzami et al. reported that *Urtica Dioica* leaves extract in perfused islet of langerhans induced insulin secretion in normal and streptozotocin diabetic rats and caused reduced blood glucose [17]. In the present study, we showed that in *Urtica Dioica* decoction treatment group (C) serum glucose significantly decreased compared with those of group B. This may be due to *Urtica Dioica* decoction stimulated β cells in islet of langerhans and increased serum insulin and reduced blood sugar in this group.

Results obtained from this survey showed that the *Urtica Dioica* decoction administration causes a decrease in FBS. Our results are in accordance with those of Bnouham et al. who reported that *Urtica Dioica* aqueous extract administration in alloxan-induced diabetic male rats causes decreased glucose tolerance test [18]. In addition, this report showed that *Urtica Dioica* aqueous extract acts on the small intestine absorption cells and affects on glucose homeostasis by inhibits glucose absorption. Bnouham et al. suggested that it is a mechanism for reduced blood glucose in diabetic animals which were under the *Urtica Dioica* extract treatment [18]. We supposed that *Urtica dioica* decoction acts on glucose influx and metabolism in the skeletal muscles and adipose tissue, and probably decreases blood glucose concentration. However, we could not measure the glucose influx and metabolism in the skeletal muscles and adipose tissue.

In the present study, we showed that the *Urtica Dioica* decoction administration causes decreasing total cholesterol (Tcho), triglyceride (TG) and LDL. This section of the results is the same as that of Avci et al. who reported that the extracts of five traditional plants such as *Urtica Dioica* affected on lipid profile [19] and caused the

reduced LDL concentration on enrich cholesterol fed male rat.

However, the other section of the results of the present study is in disagreement with those of Avci et al. who reported the *Urtica Dioica* aqueous extract did not affect on serum cholesterol and triglyceride in cholesterol fed male rat. This may be due to the fact that we examined the effects of *Urtica Dioica* decoction on lipids profile on diabetic male rats induced by STZ.

The results of the present study are in agreement with Dahr et al. study who investigated chronic intake *Urtica Dioica* aqueous and petroleum extract which had affected on blood lipid profile by reducing cholesterol and LDL concentration in hypercholesteremic diet male rats [20]. In addition, our finding showed that *Urtica Dioica* aqueous extract administration in group C caused the increased body weight, but food and water intake decreased which is in accordance with those of Kavalali et al. who reported that *Urtica Dioica* extract caused improved body weight loss, food and water intake in diabetic STZ rats [15].

These results obtained from this survey revealed that *Urtica Dioica* decoction causes decreased blood sugar and improved serum lipids in male diabetic rats which were induced by STZ.

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Authors' Contributions

Main Author: Mohammad Reza Shareki, Co-author: Elnaz Shafighi, Data Analysts: Ahmad Reza Shahreki and Hamideh Mirshekari.

Conflict of Interest

The authors declare no conflict of interest.

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