

## Role of Cinnamon Extract on Blood Glucose and Testosterone Levels

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### ABSTRACT

This study was performed to investigate the effects of cinnamon extract on of blood glucose as well as serum insulin and testosterone hormones. The experiment was carried out on twenty four male adult mice distributed into 4 groups of 6 mice each. Group one was kept as positive control, while mice of the other three groups were given orally an aqueous cinnamon extract at 0.5, 1 and 2mg/ml respectively, daily for three weeks. The results showed that oral administration of cinnamon extract at 2 mg/ml to diabetic male mice for three weeks decreased blood glucose level and increased serum insulin and testosterone levels. This study recommends that intake of cinnamon bark as a drink may be beneficial for diabetic patients who suffer from sexual impotency as their extracts induce antidiabetic activity and enhance male fertility in diabetic mice.

**Key words:** Cinnamon, Blood Glucose, Testosterone

### دور مستخلص القرفة على معدلات السكر والتستوسترون

#### الخلاصة

صممت هذه الدراسة للتحري عن فعالية مستخلص نبات القرفة على تركيز السكر بالدم إضافة إلى الانسولين وهرمون التسترون. تم اختبار 26 فأر موزعين على اربع مجاميع بواقع 6 فئران لكل مجموعة. المجموعة الاولى اختبرت كمعامل سيطرة في حين تم تجريب المجاميع الثلاثة المتبقية بالمستخلص المائي لنبات القرفة وبتراكيز تراوحت 0.5 ، 1 و 2ملغم/مل على التوالي يوميا ولمدة ثلاثة أسابيع.

أظهرت النتائج أن التجريب الفموي للمستخلص المائي للقرفة بالتركيز 2 ملغم/مل للفئران المصابة بالسكري لمدة ثلاثة أسابيع خفضت معدل تركيز السكر في الدم وزادت معدلات هرمون الانسولين والتسترون. لذلك ونظرا للنتائج التي تم الحصول عليها نوصي بأنه أخذ نبات القرفة وبشكل شراب قد يؤدي إلى نتائج مفيدة لمرضى السكري والذي يعانون من العجز الجنسي كون المستخلص النباتي يحفز الفعالية ضد السكري وتحسين الخصوبة في الفئران المصابة بالسكري.

## **INTRODUCTION**

**C**innamon (*C. zeylanicum*, Family Lauraceae) bark is commonly used in Arabian countries as a spice for most foods. In Eastern and Western folk medicine it used for treating abdominal and chest pains, chronic diarrhea, hypertension, kidney disorders and rheumatism[1]. Intake of 3g or 6g of cinnamon bark reduced serum glucose in people with type 2 diabetes[2]. Cinnamon extracts have also demonstrated hepatoprotective and antioxidant effects in CCL4 - intoxicated rats [3].

The most important components in cinnamon are cinnamomin and cinnamaldehyde. Extensive researches have been made on cinnamon and its components on various organs. Cinnamon can be used to treat diabetes [4], reduced cholesterol and low density lipoprotein (LDL)[5], posses bactericidal activity, improve nausea and diarrhea, reduce the release of free radicals in the body and increase the sexual desire[6].

Diabetes mellitus is a chronic metabolic disease which affects millions of people all over the world. The disease is characterized by hyperglycemia due to insulin deficiency or insulin resistance. Hyperglycemia occurs when the liver and skeletal muscles cannot store glycogen and/or the cells become unable to utilize glucose [7]. The prevalent treatment of diabetes mellitus besides controlling food intake; treating obesity; proper exercise and changing life style includes administration of oral hypoglycemic drugs and subcutaneous injection of insulin [8].

Infertility is one of the major health problems in life, and approximately 30 % of this problem is due to male factors [9]. Several factors can interfere with the process of spermatogenesis and reduce sperm quality and quantity. In men, testosterone plays a key role in the development of male reproductive tissues such as the testis and prostate as well as promoting secondary sexual characteristics such as increased muscle, bone mass, and the growth of body hair [10]. In addition, testosterone is essential for health and well-being as well as the prevention of osteoporosis.[11].

The original and primary use of testosterone is for the treatment of males who have too little or no natural endogenous testosterone production—males with hypogonadism. Appropriate use for this purpose is legitimate hormone replacement therapy (testosterone replacement therapy [TRT]), which maintains serum testosterone levels in the normal range[12].

In this study the effect of aqueous extract of cinnamon was examined on blood glucose levels as well as serum insulin and testosterone hormones.

## **MATERIALS AND METHODS**

### **Preparation of plant extract**

Cinnamon (*C. zeylanicum*, Family Lauraceae) dried bark were obtained from local market of Herbs and Medicinal plants, The method of plant extraction was described by Shalaby and Hamowieh [13]. In this method, the dried powder of cinnamon (500 gm ) was soaked in 2 liter of distilled water and gently heated for 30 minutes (about 45°C) until extracted out. Then the solution was cleared with

filter paper concentrated at 50 °C in oven. Extract was then prepared to 0.5, 1 and 2mg/ml using distilled water and made ready for oral administration. To prevent contamination, the extracts were kept in the refrigerator at 4°C.

#### Animales

The animals used in this study were laboratory mice (male) *Mus musculus* Balb/C male adult mice (average weight of 25g and 8-12 weeks old), purchased from central health laboratory / Baghdad. There were 4 mice in each group (positive control, treatment I, treatment II and treatment III groups). During the experiment the animals were fed by pellet and drinking water. The cage floor was covered with wood chips and sawdust. Animal cages were cleaned and disinfected twice a week.

The four groups were given alloxan by intraperitoneal injection of a single daily dose of 100 mg/Kg to induce moderate stable diabetes as described by Ashok et al.[7]. The first group of mice was left as diabetic control, while diabetic mice of the 2nd, 3rd and 4th groups were given orally cinnamon extract at 0.5, 1 and 2 mg/ml respectively, for 21 days.

#### Blood Sampling and Biochemical Analyses

Blood samples were obtained from the animal's heart and left to clot for separating the serum after centrifugation at 3000 rpm for 15 minutes. Serum samples were directly frozen at -10°C till biochemical analyses. Estimation of blood glucose was carried out using enzymatic glucose kits according to the method described by Siest et al. [14]. Serum insulin was determined using radioimmunoassay method as described by Yallow and Bauman [15]. Serum testosterone concentration was determined according to the method of Wilke and Utley [16] using ELISA (Enzyme Linked Immuno Sorbant Assay).

#### Statistical Analysis

Data were expressed as means  $\pm$  S.E. and statistical analysis was carried using computerized SPSS program. Significance was performed using the least significant difference and paired Student "t" test according to Klug and Cummings [17].

#### Results and discussion

As shown in Table (1), results obtained in the present study showed that serum levels of glucose and insulin hormone levels of diabetic mice. Oral administration of cinnamon extract at 2 mg/ml for 21 days to diabetic mice were significantly ( $P < 0.05$ ) lower than diabetic control as shown in table (1).

**Table-(1): effect of cinnamon extract on blood glucose and insulin levels.**

Groups and Treatments	Glucose level(mg/dL) mean $\pm$ SE	Insuline level( $\mu$ U/ml) mean $\pm$ SE*
Control (Diabtic control)	109.7 $\pm$ 7.40	6.15 $\pm$ 0.05
Cinnamon extract (0.5mg/ml)	116.85 $\pm$ 3.15	4.70 $\pm$ 0.10
Cinnamon extract (1mg/ml)	101.40 $\pm$ 1.10	4.35 $\pm$ 0.05
Cinnamon extract (2mg/ml)	93.2 $\pm$ 2.10	5.35 $\pm$ 0.05

SE\*= Standard Error

With regard to cinnamon extract, the present data revealed that its oral administration at the large dose (2mg/ml) decreased blood glucose level associated with decrease in serum insulin. These findings are partially similar to those reported by Kirkham [18] who concluded that intake of 3 gram or 6 gram of cinnamon reduces the fasting serum glucose in people with type 2 diabetes. The hypoglycemic effect cinnamon extract which reported her it may be due to its hyper insulinemia that evident in this study [19].

It is well known that diabetes is positively associated with lowered male fertility and sexual dysfunction [20]. Recently, Sandra *et al.* [8] concluded that the neuropathy and vascular insufficiency which caused by diabetes may be related to sexual dysfunction.

**Table-(2): effect of cinnamon extract on Testosterone levels.**

Groups and Treatments	Testosterone level(ng/dL) mean±SE
Control(Diabetic control)	6.85 ± 0.25
Cinnamon extract (0.5mg/ml)	4.20 ± 0.10
Cinnamon extract (1mg/ml)	4.55 ± 0.05
Cinnamon extract (2mg/ml)	5.20 ± 0.10

Table-(2) shows that oral administration of cinnamon extract at 2mg/ml for 21 days to diabetic mice decreases in serum testosterone levels as compared to the diabetic control mice. The improvement in fertility parameters that caused by large dose of cinnamon extract could be attributed to its antioxidant activity that previously reported by Kander [21]. The author concluded that cinnamon extracts have an antioxidant effect in CCL4 - intoxicated rats. Yang *et al.* [22] concluded that the natural antioxidants can protect DNA and other molecules from cell damage induced by oxidation and can improve sperm quality and increase reproductive efficiency of men. Jedlinska *et al.* [10] reported that intake of antioxidants and vitamins A, B, C, and E can increase stability of testicular blood barrier and protect sperm DNA from oxidative stress caused by active free radicals.

In conclusion, the oral administration of cinnamon extract at 1 and 2 mg/ml to diabetic male mice for 21 days reduced blood glucose level and decrease serum insulin and testosterone levels. Therefore, this study recommends that intake of cinnamon bark as a drink may be useful for diabetic patients who suffer from sexual impotency as their extracts produce antidiabetic activity and exhibit fertility enhancing properties in male diabetic mice.

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