



Effect of Cinnamon Zeylanicum on serum Testosterone and anti-oxidants levels in Rats

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Abstract

Objectives: Cinnamon as an antioxidant is able to reduce oxidative stress. Previous study confirmed antioxidant enzymes have beneficial and essential effects on male infertility by their role against reactive oxygen species.

Material and methods: Wistar male rats (n=20) were allocated into two groups, control group (n=10) and cinnamon group (n=10) that received 75mg/kg by gavage method, daily for 4 weeks respectively while the control group just received an equal volume of distilled water daily. In 30th day, 5 cc blood sample of each rat was taken for testosterone measurement.

Results: Total serum testosterone and TAC (total antioxidant capacity) levels were significantly increased in group that has received 75mg/kg cinnamon in comparison to control group (P<0.05). It was not seen any significant difference between groups in testis weight.

Conclusion: Since in our study 75mg/kg Cinnamon has significantly increased serum testosterone and TAC, it seems to use it in infertile patients has beneficial effects.

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Introduction:

Antioxidants are considered as significant agents in the body healthy. Knowledge about these agents has been developing recently. Polyphenols as dietary antioxidants associated with redox activities have beneficial effects on health (1). Oxidative stress is an important factor in many diseases such as diabetes (2), atherosclerosis (3,4), infertility and inflammation (5). In the people with oxidative stress, antioxidant dietary supplements intake will be a possible method to reduce the incidence of these pathologies. Among dietary antioxidants, polyphenols may confer specific health benefits (1). Cinnamon extract, an antioxidant with rich source of polyphenolic compounds, plays a significant role in modulating of oxidative stress in the obese people with impaired fasting glucose; furthermore, it is an appropriate remedy in order to reduce the risk of male infertility, cardiovascular, inflammation diseases and oxidative stress related complications (6). Cinnamon, a natural herb with a long history of safety, has been shown to improve the action of insulin in vitro(7) and in animal studies(8,9). Furthermore, studies showed anti-oxidative and anti-mutagenic properties of cinnamon. The flavonoids are a group of benzopyran derivatives which occur widely in plants. Flavonoids are products of plant metabolism and have different phenolic structures. Some of *Cinnamomum* species mainly contain three flavonoid compounds namely quercetin, kaempferol and quercetrin, so they are rich source of antioxidants. (10-12). The aim of this study was assessment of the effects of Cinnamon zeylanicum as an antioxidant on serum testosterone and TAC.

Material & Methods:

Animals

Twenty adult wistar albino male rats were 8 weeks old and weighing 250 ± 10 g, were obtained from animal facility of pasture institute of Iran. Male rats were housed in temperature controlled rooms (25°C) with constant humidity (40-70%) and 12h/12h light/ dark cycle prior to use in experimental protocols. All animals were treated in accordance to the Principles of Laboratory Animal Care. The experimental protocol was approved by the Animal Ethical Committee in accordance with the guide for the care and use of laboratory animals prepared by Tabriz medical University. All Rats were fed a standard diet and water. The daily intake of animal water was monitored at least one week prior to start of treatments in order to determine the amount of water needed per experimental animal. Thereafter, the wistar male rats (n=20) were allocated into two groups, control group (n=10) and Cinnamon zeylanicum group that received 75mg/kg (n=10) by gavage method, daily for 4 weeks respectively however, the control group just received an equal volume of distilled water daily.

Preparation of Cinnamon:

Cinnamon zeylanicum were bought in Istanbul province, Istanbul city of Turkey. By mixer 100 grams of Cinnamon zeylanicum were changed to powder. Daily 75mg/kg of it was solve in 2cc distilled water and each rat received it daily for 30 consequences days.

Surgical procedure:

In thirtieth day, the Pentobarbital sodium (40 mg/kg) was administered intra peritoneal for anesthesia, and the peritoneal cavity was opened through a lower transverse abdominal incision. Thereafter, epididymis in control and experimental groups were immediately removed. The weights of epididymis in each group were registered. The animals were decapitated between 9:00 AM and 11:00 AM.

Total serum testosterone hormone measurement:

Total serum concentration of testosterone was measured by using a double-antibody RIA kit (Immunotech Beckman Coulter Co., USA). The testosterone detection sensitivity per assay tube was 0.025 ng/ml.

Measurement of Serum Total Antioxidant capacity (TAC):

TAC was measured in serum by means of a commercial kit (Randox Co-England). The assay is based on the incubation of 2, 2'-azino-di-(3-ethylbenzthiazoline sulphinate) (ABTS) with a peroxidase (methmyoglobin) and hydrogen peroxide to produce the radical cation ABTS⁺, which has a relatively stable blue-green color, measured at 600 nm. The suppression of the color is compared with that of the Trolox, which is widely used as a traditional standard for TAS measurement assays, and the assay results are expressed as Trolox equivalent (mmol/L).

Statistical analysis:

Statistical analysis was done using the T-test for comparison of data in the control group with the experimental group. The results were expressed as Mean \pm S.E.M (standard error of means). P-value less than 0.05 were considered significant and are written in the parentheses.

Results:

Weight of Epididymis:

The obtained results in this study were illustrated in table 1. There was no significant difference in epididymis weights between the groups.

Results of serum total testosterone:

Administration of 75mg/rat Cinnamon zeylanicum for thirty consecutive days significantly increased serum total testosterone in experimental group as compared with the control group ($P < 0.05$). The results were (3.87 ± 0.22) ng/ml, in Cinnamon zeylanicum group and (1.65 ± 0.55) ng/ml, in control group respectively (Table 1).

Results of Total blood anti-oxidant capacity (TAC):

Administration of 75mg/rat Cinnamon zeylanicum for thirty consecutive days significantly increased TAC level in experimental group as compared with the control group ($P < 0.05$).

The results were (2.95 ± 0.05) mmol/ml in Cinnamon zeylanicum group and (1.8 ± 0.05)

Discussion:

It has been postulated that oxidants interfere with normal sperm function via membrane lipid peroxidation and fragmentation of nucleic acids which result in sperm dysfunction (13). Seminal plasma is considered to be the source of antioxidants that protect sperm cells against oxidative damages. Antioxidants mainly discussed include SOD (superoxide dismutase), GPX (Glutathione peroxidase) and catalase enzymes. Decreased antioxidants concentrations in seminal plasma of infertile men are accompanied by increased levels of seminal MDA (malondialdehyde) of them. Therefore, diminishing of antioxidants could be explained by the elevated lipid peroxidation in infertile patients. GPX plays a crucial role in the antioxidant defense of the epididymis and the ejaculated spermatozoa (14). Human spermatozoa is known to possess all of the major antioxidant defensive systems, including catalase, SOD, GPX and GRD (glutathione reductase), their effectiveness is impaired by their limited concentrations and distribution. Interestingly, the seminal plasma is well equipped with an array of anti-oxidative defense mechanisms to protect the spermatozoa against oxidants. Antioxidants that are present in the seminal plasma compensate for the deficiency in cytoplasmic enzymes in the spermatozoa (15). The activities of seminal antioxidant enzymes like SOD and GPX has been measured in several studies. Additionally, low molecular weight scavengers from seminal plasma appeared to be more important than enzymes, including trace elements and GSH (16). Antioxidants can interfere with the oxidation process by reacting with free radicals, chelating catalytic metals, acting as oxygen

scavengers (17, 18) and prevent lipid auto oxidation (19-20). Several studies have reported that antioxidants and vitamins A, B, C, and E in diet can protect sperm DNA from free radicals and increase blood-testis barrier stability (21). Androgens and partial androgens are essential for male fertility and the maintenance of spermatogenesis (22). Androgen deficiency is common in aged men ; it has shown that there is a slow declining in serum total testosterone (T) level with aging even in the absence of any diseases (23). Different diseases and medicinal complications could exacerbate declining of testosterone. In this study results showed administration of 75mg/kg Cinnamon zeylanicum cause significant enhancement in serum total testosterone and this is due to cinnamon's flavonoids and similar compounds. Researches confirmed that flavonoid especially Phytoestrogens affect steroid biosynthesis and metabolism through a number of pathways potentially (24). A number of phytoestrogens also inhibit 17 β hydroxysteroid dehydrogenase (25). A research on male rats after feeding with phytoestrogens showed no changes in hypothalamic aromatase activity, even though isoflavone levels were 8 times higher in the brains of these animals than in the controls (26). Another experimental study showed Cinnamon zeylanicum could increase sperm parameters such as population, viability and motility. Herbal antioxidants and antioxidant enzymes like CAT and GSH are main detoxifying systems for peroxidation; this compounds dispose, scavenge, and suppress the formation of ROS and lipid peroxidation. Therefore, ROS reduction is an important factor for sperm cells generation and improvement of the spermatogenesis and increasing chance of fertility (27,28). Further experiments and researches are required to confirm the pharmacological and toxicological studies

about effects of this herb on the body tissues. Therefore increased use of herbal medicine like fruit, vegetables, onion, tea, black burgundy grape and Cinnamon zeylanicum which are full of flavonoids as herbal antioxidant to improve blood total anti-oxidants and serum testosterone levels and increase chances in infertile couple to get a new life. This study is a confirmation of a research done by Yüce et al that demonstrated the improvement effects of cinnamon on testicular oxidant-antioxidant balance and sperm quality (29).

Conclusion:

Results demonstrated that antioxidants of cinnamon zeylanicum could increase total antioxidant capacity and testosterone level in male infertile rats so it could restore fertility. Therefore, this study and other studies confirm remedial effects of cinnamon zeylanicum on male infertility.

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Table 1. The effect of the 75 mg/kg/rat Cinnamon zeylanicum on Serum Testosterone, TAC and epididymis weight of control and experimental group in the rats. Data are presented as mean \pm SE.

Samples	Groups	Control(n=10)	Cinnamon zeylanicum, (75mg/kg-per day) (n=10)
epididymis (gr)		1 \pm 0.33	1 \pm 0.55
Testosterone(ng/ml)		1.65 \pm 0.55	3.87 \pm 0.22**
Total blood anti-oxidant capacity(mmol/ml)		1. 8 \pm 0.55	2.95 \pm 0.55*

*Significant different at P< 0.05 level, (compared with the control group).

**Significant different at P< 0.01 level, (compared with the control group).

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