**Journal of Pioneering Medical Sciences**
Received January 05, 2024 Accept March 31, 2024 Publish April 29, 2024.
Volume 13, Issue 2, Pages 198-202

*DOI https://doi.org/10.61091/jpms202413230*


# Effects of Aquatic Extracts of Cyperus Rotundus Tubers on the Level of Blood Sugar in Healthy and Diabetic Rats

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**Abstract** In this investigation, the effectiveness of aquatic extracts of Cyperus rotundus tubers was examined. The aerial parts of the curly plant (Teucrium polium) and the fruits of the carob plant (Prosopis farcta) help reduce levels of glucose, cholesterol, and blood triglyceride levels of healthy male rats and those with induced diabetes. With alloxan and compared with the effect of insulin. It has been shown that aqueous extracts of saad, jaada, and carob caused the levels of the blood sugar decreasing significantly. In healthy plus rats with diabetes. The results of this study show that the aqueous extract of Saad tubers caused a significant decrease in the lipid and cholesterol content of all but the aquatic extract of carob fruits prompted a notable drop in the quantity of triglycerides only, while the aqueous extract did not change the aerial parts of the increase in the levels of cholesterol and triglycerides in rats with diabetes.

**Key Words** diabetes mellitus, experimental models, herbal therapy, insulin, triglyceride

## 1. Introduction

About 347 million people suffer from diabetes in the world. More than 3.4 million individuals perished in 2004 as a result of excessive fasting blood sugar. A similar number has been estimated of deaths in 2010, the World Health Organization expects diabetes to be the seventh the primary reasons for dying in 2030. In the Middle East, rates have been recorded High mortality. When a health care provider tells a patient that he or she has diabetes. Subsequently reassures him that while diabetes cannot be cured, there are numerous procedures that can lower blood sugar levels. Each diabetic treatment's effectiveness is contingent upon the diabetes patient. The most recent survey carried out in the Kingdom indicates that 14.1% of people across every demographic have diabetes. The rate for individuals older than thirty years of age is 28% [1]. Diabetes mellitus, also known as DM, is a serious metabolic condition defined by consistently elevated blood sugar levels caused by insufficiencies in the synthesis, activity, or combination of both insulins [2]. At the moment, insulin resistance is regarded as one of the greatest prevalent chronic illnesses in almost every nation, and type 2 diabetes especially is becoming more and more commonplace globally.

Around 135 million individuals had diabetes in 1995, and by 2025, there would likely be an additional 300 million cases [3]. According to additional recent research, over 552 million of individuals worldwide or almost 9.9% of the total population will have diabetes by 2030 [4]. As a result, study over the past few years has concentrated on developing novel plant-derived antidiabetic compounds that have lower adverse consequences [5]–[7]. Numerous types of plants are presently employed as antidiabetic medicines worldwide and are thought to be an essential source of these novel drugs. There have been reports of over 1200 distinct plants being used for conventional diabetes treatments [8]. Eighty percent of all species examined in vitro have the potential to be antidiabetic, and some of these plants have even inspired the creation of fresh medications, such as metformin, as it was derived from Linum usitatis Galega L. [9].

Unfortunately, nothing is recognized concerning the molecular structure or functions of the active chemicals in hypoglycemic plants, making it impossible to use them in conventional diabetes treatment [10]. Approximately 140 million individuals had diabetes in 1993, and by 2025, there would likely be a further 300 million cases [3]. According to additional recent research, over 552 million people worldwide or almost 9.9% of the total population will have diabetes by in 2030 [4]. Due to the negative consequences of long-term use of conventional medications and the rising global expenditure of over USD 700 billion (10%) on diabetes,

| Treatments | Glucose mg/100 cm3 | Change rate % |
|---|---|---|
| Control | 130.2 ±11 | – |
| Insulin | 56.5 ±3* | - 57.23 |
| Aqueous extracts of Saad 250 mg/kg | 75.5 ±6* | - 46.31 |
| Aqueous extracts of the jaada plant, 250 mg/kg | 109.1±9* | - 17.11 |
| Carob aqueous extracts: 125 mg/kg | 83.8 ±4* | - 36.49 |

Table 1: The consequences of aqueous plant extracts on male, normal rats' blood triglyceride levels

| Treatments | Glucose mg/100 cm3 | Change rate % |
|---|---|---|
| Control | 227.2 ±8 | + 77.62 |
| Insulin | 114.8 ±9 * | - 49.21 |
| Aqueous extracts of Saad 250 mg/kg | 141.5 ±9* | - 39.33 |
| Aqueous extracts of the jaada plant, 250 mg/kg | 219.1±15* | - 4.97 |
| Carob aqueous extracts: 125 mg/kg | 159.8 ±8* | - 49.22 |

Table 2: Effect of aqueous plant extracts on the concentration of triglycerides in the bloodstreams of male rats that have diabetes brought on by alloxan

natural and less intrusive products are becoming more and more popular for both therapeutic and preventive purposes [11].

Maintaining blood glucose levels within normal ranges is the primary objective of diabetes therapy, which is based on four fundamental factors: the person's lifestyle and understanding of the illness; exercise; dietary changes; and blood sugar-lowering drugs. As well as treatment with herbs and medicinal plants. Which works to reduce blood sugar levels, and attention has been paid to treatment with these extracts due to the side effects caused by chemical drugs [12]. Among the plants that have been studied are aloe vera, fig leaves, fenugreek, bitter melon, black seed, and leaf of olive, sesame, and lettuce oil, as it was found that their aqueous extracts have the ability to reduce blood sugar in people with diabetes and some experimental animals that have been afflicted with diabetes by alloxan. The current study aims to assess the effects on different factors of aquatic extracts of Carob (Prosopis farcta), Al-Jadaa (Teucrium polium), and the Sad plant (Cyperus rotundus). Male normal mice and those with alloxan-induced diabetes experimentally had their biochemical substances (glucose, cholesterol, and triglycerides) compared to insulin.

## 2. Material and Methods

**Extracts of plants set up:** The suggested procedure was followed in order for preparing the plant extracts in this reference [13], using the Soxhlet extractor method by mixing 10 g of plant powder with distilled water (200 ml), after which the resulting plant extract was dried using a rotary evaporator device (from the Japanese company Yamato) until it became a powder, which was stored in a refrigerator at 21 degrees Celsius in sealed tubes until the injection is performed in animals with diabetes.

**Inducing diabetes:** White rats whose weight ranged from 250–310) g were used, and they were prevented from eating food for 24 hours, after which they were injected subcutaneously with a concentration of 1 milliliter of alloxan, which was prepared in a saline solution with an entire body weight concentration level of 150 kilograms. Then, immediately after the injection, the animals were provided via nourishment and glucose a (5%) preventative measure the sharp drop in glucose levels resulting from the cessation of beta cell activity. Pancreatic. As for the untreated animals (control), they were injected with a saline solution only. The occurrence of diabetes was confirmed by examining the urine to confirm the appearance of glucose using the Uriscan reagent strip once every two days for ten days. The experimental diabetic was defined as a glucose level in the blood more than 200 mg/100 ml in rats.

**Treatments:** Plant extracts were given orally to five-animal groups consisting of healthy and diseased mice, while insulin was administered subcutaneously. The groups were randomly assigned. For three weeks, a single dose was administered to each patient as follows:

1) A healthy group. Without treatment (control).
2) Infected group without treatment (control but infected).
3) A healthy group and an infected group. They were injected with insulin subcutaneously with a dosage of five international units per kilograms of body mass (Al-Kaki, 1999).
4) A healthy group and an infected group. One group was given the Saad extract orally dose of 250 mg per kilogram of body mass; the other group comprised the infected group. The dosage of the Al-Jadaa extract was 250 mg/kg of body mass when taken orally.
5) Orally at a dose (a healthy group and an infected group) Carob extract was given at an overall mass of 125 mg per kilogram.

**Collecting samples of blood:** After giving the aqueous extracts (volume 1 ml) for a period of three weeks, depending on the totals, the animals were starved for 24 hours, after which they were given ether anesthesia, and a blood sample was taken from the corner of each eye. Using a capillary tube [14], blood samples were taken within tube tests devoid of anticoagulants, then the serum was separated by a centrifuge, and the serum was kept at a temperature of -20 degrees Celsius until the analyses were performed.

**Estimating the glucose level:** Utilizing an analysis kit (Kit), using enzymatic procedure that involves oxidizing glucose (the Thinder reaction), the amount of glucose in the blood serum was measured. The findings of the absorption were read at the wavelength of 546 micrometers using a spectrophotometer made by the British firm Cecil.

**Cholesterol level estimation:** Plasma serum cholesterol has been measured with an analytical kit (Mon, French manufacturer Bio Merieux). This is an enzymatic process that converts esters and cholesterol. Cholesterol was added to quinonimine dye, and the absorbance of the samples was read at that wavelength (550 nm).

**Utilized statistics analysis:** The data were statistically analyzed at a significant level ($P < 0.05$) using the Costat statistics software.

## 3. Results and Discussion

The way in which that therapies affect blood sugar levels; Tables 3 and 4 make it evident that insulin therapy might have resulted in a significant ($P < 0.05$) drop in the blood glucose level in male healthy rats compared to the corresponding blood glucose levels of healthy and infected control. These findings align with what several research have suggested [15], [16] stated wherein insulin raises the overall amount of glucose transporters in the plasma membrane, speeding up the rate at which glucose enters cells. [17] insulin also inhibits the enzymes that cause glucose to be formed, such as the enzyme pyruvate carboxylase, fructose-1, 6-Di-phosphatase, and glucose-6-phosphatase, while also increasing the formation of the enzymes that dissolve glucose, such as Pyruvate Kinase as well as Phospho fructose Kinase [18]. When compared with the control for every one of the investigated extracts, the blood sugar levels of both healthy and sick animals significantly decreased (Tables 3 and 4). One possible explanation for these extracts' capacity to lower the blood sugar level is because they delay or prevent the intestines from absorbing glucose, encouraging the pancreas to secrete insulin [19] by making it easier for glucose to enter adjacent cells in tissues (fatty and muscle) [20].

The impact of medical interventions on blood cholesterol levels: When compared to the untreated group that did not receive treatment, Table 5 illustrates that therapy with insulin at a dose of five international units/kg of body weight produced no statistically significant outcome change in the cholesterol level. These results are in line with various other studies including [21], [22], It is incompatible with a different study area [23]. Studies demonstrate that insulin causes a considerable rise in cholesterol within healthy animals; storing may be the cause of this increase. Since these excess amounts are found in the fat cells, no appreciable alterations were noticed [24]. When a control group of healthy rats was given aqueous extracts from the Saad, Jaada, and Carob plants, the rodents' cholesterol levels did not significantly change. When compared with the control group of calm rats, the group of rats who had alloxan-induced diabetes had significantly higher cholesterol levels (Table 6), which is in line with other studies like [15], [22], it shown a shift in the blood cholesterol levels of rats with diabetes brought on by alloxan. Elevated enzyme activity in diabetes is linked to high cholesterol. The gastrointestinal tract absorb cholesterol by a process called cholesterol acyl transferase, which is triggered by the lack of insulin.

Insulin treatment resulted in a considerable reduction in cholesterol levels in infected rats, which is in line with several research [15], [21], [23]. That could be explained by insulin replenishing the quantity of fatty acids and glucose that were used as a result of the body turning to them as alternate energy sources by converting the significant levels of blood sugar. Apart from the potential for insulin to impede the acyl CoA cholesterol acyl transferase activity, when the sick mice were treated with the Saad plant's aqueous extract, their cholesterol levels significantly decreased in comparison to the infected control group. While implementation with an aqueous solution of berries and carob did not significantly alter the cholesterol level in comparison to the control, the reason for this could be attributed to The ability of the extract to prevent the hydroxyl methyl glutaryl enzyme, which is responsible for constructing cholesterol, or the extract's potential to inhibit the lipase enzyme, which is located in fat cells, decreasing the amounts of cholesterol let go into the blood stream.

**The influence of interventions on blood triglyceride levels:** The results of this investigation demonstrated that triglyceride levels significantly increased in alloxan-diseased animals as compared to healthy animals (Tables 1 and 2). This aligns with research conducted on male rabbits [15]. The reduction in the activity of the lipase, or lipoprotein, enzyme, which is responsible for eliminating triglycerides, may be the cause of an increase for triglycerides in the case of acquiring diabetes [24].

When insulin therapy was given to rats, the levels of triglycerides in the uninfected and infected species were significantly lower than in the two control groups for each of them. This is because insulin causes the adipose tissue's lipoprotein lipase enzyme to activate, breaking down triglycerides through fatty acids that are metabolized by fat cells [24].

## 4. Conclusion

These results also demonstrated that levels of triglycerides in healthy rats were significantly reduced by aqueous extracts of saad, jaada, and carob; in infected rats, the saad and carob groups experienced significant reductions in triglyceride levels, while the jaada group did not significantly decrease in comparison to the infected control. This could be explained by the extract's inability to release enough insulin to for its lipase enzyme to become active.

## Conflict of interest

Author declares no conflict of interests. Author read and approved final version of the paper.

| Treatments | Glucose mg/100 cm3 | Change rate % |
|---|---|---|
| Control | 75 ±3 | |
| Insulin | 27.10 ±4* | - 63.64 |
| Aqueous extracts of Saad 250 mg/kg | 43.5 ±5* | - 44.7 |
| Aqueous extracts of the jaada plant, 250 mg/kg | 46.4 ±5* | - 38.08 |
| Carob aqueous extracts: 125 mg/kg | 53.9 ±6* | -28.3 |

Table 3: Effect of aqueous plant extracts on blood glucose levels in healthy male rats

| Treatments | Glucose mg/100 cm3 | Change rate % |
|---|---|---|
| Control | 315 ±12 | + 322.7 |
| Insulin | 66.9 ±4* | - 82.61 |
| Aqueous extracts of Saad 250 mg/kg | 71.5 ±9* | - 78.33 |
| Aqueous extracts of the jaada plant, 250 mg/kg | 128.4 ±9* | - 61.08 |
| Carob aqueous extracts: 125 mg/kg | 217.10 ±8* | -34.3 |

Table 4: Blood sugar levels in male rats exposed to plant aqueous extracts after developing diabetic caused by Alloxan

| Treatments | Glucose mg/100 cm3 | Change rate % |
|---|---|---|
| Control | 88.35 ±19 | — |
| Insulin | 75.5 ±6* | - 15.88 |
| Aqueous extracts of Saad 250 mg/kg | 79.5 ±7* | - 11.53 |
| Aqueous extracts of the jaada plant, 250 mg/kg | 82.41±7* | - 7.11 |
| Carob aqueous extracts: 125 mg/kg | 81.4 ±6* | -8.95 |

Table 5: The influence of water-based plant extracts on male rodents' blood cholesterol levels

| Treatments | Glucose mg/100 cm3 | Change rate % |
|---|---|---|
| Control | 116.42 ±8 | + 79.37 |
| Insulin | 81.5 ±7* | - 44.23 |
| Aqueous extracts of Saad 250 mg/kg | 63.5 ±5* | - 50.92 |
| Aqueous extracts of the jaada plant, 250 mg/kg | 103.81±5* | - 10.03 |
| Carob aqueous extracts: 125 mg/kg | 114.08 ±8* | - 407 |

Table 6: Influence of aqueous extracts from plants on male rodents' cholesterol levels in the blood Patients who have diabetes caused on by alloxan

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