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THE HYPOGLYCEMIC EFFECT OF SAFFRON PETALS' IN DIABETIC RATS

Mansour Amraei[1], Parastoo Shahmir[2], Mojtaba Mohamadpour[3], Masoumeh Asadi[1], Ayub Ghorbani[1*]

[1]Department of Physiology, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran.

[2]Department of Clinical Biochemistry, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran.

[3]Student Research committee, Ilam University of Medical Sciences, Ilam, Iran.

Abstract:

Type 2 diabetes is one of the most important health problems around the globe and there are huge sums of money spent on its control. Various chemical and herbal substances have been applied to control blood sugar. In line with this, the present study evaluates the effect of saffron petals' hydroalcoholic extract on the fasting blood sugar and serum insulin in diabetic rats.

In the present study, male Wistar rats (180 g to 220 g) were assigned to five groups (n=5): a normal control group, streptozotocin (60 mg/kg) diabetic control group and three diabetic groups that were administered with 100 mg/kg, 200 mg/kg and 300 mg/kg body weight saffron petal hydroalcoholic extract per day. After eight weeks since the initiation of the treatment, the fasting blood samples were collected from the rats' hearts to undergo fasting blood sugar and serum insulin measurements. The data were analyzed in SPSS, version 16.

The serum level of fasting blood sugar in the diabetic groups that had been fed on 100 mg/kg and 200 mg/kg saffron petals extracts was found significantly reduced in contrast to the diabetic control group ($P<0.01$ and $P<0.05$, respectively). But, there was not found any significant difference between the diabetic group, treated with 300 mg/kg saffron petal hydroalcoholic extract, and the diabetic control group. In the case of insulin, all the three diabetic groups that had been administered with 100 mg/kg, 200 mg/kg and 300 mg/kg saffron petal hydroalcoholic extract showed significant increases in comparison to the diabetic control group ($P<0.001$, $P<0.001$ and $P<0.05$, respectively) .

Our study indicated that saffron petal is capable of reducing the high level of fasting blood sugar and serum insulin and thus it can be prescribed as a hypoglycemic drug through performing further and more complete research.

Corresponding author:

Ayub Ghorbani,

Department of Physiology,
Faculty of Medicine,
Ilam University of Medical Sciences,
Ilam, Iran.

Email: *auyb.ghorbani@yahoo.com*

Tel: +988432235745; Fax: +988432227136

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INTRODUCTION:

Diabetes Mellitus is inter alia the metabolic diseases accompanied by relative or absolute insulin deficiency, blood sugar elevation as well as carbohydrate, fat and protein metabolism disorder [1]. The increase in the occurrence rates of type 2 diabetes is one of the most important health problems worldwide [2]. Diabetes control requires long-term curbing of the glycemia levels. It has been evidenced to degrade the quality of life for the symptoms it is followed with and considerably increases the medical costs [3]. Moreover, diabetes heightens the risk of being inflicted with other dangerous diseases like cardiovascular diseases and cancer [4] in such a manner that the prevalence rate of the cardiovascular diseases in diabetic individuals is two to four times higher than the other society members [5].

There are various drugs used to control blood sugar and diabetes amongst which one can point to glibenclamide and glycolic acid [6, 7]. These compounds have been found with extensive side effects such as blood sugar drop, hypertension and weight gain, so they are not promising alternatives in long-term in preventing the disabling symptoms of diabetes. Therefore, there is a need for discovering new pharmaceutical compounds having larger effects and lower side effects [8, 9].

Diabetes prevention is of a high priority. Medicinal herbs can create new oral hypoglycemic ingredients that enable fighting the extravagant costs and unavailability of the presently-applied drugs and their side effects [10].
Saffron (Crocus Sativus L.) is a small perennial plant belonging to Iridacea family and the dried stigma of the plant is widely utilized in food industry (as an aromatic condiment for coloring the foodstuff) and pharmacy [11]. Saffron possesses a vast array of applications including as anticonvulsant [12], anti-depression [13], anti-anxiety and soporific [14], anti-hypertension [15] and analgesic and anti-inflammatory [16].

Considering the prior research performed on the investigation of saffron (stigma)'s properties, the present study deals with the evaluation of the effect of saffron petals hydroalcoholic extract on the blood sugar level.

MATERIALS AND METHODS:

After collecting the fresh petals of saffron from the saffron farms in the vicinity of Boshrouyeh City, it was subjected to herbarium identification and verification and then dried in shade. Hydroalcoholic solvent (consisted of water and ethanol for a ratio of 20:80) was added to the milled saffron petals and the solution was mixed on a shaker device for 72 hours. The resulting solution was filtered and placed in a rotary device as a result of which the dried extract was obtained and it was kept in refrigerator (4°C) till the moment of use.

A total of 25 male Wistar rats were procured from Razi Serum Institute and maintained in laboratory animals fostering room, belonging to Ilam's Medical Sciences University, in 22±2°C with a 12 h light/dark cycle and a relative humidity of 60±5. After one week, some of the rats underwent diabetes induction by the use of streptozotocin (Enzo, life sciences, Inc., USA) in a dosage of 60 mg/kg. Three days after injection, blood samples were taken from rats' tail vessels and glucose levels of the samples were measured by the use of Glucometer (Bionime®, Switzerland) and the rats were diagnosed diabetic in case of glucose levels above 250 ml/dl. After diabetes verifications, the healthy and diabetic rats were randomly assigned to 5 equal groups:

The healthy group and diabetic group that were fed on an ordinary dietary regime; the experimental groups one to three the members of which were diabetic and treated with 100 mg/kg, 200 mg/kg and 300 mg/kg body weight saffron petals hydroalcoholic extract per day, respectively. The rats' weights were measured at the beginning and at the end of the study. At the end of week six of the experiment and after 12 hours of fasting while having access to water, were the animals were anesthetized with ether and blood samples were taken from their heart. Pars Azmoun Iran Company's diagnostic kits were utilized for the determination of the rats' fasting blood sugar levels.
The data were analyzed in SPSS software (version 16) based on t-test method and one-way variance analysis. The data have been presented in the form of Means±SD for all of the five groups (n=5). The significance level of the tests was set at $P<0.05$.
Code of Ethics: Approved by the Ethics Committee of Ilam University of Medical Sciences (ir.medilam.rec.1395.191).

RESULTS:

The serum level of fasting blood sugar in the diabetic groups that had been fed on 100 mg/kg and 200 mg/kg saffron petals extracts was found significantly reduced in contrast to the diabetic control group ($P<0.01$ and $P<0.05$, respectively) (Table 1). But, there was not found any significant difference between the diabetic group, treated with 300 mg/kg saffron petal hydroalcoholic extract, and the diabetic control group. Also, the results of the study indicated that the glucose levels in the two diabetic groups that

had been treated with 100 mg/kg and 200 mg/kg of the hydroalcoholic extract was found significantly reduced at the end of the experiment as compared to the beginning of the experiment (P<0.01) (Figure 1).
In the case of insulin, all the three diabetic groups that had been administered with 100 mg/kg, 200 mg/kg and 300 mg/kg saffron petal hydroalcoholic extract showed significant increases in comparison to the diabetic control group (P<0.001, P<0.001 and P<0.05, respectively) (Table 1). The serum insulin levels of these groups were found significantly increased at the end of the experiment in contrast to the values measured at the onset of the tests (P<0.01, P<0.01 and P<0.05, respectively) (Figure 2).

Table 1: Comparing the FBS and serum insulin the experimental groups with the diabetic control group.
The significance level was set at P<0.05. Means ± SD for every group (n=5). (*:P<0.05; **: P<0.01; ***: P<0.001)**.**

Groups / Factors	FBS (mg/dl)		Insulin (µu/dl)	
	Mean±SD	P Value	Mean±SD	P Value
Normal Control	104.55±10.82	0.000***	9.76±0.56	0.000***
Diabetic Control	501.20±28.00	-	1.39±0.53	-
Diabetic + Extract (100 mg/kg)	377.77±33.41	0.001**	8.16±0.75	0.000***
Diabetic + Extract (200 mg/kg)	419.05±44.46	0.021*	6.21±0.54	0.000***
Diabetic + Extract (300 mg/kg)	483.32±37.35	0.935	2.95±0.45	0.014*

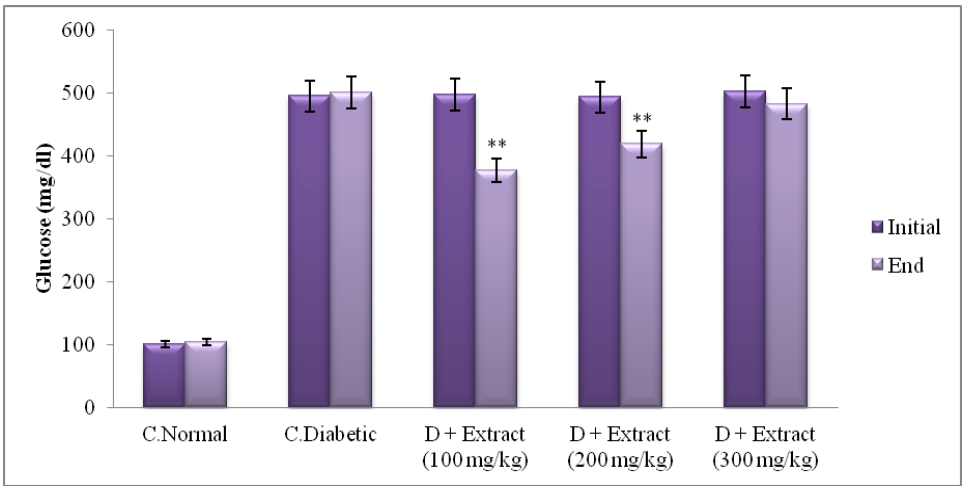

Fig 1: Comparing the FBS levels of serum in the experimental groups at the beginning and at the end of the experiment. C.Normal: Control Normal; C.Diabetic: Control Diabetic; D+Extract: Diabetic+Extract. Means ± SD for every group (n=5). (**: P<0.01)**.**

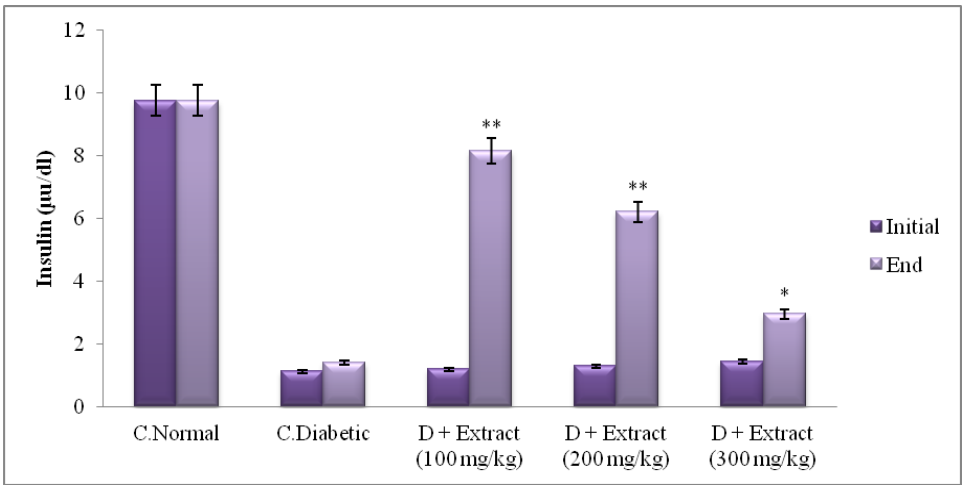

Fig 2: Comparing the Insulin levels of serum in the experimental groups at the beginning and at the end of the experiment. C.Normal: Control Normal; C.Diabetic: Control Diabetic; D+Extract: Diabetic+Extract. Means ± SD for every group (n=5). (*:P<0.05; **: P<0.01)**.**

DISCUSSION:

The results of our study indicated that saffron petals hydroalcoholic extract firstly reduces and then increases the high fasting blood sugar levels in an effective manner in the diabetes-induced rats. The hypoglycemic effects of medicinal herbs have also been previously reported [17]. Saffron and its constituents, like safranal and crocin, possess free radical regulation activities [18].

Mahesh et al in a study investigated the effect of hypoglycemic effect of oral quercetin on oxidative stress in diabetic rats and concluded that the quercetin might have exerted such an effect due to its antioxidant ingredients that are served to neutralize the free radicals produced by streptozotocin and such an activity enables pancreas protection against oxidative stresses and such an oxidative stress when lifted from pancreas can provide for the multiplication of beta cells that have been decreased in number by the effect of streptozotocin so that they can secrete more insulin [19].

In 2007, a study was conducted on rats by Xi et al who investigated the effect of crocetin on these animals fed on a dietary regime rich in fructose. Their results are suggestive of the idea that the rats treated with crocetin showed lower insulin levels [20]. Also, in another similar study carried out on rats, it was indicated that serum insulin levels are significantly reduced after six weeks of treatment with dexamethasone or dexamethasone plus crocetin [21]. Moreover, in the other studies undertaken in this regard, it was figured out that crocetin and crocin mitigate the effects of such diseases as hypercholesterolemia, hypertension, insulin resistance, hyperlipidemia, hyperinsulinemia and hypertryglyceridemia [20-23]. But, the crocetin used in the majority of these studies had been obtained from sources other than saffron petals [20, 22-24].

It seems that lower dosages possess more reductive effects in such a manner that, according to the results obtained herein, 100 mg/kg dosage of saffron petal hydroalcoholic extract demonstrated far greater effects on FBS reduction and serum insulin levels as compared to higher dosages (200 and 300 mg/kg).

CONCLUSION:

Saffron petals hydroalcoholic extract was evidenced reducing the FBS and elevating the lower levels of insulin possibly for the existence of carotenoids and phenols in its constituents that are known to prevent the free radical chains from starting reactions. It is suggested that further research, within the format of molecular and empirical examinations, should be conducted on saffron petals' ingredients so as to precisely determine their mechanism of action and their effective dosages.

REFERENCES:

1. Sarah SB, Griffitis H. Dietary antioxidant interventions in type 2 diabetes patients: a metaanalysis. Br J Diabetes Vascular Dis. 2011; 11:62-8.
2. Shane-McWhorter L. Botanical dietary supplements and the treatment of diabetes: what is the evidence? Current Diabetes Rep. 2005; 5:391-8.
3. Chen C, Zhang H, Broitman SL, Reiche M, Farrell I, Cooperman BS, Goldman YE. Dynamics of translation by single ribosomes through mRNA

secondary structures. Nat Struct Mol Biol. 2013; 20:582-88.
4. Seshasai SR, Kaptoge S, Thompson A, Di Angelantonio E, Gao P, Sarwar N, Whincup PH, Mukamal KJ, Gillum RF, Holme I, Njølstad I, Fletcher A, Nilsson P, Lewington S, Collins R, Gudnason V, Thompson SG, Sattar N, Selvin E, Hu FB, Danesh J; Emerging Risk Factors Collaboration. Diabetes mellitus, fasting glucose, and risk of cause-specific death. N Engl J Med. 2011; 364:829-41.
5. Nabipour I, Vahdat K, Jafari SM, Beigi S, Assadi M, Azizi F, et al. elevated high sensivity C reactive protein in associated with type II diabetes mellitus: The Persian gulf healthy heart study. Endocr J 2008;55(4):717-22.
6. European Diabetes Policy Group. A desktop guide to type 2 diabetes mellitus. Diabet Med. 1999; 16: 716-30.
7. Campbell DB, Lavielle R, Nathan C. The mode of action and clinical pharmacology of gliclazide: a review. Diabetes Res Clin Pract. 1991; 14:S21-S36.
8. Stein SA, Lamos EM, Davis SN. A review of the efficacy and safety of oral antidiabetic drugs. Expert Opin Drug Saf. 2013; 12:153-75.
9. Zargari A. Medicinal Plants. Tehran: Tehran University Publications; 1997.
10. Farkhondeh T, Samarghandian S. The effect of saffron (Crocus sativus L.) and its ingredients on the management of diabetes mellitus and dislipidemia. Afr J Pharm Pharmacol. 2014; 8:541-49.
11. Azami L, Babapour A, Garechahi M. Antimicrobial Effect of aqueous extract of saffron petals on some of food-borne bacterial pathogen. J Food Hyg. 2012; 2:63-73.
12. Khajuria DK, Asad M, Asdaq SMB, Kumar P. The potency of Crocus sativus L. (Saffron) and its constituent's crocin as an immonomodulator in animals. Latin Am J Pharm. 2010; 29, 713-18.
13. Hosseinzadeh H, Karimi G, Niapoor M. Antidepressant effect of (Crocus sativus L.) Stigma extracts and their constituents, crocin and safranal, in Mice. J Med Plant. 2004; 3:48-58.
14. Hosseinzadeh H, Noraei N. Anxiolytic and Hypnotic Effect of (*Crocus sativus* L.) aqueous extract and its constituents, crocin and saftanal, in mice. Phytother Res. 2009; 26:768-74.
15. Imenshahidi, M., Hosseinzadeh, H., and Javadpour Y. Hypotensive Effect of Aqueous Saffron Extract (Crocus sativus L.) and its Constituents, Safranal and Crocin, in Normotensive and Hypertensive Rats. Phytother Res. 2010; 24:990-94.
16. Hosseinzadeh H, Younesi MH. Antinociceptive and anti-inflammatory effects of *Crocus sativus* L. stigma and petal extracts in mice. BMC Pharmacol. 2002; 2:7.
17. Meliani N, Dib MEA, Allali H, Tabti B. Hypoglycaemic effect of Berberis vulgaris L. in normal and streptozotocin-induced diabetic rats. Asian Pac J Trop Biomed. 2011; 1:468-71.
18. Bhargava V. Medicinal uses and pharmacological properties of Crocus sativus Linn (Saffron). Int J Pharm Pharmaceut Sci. 2011; 3:22-26.
19. Mahesh T, Menon VP, Quercetin Allievates Oxidative Stress inStreptozotocin-induced Diabetic Rats. Phytother Res. 2004 ; 18:123-27.
20. Xi L, Qian Z, Xu G, Zheng S, Sun S, Wen N, Sheng L, Shi Y, Zhang Y. Beneficial impact of crocetin, a carotenoid from saffron, on insulin sensitivity in fructose-fed rats. J nutr biochem. 2007; 18:64-72.
21. Xi L, Qian Z, Shen X, Wen N, Zhang Y. Crocetin prevents dexamethasoneinduced insulin resistance in rats. Planta med. 2005; 71:917-22.
22. Zheng S, Qian Z, Tang F, Sheng L. Suppression of vascular cell adhesion molecule-1 expression by crocetin contributes to attenuation of atherosclerosis in hypercholesterolemic rabbits. Biochem pharmacol. 2005; 70:1192-199.
23. Sheng L, Qian Z, Zheng S, Xi L. Mechanism of hypolipidemic effect of crocin in rats: crocin inhibits pancreatic lipase. Europ j Pharmacol. 2006; 543:116-22.
24. Nair SC, Kurumboor S, Hasegawa J. Saffron chemoprevention in biology and medicine: a review. Cancer Biother. 1995;10:257-64.