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RESEARCH ARTICLE

The Effect of Hydro-Alcoholic Extract of *Morus nigra* leaf on Lipids and Sugar in Serum of Diabetic Rats

Barati S[1*], Momtaze H[2], Azhdary mamoreh M[3]

[1]- Department of Bacteriology, Faculty of Veternary Medicine, Shahrekord University, Shahrekord- Iran.

[2]- Department of Microbiology, Faculty of Veternary Medicine, Azad University of Shahrekord, Shahrekord- Iran.

[3]- Faculty of Veternary Medicine, Azad University of Shahrekord, Shahrekord- Iran.

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ABSTRACT

Morus nigra (mulberries) are all widespread in Pakistan, Iran, India, and Afghanistan, where the tree and the fruit are known by the Persian-derived names king's or "superior" mulberry. Herbs are rich sources of natural antioxidants, which are used to cure many diseases in traditional medicine. The researches have shown that some herbal extracts have anti-diabetic effect, so they can be used to lower blood sugar in people with diabetes. 27 male adult rats were randomly selected and divided into three groups as nondiabetic control; diabetic control; diabetic rats treated with hydroalcoholic extract of *Morus nigra* leaf. In diabetic groups, alloxan monohydrate (100 mg/kg) was injected intraperitoneally to develop diabetes. Then the Test group received intraperitoneal injection of hydro-alcoholic extract of *Morus nigra* leaf (100 mg/kg). At last, glucose, cholesterol, triglyceride and HDL contents of the rats' serum sample were determined. The findings show that using hydro-alcoholic extract of *Morus nigra* leaf decreased glucose, cholesterol and triglyceride contents of diabetic rats' blood serum ($p<0.01$) and increased HDL content ($p>0.05$). Considering these findings, it is found that *Morus nigra* leaf can be effective in decreasing blood sugar and fat in diabetic people.

Key words: *Morus nigra*, diabetes, lipid, blood sugar.

1. INTRODUCTION

The blackberry *(Morus nigra, Rubus fruticosus)* is the fruit of the blackberry bush. There is an important consumption of this fruit in Spain as well as in other countries of the world. It is native to southwestern Asia, where it has been cultivated for so long that its precise natural range is unknown. Diabetes is the most common endocrine disease being characterized with increased blood sugar (hyperglycemia) and disorders in metabolizing carbohydrates, proteins, and Lipid. This disease is caused by either disorder in insulin secretion or insulin function. During the disease process, all body systems and organs are involved (1). Due to unpleasant effects of sugar-lowering chemical drugs and their high cost, it seems necessary to find compounds which can lower blood sugar with minimum by effects-sides. It is necessary to pay attention to this disease (2, 3). Many researches in recent years have shown that some herbal compounds have an anti-diabetic effect so can be used in diabetic people to lower blood sugar. As an example, hypoglycemic effect of alcoholic extract of dandelion leaf has been proved by many researches(4). Since using herbs has been common and different diseases have been cured one or more herbs or herbal extracts of yore and due to the miraculous role of these herbs in curing diseases, their usage is ever-increasing. Therefore, the present research is aimed to reach a compound that can affect on diabetes with minimum unpleasant by-effects and that can be used in the diabetics to lower blood sugar. *Morus nigra* is a deciduous tree growing to about 10–13 metres (35–45 ft) tall. The leaves are about 10-20 centimetres (4–8 in) long and 6-10 centimetres (2½-4 in) broad (up to 23 centimetres long on vigorous shoots), downy on the underside, with the upper surface rough with very short, stiff hairs. In this study, we have examined the role of

*Corresponding author: Barati S| Department of Bacteriology, Faculty of Veternary Medicine, Shahrekord University, Shahrekord- Iran | Email: sarabarati52@yahoo.com

alcoholic extract of *Morus nigra* leaf on glucose serum and lipid profile of healthy animals and animals with diabetes caused by alloxan monohydrate (5).

2. METHODS AND MATERIALS

Following identification and for extraction, *Morus nigra* leaves were dried in shade and then were powdered. 120 g of resulted powder was placed into a one-liter erlen and 96% ethylic alcohol was added such that covered the powder surface. The solution was filtered after 24 hours. In the next stage, 75% alcohol was added to dross and the resulted solution was filtered after 24 hours. The filtered solutions were mixed and then were concentrated with a distilling machine in vacuum at 55°C and 70rpm into one third of initial volume. In order to separate protein, lipid, and chlorophyll, the concentrated solution were decanted with 60ml chloroform for three times. The resulted solution from the last phase was dried in autoclave in 37°C and sterile conditions. In this manner, the extract dried powder was prepared after a 3 days and dried powder was stored at 4°C (6).

Rats were randomly divided into three groups of 9 members: diabetic group (injection of 100 mg/kg alloxan monohydrate into the peritoneum for three alternative days), and diabetic group receiving the extract (being affected by diabetes like the second group and then injecting 100 mg/kg *Morus nigra* leaf hydro-alcoholic extract into peritoneum for six alternative days). The control group (injection of physiological serum into the peritoneum). two days after the last injection, the bleeding was performed from all groups and the resulted serum was used to determine blood glucose, triglyceride, cholesterol and HDL with enzyme kits (from Zist-Shimi, Iran). During the survey, storage, injection of materials, bleeding, and perishing animals were performed according to standard methods of working with laboratorial animals. In statistical survey ANOVA and Tukey test were used to compare average of each variable in test groups. Statistical analysis of findings was done with SPSS software and $p<0.05$ was treated meaningful.

3. RESULTS

Comparison of serum glucose concentration results showed the average serum glucose content in both control and diabetic groups were 122.3±10 mg/dl and 525.6±43 mg/dl respectively, and in extract treated diabetic group it was 342.0±31 mg/dl. The mean difference among the three groups was meaningful ($p<0.01$) (Table 1). Also the average serum cholesterol content in both control and diabetic groups were 71±10 mg/dl and 111.8±6.5 mg/dl respectively, and in extract-treated diabetic group it was 75.2±7 mg/dl. The mean difference of cholesterol in extract-treated diabetic group is meaningful comparing to diabetic group ($p<0.01$) but it has no meaningful difference comparing to control group (Table.1).

Group* variable	Receiving the extract	Non-diabetic control	diabetic control
Glucose	342.0±31 **	122.3±10	525.6±43
Triglyceride	92.4±14**	83.4±13	182.4±20
Cholesterol	75.2±7 **	71±10	111.8±6.5
HDL	39.1±2.3 ***	38.3±2.2	22.5±4.1

*the number of rats in each group is 9.

** $p<0.01$ comparing to control group for associated variable

*** $p<0.05$ comparing to diabetic control group for associated variable

Table.1: measured values of blood sugar, cholesterol, triglyceride, and HDL (mg/dl) in studied groups (mean ± standard deviation)

The average triglyceride content in both control and diabetic groups were 83.4±13 mg/dl and 182.4±20 mg/dl respectively, and in extract-treated diabetic group it was 92.4±14 mg/dl. The mean difference of triglyceride in extract-treated diabetic group is meaningful comparing to diabetic group ($p<0.01$), but it has no meaningful difference comparing to control group (Table.1) and average serum HDL content in both control and diabetic groups were 38.3±2.2 mg/dl and 22.5±4.1 mg/dl respectively, and in extract-treated diabetic group it was 39.1±2.3 mg/dl. The mean difference of HDL in extract-treated diabetic group is meaningful comparing to diabetic group ($p<0.05$) but it has no meaningful difference comparing to control group (Table.1).

4. DISCUSSION

In this study, increased serum glucose which was done with destroying islets of Langerhans β-cells and with monohydrate alloxan.(7) One of hydro-alcoholic extract effects of Morus nigra leaf is controlling α-amylase and α-glycosidase and by this way it lowers the blood sugar content. This activity is associated to existing antioxidant compounds such as flavonoids, ellagic *acid*, and antocianine in mentioned extract (8). By increasing blood sugar content in diabetic rats following injecting alloxan, triglyceride content also increased and shows insulin contribution in adjusting lipids metabolism.

In addition to its effect on hypoglycemic, extract of Morus nigra leaf effects on lipid metabolism, function of capillaries and typically controls blood pressure, recovery of body antioxidant system and blood sugar (9).

Decrease in triglyceride content by hydro-alcoholic extract of Morus nigra leaf can be explained by improved glycemic control and decreased blood glucose by the extract, glucose consumption instead of lipids to produce energy would increase and A-coenzyme acetyl from pyruvic *acid* enters into krebs cycle rather than synthetic

phase of triglycerides and then cause final metabolizing of glucose.

With rats being affected with diabetes, HDL content would decrease that confirms the results from Abou-Seif, Winocour (10, 11)

HDL concentration has a negative relation with triglyceride, and considering this fact that Morus nigra leaf could decrease triglyceride content. So, one can expect that HDL will increase by decreased triglyceride. In the meanwhile, by improved metabolic path of glucose, proteins' metabolism would adopt anabolic paths instead of inclining toward catabolic effects; thereby, synthesis of such proteins as APO-A1, which consists about 70% of HDL structure, will increase that in turn would result in increased HDL concentration in rats.(12, 13)

5. CONCLUSION

This study implies that treating with hydro-alcoholic extract of Morus nigra leaf has blood glucose and lipid decreasing effects in rats affected with diabetes by monohydrate alloxan.

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Conflict of Interest: None Declared

