

The Effect of Aqueous Extract of White Tea on Glucose and Lipid Profile in Diabetic Rats

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Abstract

Introduction: Diabetes is a metabolic disorder characterized by hyperglycemia and defects in insulin secretion, resistance to insulin action or both is created. Research has shown that aqueous extracts of white tea has antioxidant properties, but few studies have been conducted on the effects of diabetic and hyperlipidemic. The aim of this study was to evaluate the effect of aqueous extract of white tea on lipid profile and blood glucose in diabetic rats with streptozotocin. **Materials and Methods:** In this study, 32 male Wistar rats were randomly divided into 4 groups of 8 animals were: first group: Use of the standard diet and the control rats daily by gavage cc distilled water. Second group: Streptozotocin-induced diabetic rats. Group Third: Normal water extract of white tea (5.1 percent) consumed. Group Four: Diabetic rats that aqueous extracts of white tea (5.1 percent) consumed. After the Timurid period (30 days) to determine blood glucose levels and lipid profile was performed and the data were analyzed with SPSS software ($P < 0.05$). **Results:** The results showed that aqueous extracts of white tea could serum levels of glucose, triglycerides, cholesterol, LDL and HDL cholesterol levels significantly increased ($P < 0.05$). **Conclusion:** Considering the results, it appears that aqueous extracts of white tea can be used on diabetic hyperglycemia and hyperlipidemia.

Key words: Diabetes, catechin, white tea, lipid profile

Introduction

Diabetes, chronic metabolic disease, primary or acquired due to lack of insulin secretion or decreased response to insulin from the pancreas organs occur. As a result of the lack or deficiency, elevated blood glucose levels that damage to many body systems, including vessels, nerves knocks. Diabetes is one of the biggest health problem in all countries, so that the World Health Organization has named it as a silent epidemic. Now more than 230 million people with diabetes worldwide, and it is predicted that this number will increase to 300 million by 2025. The share of developing countries (Vosoughi Karkazlu et al., 2011). In Iran, the head of non-communicable diseases is diabetes and it is estimated that 5.2% of people are affected by diabetes is the sixth leading cause of death in the world, Ido caused four million deaths annually in the world is. (Vosoughi Karkazlu et al., 2011)

Since the use of medicinal plants has long been popular in the treatment of various diseases from one or more plant or vegetable extracts and miraculous role in the treatment of diseases characterized some of these plants, application of the treatment plants, continue to rise. Numerous studies in recent years have shown that some herbal compounds have anti-diabetic effects and therefore can in order to lower blood sugar in people with diabetes, are used. For example, according to a study conducted by S. Asgari et al. 87 on the effect of ethanol extracts of dried leaves of the walnut (*Juglans regia*) in the prevention of type 1 diabetes in adult male rats were performed and showed that the alcoholic extract of the dried leaves of walnut may be effective in the treatment and prevention of diabetes. The effect of this extract could be due to the presence of flavonoids and their antioxidant properties. The results showed a significant reduction in blood glucose and LDL in the group treated with alcoholic extract of walnut leaves were dried p value (of less than 5%). In addition, the treated groups, compared to diabetic group had significantly higher insulin levels p value(of less than 5%). Histological examination showed that the extract prevents the destruction of pancreatic tissue in diabetic rats (Asgari et al., 2008). Mineral Hussein and his colleagues also study in 1384 on Shvyddr extract glucose and lipids in diabetic rats showed that the extract is not effective in lowering blood sugar as

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well as antioxidant compounds not found in the restored and reconstruction of damaged beta cells have a key role. The results showed that not extract a significant effect on reducing blood sugar and total cholesterol, triglycerides, vLDL, LDL and HDL increase compared with diabetes (Madani et al., 2005). Manny Feizi and colleagues in a study in 1393 on the effect of cinnamon on glucose control and lipid profile in patients with type II diabetes show. Cinnamon oral supplementation alone reduces the indices of glucose and lipid control in patients with type II diabetes, then use it to set the weight of the patients in the conventional therapy is recommended. In this study, a significant decrease in BMI was observed in the group taking the cinnamon compared to placebo ($P = 0/01$), but this difference was not significant in other variables. In addition, in patients receiving cinnamon mean HbA1c, BS2hpp, FBG, insulin, HOMA and BMI score significantly higher than before the intervention p value) of less than 5%) (Mirfeizi et al., 2014). White tea comes from the plant *Camellia sinensis* achieved, but leaves before it is fully open, picked and arranged. White tea is the most expensive place in the world where the buds have blossomed and achieved hairy tea extract is a miracle of technology and because of catechins in reducing cholesterol and blood triglycerides and increase good cholesterol (HDL-C) is effective, So it can be useful for the prevention of cardiovascular disease as well as white tea caffeine is low and this important benefit. The aim of this study was to determine the effect of black tea on blood glucose and lipids in diabetic rats by them (Mozaffarian, 1996). Among them will be to a study by the America Diabetes Association in 2012, the white tea extract has been using previous studies, noted. In this study, the antioxidant activity of enzymes including superoxide dismutase (SOD), glutathione peroxidase (GSH-px), and catalase (CAT) were studied in diabetic mice, and showed a significant decrease in serum liver SOD, GSH-Px and CAT activity in the control group of diabetic mice compared with nondiabetic control group was observed And yet, a significant increase in SOD, GSH-Px activity and CAT (serum and liver) in diabetic patients treated with bleaching was observed (Banshidhar and Deepmala, 2013). It is also possible to study Silva and his colleagues in 2014, on the health effects of white tea was beneficial antioxidant properties and they were noted. White tea catechins in particular due to the presence of phenolic compounds with high antioxidant properties that for some human diseases including cardiovascular disease, diabetes, neurological disorders and certain types of cancer are effective (Oliveira et al., 2013). David Kapral Thomas and his colleagues in 2013, white tea antioxidant effect in the testes of mice with type II diabetes were studied in order to avoid preserve sperm quality. For this purpose, a month-old mice with type II diabetes resulting from streptomycin injections were used, inspected. In this study it was shown that black tea consumption improves glucose tolerance and insulin sensitivity in rats with type II diabetes, as well as protein oxidation and lipid peroxidation in this study surfaces and its value in the control mice was And showed testicular antioxidant potential of black tea consumption in rats with type II diabetes has increased, while decreased testicular oxidative stress (Tomás, 2013). One of the approaches to the treatment and control of diabetes, hypoglycaemia after a meal is reduced. This delay in digestion and absorption of glucose by inhibiting the digestion of carbohydrates like amylase inhibitors and alpha glucosidase enzymes is possible. There are many studies on inhibitors of medicinal plants and their effect on lipid and glucose were detected (Banshidhar and Deepmala, 2013). White tea is rich in antioxidants and helps to increase the body's metabolism through the inhibition of pancreatic lipase activity in fat loss and weight loss is also effective (Nouri et al., 2012). White tea can help other properties of therapeutic effects in patients with rheumatoid arthritis, hypertension, asthma and liver disease as well as its effects in preventing blood clots and strokes pointed out (Nouri et al., 2012).

Regular intake of black tea along with proper diet and disease prevention, can increase blood sugar and prevent complications of diabetes (Hosseinzadegan et al., 2010).

Given that few studies on the role of white tea in the prevention and treatment of diseases. The aim of this study was to study the effect of white tea in lowering blood sugar and lipid in diabetic rats, respectively. The present study aimed to investigate the effect of white tea infusion of glucose, lipid streptozotocin-induced diabetic rats was performed.

Materials and Methods:

In this study, 32 adult male rats weighing 100-200 g in the range of Urmia University School of Veterinary Medicine and has been prepared in four groups of eight who were randomly selected, the cages were kept separately. The rats in a cage right under standard conditions (temperature 2 ± 25 degrees and cycles of light and dark natural animal house Research Center for Agriculture and Natural Resources in Western Azerbaijan) were kept to feed and water the standard plate and corn had access to non-diabetic group control , non-diabetic rats treated with brewed white tea, diabetes and diabetic rats treated with white tea were brewed. White tea is brewed rats received by gavage. The rats in an animal house at 2 ± 25 ° C and humidity $5 \pm 60\%$ and photoperiod of 12 hours light and 12 hours of darkness were kept free of food and water for the rats were placed at their disposal.

Streptozotocin

By injection of streptozotocin-diabetic rats were intraperitoneal injection of streptozotocin to induce diabetes (Streptozotocin) at a dose of 50 mg per kg of body weight carrier with normal saline that is used as single dose. In this way, 48 hours after injection, diabetes was induced in mice. For confirmation, by creating a small wound on the tail by The Lancet, a drop of blood spread on a glucometer strip and glucometer readings result of high blood glucose mg / dl 300, is considered as an indicator of diabetes (Doustar and Mohajeri, 2009).

At the end of the period (30 days), rats were anesthetized by ether to provide blood samples were obtained and then Serum some of it to centrifugation for 15 min at 4 ° C (3000 rpm), respectively.

The relevant test for determining the amount of glucose and lipid profile (cholesterol, triglycerides, LDL, HDL) took place. All trials were conducted to mice with full respect for ethical standards (Doustar and Mohajeri, 2009).

Preparing herbal tea:

White tea quality of the samples were purchased from shops in Orumiye, after being approved by experts of West Azerbaijan Research Center for Agriculture and Natural Resources were extracts.

15 g of distilled white tea in 1 liter of boiling water for 5 minutes was soaked. The solution to make 5/1% were white tea extract filter (Hosseinadegan et al., 2010).

Study groups:

In this study, 32 male Wistar rats were used.

The first group: the control group who use standard diet and a daily ml of distilled water by gavage.

The second group to which streptozotocin-induced diabetic dose was half a percentage point.

The third group of healthy rats aqueous extract of white tea (5.1 percent) once daily by gavage.

Group Four: A diabetic rats (streptozotocin) the aqueous extract of white tea (5.1 percent) by gavage.

Sampling:

At the end of the period (30 days), rats were anesthetized by ether to provide blood samples were obtained and then Serum some of it was centrifuged for 15 min at 4 ° C (3000 rpm), then the corresponding tests to determine glucose and lipid profile were carried out. All trials were conducted to mice with full respect for ethical standards (Doustar and Mohajeri, 2009).

Measure biochemical parameters:

In animal serum cholesterol, triglycerides, LDL, HDL and glucose were measured.

Statistical Analysis

The results of biochemical tests through ANOVA (One-Way ANOVA) and Duncan (Duncan Post Hoc) using SPSS version 18 software was used to analyze the data and indexes such as mean and standard deviation to see the use of independent t-test was used (Eidi et al., 2011).

Table 1- The averages and standard deviation of the cholesterol, triglycerides, LDL, HDL, glucose and weight

Parameters investigated	control group Healthy	Diabetic control group	Two control groups aqueous extract of white tea	White tea extract-treated diabetic group blue	p- value
Serum cholesterol (mg/dl)	61.25±11.74 ^a	68.42±6.97 ^b	35.5±6.39 ^c	48±9.79 ^d	/.5
triglyceride (mg/dl)	67±13.88 ^a	83±18.16 ^b	32.87±15.1 ^c	59±5.35 ^d	/.5
(mg/dl) LDL	12.62±2.82 ^a	18.42±3.77 ^b	9.37±1.68 ^c	12.57±1.27 ^d	/.5
(mg/dl) HDL	28.62±3.81 ^a	22.71±3.35 ^b	44.37±10.9 ^c	28.23±59.23 ^d	/.5
Glucose (mg/dl)	164±39.99 ^a	363.71±48.95 ^b	151.75±29.36 ^c	261±60.7 ^d	/.5
Weight (g)	138.57±9.54 ^a	121.42±9.88 ^b	174.37±15.68 ^c	146.16±7.4 ^d	/.5

The letters represent meaningful descendants between the groups.

Results

Biochemical findings:

Using independent t-test p value) of less than 0.05). The results show that 5.1 percent of white tea brewed consumption lowers blood sugar, triglycerides, cholesterol, LDL and increase HDL and weight in rats that had white tea, compared with the control group and diabetic control.

The amount of cholesterol in the four tested groups show that:

In non-diabetic control group averaged cholesterol checked mg / dl 25 / 61 is. In diabetic group averaged mg / dl 42 / 68, the extract group equal to mg / dl 5 / 35 and in the group of diabetic rats treated with extracts mg / dl 48's.

Compare groups, independent t-test for cholesterol show zero means that the aqueous extract of white tea consumption significantly decreased p value) of less than 5%) in the amount of cholesterol in diabetic rats treated with aqueous extract of white tea the diabetic group had.

The amount of triglyceride in the four tested groups show that:

In non-diabetic control group the average serum triglycerides equal to mg / dl 67 is. In diabetic group averaged mg / dl 83, the extract group equal to mg / dl 87 / 32 and in the group of diabetic rats treated with extracts mg / dl 59's.

Compare groups, independent t-test, which will show zero consumption of aqueous extract of white tea caused a significant decrease p <0.05 triglyceride in the diabetic group compared to the group treated with aqueous extract of white tea is a diabetic.

The effect of aqueous extract of white tea on serum HDL changes show that:

Evaluation of concentration in mg / dl) HDL) levels in four study groups shows that in non-diabetic control group the average serum HDL by mg / dl 62 / 28 is. In diabetic group averaged mg / dl 71 / 22, in the group receiving aqueous extract of white tea is equal to 37 / 44mg / dl and in diabetic rats treated with the extract with 28/23 mg / dl is.

Compare groups, independent t-test, which will show zero consumption of aqueous extract of white tea increases the p value) of less than p <0.05) in the serum HDL in diabetic rats treated with aqueous extract of white tea to diabetic rats Are.

The effect of aqueous extract of white tea indicate that changes in LDL cholesterol into four groups:

In non-diabetic control group mean LDL equal to mg / dl 62/12 is. In diabetic group averaged mg / dl 42 / 18, the extract group equal to mg / dl 37 / 9 and in the group of diabetic rats treated with extracts mg / dl 57 / 12's.

Compare groups, independent t-test showed that the aqueous extract of white tea consumption significantly decreased (p <0.05) in the serum LDL white tea extract-treated diabetic group compared to the diabetic group.

The effect of aqueous extract of white tea on blood glucose levels in four groups show that:

In non-diabetic control group of average blood glucose mg / dl 164 is. In diabetic group averaged mg / dl 71 / 363, the extract group equal to mg / dl 75 / 151 and diabetic rats treated with the extract equal to mg / dl 261 is.

Compare groups, independent t-test showed that the aqueous extract of white tea consumption significantly decreased) P <0.05) in blood glucose levels compared to diabetic group was treated diabetic group.

The effect of aqueous extract of white tea gr weight changes in four groups show that:

In non-diabetic control group of average weight g57 / 138 is. In diabetic group averaged g42 / 121, the extract group at g37 / 174 and diabetic rats treated with the extract of g16 / 146's.

Compare groups, independent t-test zero indicates that the aqueous extract of white tea consumption increased significantly (P <0.05) in the weight of the treated diabetic group compared to the diabetic group.

Discuss:

Diabetes or diabetes is a disorder of metabolism that occurs for different reasons and with different degrees of insulin deficiency or lack of response to insulin. According to this definition, the important role of insulin and significant changes in metabolism caused by deficiency seeking better characterized (Parsian, 1998).

This disease, despite recent improvements, has become less deadly but still the leading cause of blindness and kidney failure. Although there is no way to cure diabetes, but it is possible to control a success.

One of the goals of diabetes, control blood sugar and blood fat. Use a balanced diet with intake of herbs, weight control, and follow a healthy way of life, is of particular importance can be enjoyed (Parsian, 1998; Henzen, 2012).

Glucose lowering effect in a number of plants have been studied in animal models and clinical trials and is approved. Although the use of medicinal plants in the treatment of diseases has a long history but it has yet to be accepted in modern medicine and the use of medicinal plants in the mainstream medical properties distance. Medicinal herbs being rich in natural antioxidant compounds in traditional medicine to treat a variety of diseases control and goes to work. White tea leaf extract is effective for preventing oxidation compounds (Nouri et al., 2012).

Research has shown that white tea catechins in reducing cholesterol and triglyceride levels due to blood and increase good cholesterol (HDL-C) is effective, so it can be useful for the prevention of cardiovascular disease (Nouri et al., 2012; Shahidul Islam, 2011).

Tea catechins in white, pancreatic lipase activity (the enzyme responsible for digesting fat) rat. As a result, break down fat and turn it into absorbable components is considerably lower speed (Shahidul Islam, 2011).

Regular intake of black tea along with proper diet and disease prevention, can increase blood sugar and prevent complications of diabetes (Shahidul Islam, 2011).

One of the possible mechanisms of white tea inhibit the activity of salivary amylase enzymes and intestinal enzymes (enzymes for digestion of starch) is. By inhibiting the activity of this enzyme breaks down starch slowly, resulting in blood sugar rises at a slower rate. White tea is a powerful antioxidant property damage to the beta cells of the pancreas and diabetes can prevent (Nouri et al., 2012; Zolfaghari et al., 2012).

Based on the results of this study, aqueous extracts of white tea remarkable and significant effect in reducing blood glucose and lipid profile showed. The results we reported results from several studies on the effects of aqueous extract of white tea on blood glucose, cholesterol, triglycerides and LDL and increase HDL in diabetic mice gained but few studies regarding the effects of aqueous extract of white tea on glucose blood lipid profile done and most studies and reports on the identification of phenolic compounds and antioxidant activity of free radicals is clear.

Also, Islam and colleagues in 2011, half a percentage point effect of aqueous extract of white tea with (*Camellia sinensis*) in streptozotocin-induced diabetic rats were examined after 4 weeks diabetic mice compared to control mice with diabetes showed that aqueous extracts was high in diabetic mice results in decreased blood glucose concentrations and glucose tolerance in diabetic group compared to the control group were improved. Weight significantly increased liver glycogen and serum total cholesterol and LDL-C in diabetic rats compared to controls was significantly reduced levels of food intake, body weight, insulin and serum fructosamine were differences in the consumption of white tea. Data from this study showed that 5/0% water extracts of white tea to further reduce diabetes abnormalities (Shahidul Islam, 2011).

Silva and his colleagues study in 2014, the beneficial antioxidant properties and health effects was conducted and showed white tea White tea catechins in particular due to the presence of phenolic compounds with high antioxidant properties that for some human diseases including cardiovascular disease, diabetes, neurological disorders and certain types of cancer are effective (Oliveira et al., 2013).

In a study by (ADA America in 2012 on the previous studies have been done using white tea extract, Activity of antioxidant enzymes including superoxide dismutase (SOD), glutathione peroxidase (GSH-px), and catalase (CAT) in diabetic mice was studied, a significant decrease in serum SOD liver, GSH-Px and CAT activity in diabetic mice control compared with diabetic control group was observed, however, a significant increase in SOD, GSH-Px activity and CAT (serum and liver) in diabetic patients treated with the white color was observed (Banshidhar and Deepmala, 2013). In the study Vsula and colleagues in 2012 has been shown that inhibition of glucose transporter-dependent glucose uptake in the intestine with the help of sodium, (SGLT1) can also act as antagonists, (SGLT1) is reduced glucose uptake (Omodesola et al., 2014). White tea catechins consumption among people with type 2 diabetes reduce abdominal

circumference, elevated levels of circulating adiponectin levels and increase insulin sensitivity and blood pressure regulation. As well as having anti-inflammatory and antioxidant significant role in osteoporosis (Natheer, 2011).

Conclusion:

The results of this research can be concluded that white tea herbal tea daily at a dose of 5.1 percent resulted in a significant reduction in LDL, cholesterol, triglycerides, glucose and HDL cholesterol and weight gain in rats diabetes. According to report on the antioxidant white tea is recommended in future studies antioxidant properties of the extracts and antioxidant enzymes in diabetic rats also be measured.

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