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Research Article

INVESTIGATION THE ANTI-HYPERLIPIDEMIC EFFECTS OF SAFFRON PETALS' OF HYDROALCOHOLIC EXTRACT IN RATS

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Abstract:

The use of medicinal herbs has been customary in traditional medicine since very long ago and according to the intolerances exhibited by some of the patients for chemical drugs due to the emergence of side effects, the medicinal herbs can be utilized as alternative treatments through adhering to evidence-based medical principles. The current research paper investigates the effects of saffron petal hydroalcoholic extract on the lipid profiles.

Thirty Wistar rats were assigned to six groups: a control group and a sham group that received ordinary dietary regime and high cholesterol (2%) dietary regime, respectively, and experimental groups one to four that, besides the high cholesterol dietary regime, were also, correspondingly, treated by 50, 100 and 200 mg/kg of their body weights saffron petal hydroalcoholic extract per day and 10 mg/kg of the body weight lovastatin per day. Blood samples were collected of the animals after eight weeks to determine their serum lipid profiles. SPSS (version16) was employed to perform the analysis.

The serum levels of cholesterol, triglyceride and LDL-C were found significantly increased in sham group and experimental group three (high cholesterol dietary regime plus 200 mg/kg of the extract) in contrast to the control group ($P < 0.001$). The significance level was found lower in experimental group 1 (high cholesterol regime plus 50 mg/kg of the extract) ($P < 0.05$, $P < 0.001$ and $P < 0.05$, respectively). The serum levels of these three factors and HDL-c were not found significantly different in experimental groups two and four in comparison to the control group.

The results are indicative of the favorable effects of saffron petal hydroalcoholic extract, especially in lower dosages, on the regulation and correction of the serum lipid profile.

Keywords: Saffron, Anti-hyperlipidemic, Medical plants, Lipid profile, Rat

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INTRODUCTION:

The majority of the countries are struggling hard to cope with cardiovascular diseases as the major cause of mortalities and the correction and regulation of lipid profile, as the most important factor giving rise to cardiovascular diseases, causes considerable decrease in such diseases [1].

Besides their harmful economical outcomes, the cardiovascular diseases intensively influence the society's health and they are unfortunately enjoying a high prevalence in Iran, as well [2-4].

The use of drugs decreasing the blood fat is envisioned as a common method of preventing the development of cardiovascular diseases [5]. The results of the studies have shown that the use of statins brings about reductions in serum levels of LDL, coronary artery diseases as well as patients' mortalities [5, 6]. These drugs for their high tolerance and ease of prescription are most frequently applied in treating hyperlipidemia and reduce cholesterol production through regulating the activities of HMG-CoA enzyme in liver. Simvastatin, Pravastatin, Fluvastatin and Lovastatin are inter alia the family of the drugs prescribed for fat reduction. Although these drugs exert their primary influence through decreasing cholesterol, they are all capable of lowering triglyceride levels to some extent [7, 8].

Although the general health records are suggestive of the usefulness of the statins [9], this set of drugs are usually found with abundant side effects such as myopathy, rhabdomyolysis, liver enzymes reductions, nausea, dizziness and digestive problems [10-12].

The use of the medicinal herbs, both directly and as supplementary treatment, aiming at the curing or prevention of blood fat increase and cardiovascular diseases has long been exercised in the traditional medicine [13].

Saffron plant, scientifically named *Crocus Sativus L.*, belongs to the family Iridaceae and it is a perennial herbaceous plant having no stem grown in Spain, France, Greece and widely in the central and eastern Iran [14].

The antioxidant [15], anti-inflammatory [16], anti-depression [17&18] and hypertension regulation [19] effects of the saffron petal extract has been investigated in various studies. Saffron petal contains strong antioxidants, flavonoids, carried in the blood serum attached to albumin and concomitantly exerts mutual influences with this protein. On the other hand, the different effects of flavonoids in reducing

the cholesterol and their antiradical characteristics have been proved frequently [20, 21].

A large volume of saffron petal is discarded as waste materials every year, while there are various evidences signifying the existence of ingredients featuring different pharmacological effects in these thrown-away saffron petals. Therefore, the present study deals with the investigation of saffron petal hydroalcoholic extract effects on the lipid profiles of the hypercholesterolemic rats.

MATERIALS AND METHODS:

Fresh saffron petals were collected from the farms at the periphery of Boshrouyeh city. The saffron plants were verified by the Herbarium of Lorestan University and then dried in shade.

The milled and dried saffron petals were admixed with hydroalcoholic solvent comprised of water and ethanol (20:80, respectively). Three days later, the solution was filtered and was placed on a rotary device for condensation. The hydroalcoholic extract, after being dried, was kept in 4°C to be used for further research.

Male Wistar rats were purchased from Razi Serum Institute and they were kept in laboratory animals fostering room in physiology department of Ilam's Medical Sciences University. The animals were maintained in 22±2°C and 12 h light/dark cycle and a relative humidity of 60%±5% and then they were randomly assigned to six groups after getting accustomed to the environment:

A control and a Sham group that were fed on a saline-normal, respectively, normal and high cholesterol (2%) dietary regime; Experimental groups 1 to 4 that, respectively, received 50 mg/kg, 100 mg/kg and 200 mg/kg body weight per day saffron petal hydroalcoholic extract and 10 mg/kg body weight per day lovastatin plus being fed on a high cholesterol, 2%, dietary regime. After eight weeks, blood samples were collected of the animals for determining the serum lipid profiles and the diagnostic kits obtained from Pars Azmoon Iran Company were utilized to determine the serum concentrations of HDL-C, TG and total cholesterol. The serum level of LDL-c was also calculated via taking advantage of the following formula [22].

$$\text{LDL-Cholesterol} = \text{Total Cholesterol} - \text{HDL-Cholesterol} - (\text{Triglycerides} \div 5)$$

SPSS software (version 16) and one-way variance analysis (ANOVA) was used to analyze the data. The data were computed statistically and presented in

Means \pm SD for every group (n=5). The significance level was set at $P < 0.05$.

RESULTS:

The results indicated that the serum level of HDL-c has undergone a significant decrease in the sham group, fed on a high cholesterol dietary regime, and experimental groups 1 and 3 that had been respectively administered a high-cholesterol dietary regime plus 50 mg/kg and 200 mg/kg saffron petal

hydroalcoholic extract body weight per day as compared to the control group ($P < 0.001$, $P < 0.01$ and $P < 0.001$, respectively). The serum rate of the factor was not found indicative of a significant difference in the experimental group 2, fed on a high cholesterol dietary regime plus 100 mg/kg body weight per day of the extract, and the group that had been treated with lovastatin (exp. group 4) with the control group (Figure 1).

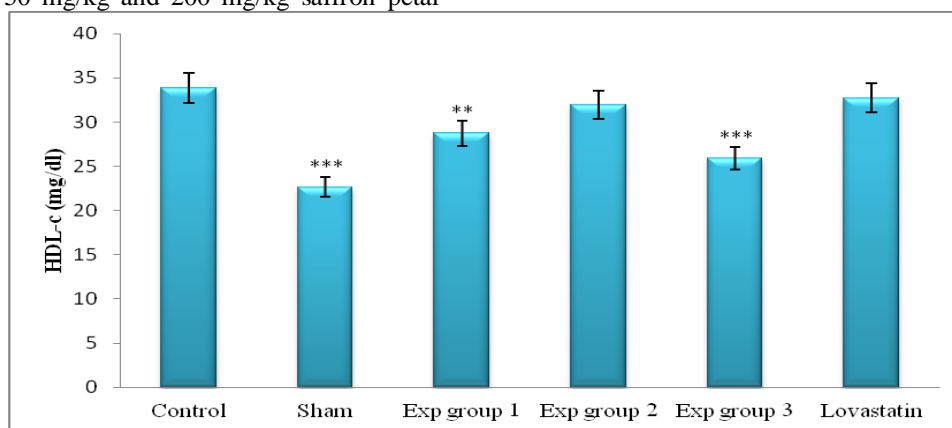


Fig 1: Effect of Saffron hydroalcoholic extracts on the serum HDL-c Concentration in various groups vs. control group. The significance level was set at $P < 0.05$. Means \pm SD for every group (n=5). (**: $P < 0.01$; ***: $P < 0.001$)

Regarding the serum levels of cholesterol, triglyceride and LDL-c, there was found a significant increase in sham group, fed on a high cholesterol, 2%, dietary regime, and the experimental group 3 that had been given 200 mg/kg body weight per day of the saffron petal hydroalcoholic extract plus a high cholesterol, 2%, dietary regime in comparison to the control group ($P < 0.001$). Experimental group 1, fed on a high cholesterol dietary regime plus 50 mg/kg body weight per day of the extract demonstrated a significant increase in the serum levels of cholesterol,

triglyceride and LDL-c in contrast to control group but its significance level was different from the other aforesaid two groups ($P < 0.05$, $P < 0.001$ and $P < 0.05$, respectively). There was not found any significant difference in terms of the three abovementioned factors between the experimental group 2 and 4, fed on a high-cholesterol dietary regime plus 100 mg/kg body weight per day of saffron petal hydroalcoholic extract and 10 mg/kg body weight per day of lovastatin, respectively, as compared to the control group (Figure 2-4).

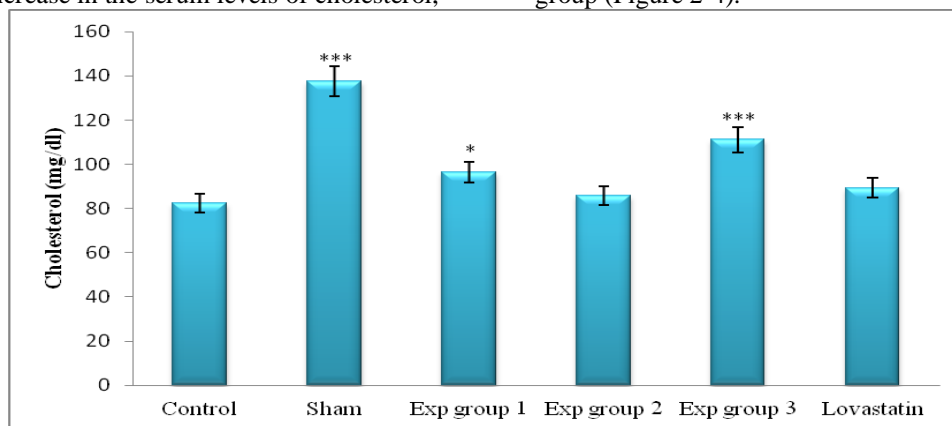


Fig 2: Effect of Saffron hydroalcoholic extracts on the serum cholesterol Concentration in various groups vs. control group. The significance level was set at $P < 0.05$. Means \pm SD for every group (n=5). (*: $P < 0.05$; ***: $P < 0.001$).

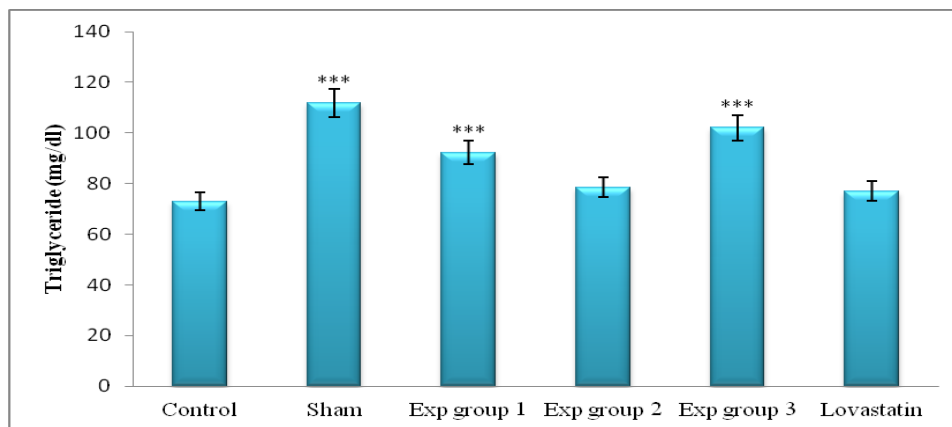


Fig 3: Effect of Saffron hydroalcoholic extracts on the serum triglyceride Concentration in various groups vs. control group. The significance level was set at $P < 0.05$. Means \pm SD for every group ($n=5$). (***: $P < 0.001$).

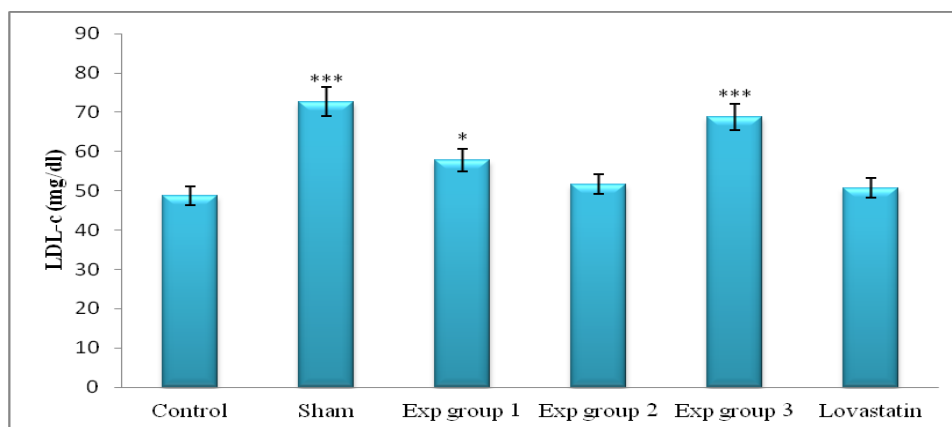


Fig 4: Effect of Saffron hydroalcoholic extracts on the serum LDL-c Concentration in various groups vs. control group. The significance level was set at $P < 0.05$. Means \pm SD for every group ($n=5$). (*: $P < 0.05$; ***: $P < 0.001$).

DISCUSSION:

The results of the present study indicated that the saffron petal like saffron itself (stigma) possesses anti-hyperlipidemic effects in such a manner that it caused significant reduction in serum levels of the three factors, i.e. cholesterol, triglyceride and LDL-c, in hypercholesterolemic rats. Moreover, the serum level of the good blood cholesterol, to wit HDL-c, was also found significantly increased.

In 2005, Xi et al dealt with the investigation of inducing insulin resistance in rats. They treated the animals with dexamethasone or dexamethasone plus crocetin for six weeks and observed a significant decrease in serum insulin, free fatty acids, TG and TNF- α levels [23]. Also, in another similar study, the effect of crocetin on the outcomes of a dietary regime full of fructose was studied in rats. The group that had been treated with crocetin exhibited lower hypertension, epididymal fat tissue, TG, free fatty

acids, LDL and insulin [24]. This is consistent with what was found out herein.

It seems that higher dosages of saffron petal extract exerts influences far lower than the intermediate dosages in such a manner that 200 mg/kg dosage of the extract was found having not much of an effect on the correction of lipid profiles in the rats that had been given high cholesterol regime in the current research paper. Instead, 100 mg/kg had a well balancing effect on the lipid profile of the rats.

Crocetin and crocin were also reported to have alleviated atherosclerosis and the other relevant diseases like hypercholesterolemia, hypertension, insulin resistance, hyperlipidemia, Hyperinsulinemia and hypertriglyceridemia [23-27] in other researches. But, these studies have been carried out based on the use of crocetin from resources other than saffron [23, 25, 27, 28].

In the studies performed on the people from Mediterranean countries, the results are reflective of the idea that the cardiovascular diseases are less prevalent in them due to their daily uses of saffron (in the form of additives for flavoring and coloring the foods, especially in cooking rice) [29-30].

CONCLUSION:

According to the antioxidant and bad cholesterol (LDL-c)-reduction effects as well as for the elevation of good cholesterol (HDL-c) characteristics documented for saffron, this effective material can be, in lieu of being discarded, used through proper planning for undertaking further scientific researches in line with the enhancement of body health, particularly the heart and the veins.

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