Effect of Cinnamon and Coriander Hypercholesterolemic and Diabetic Rats

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Abstract

The effects of different concentrations (5 and 10%) of cinnamon and coriander as powder on improving of hypercholestremic and diabetic rats were evaluated. Sixty three male albino rats were used and divided to 6 groups, each group (6) rats. Firsr group fed on basil diet and use as negative control group. The Hypercholesterolemic treated with alloxan (150 mg/kg) of rat's body weight and used as a positive control group, ather groups treated with cinnamon and coriander as powder. The results showed that there are significant differences between negative control group and positive control group. The lowest glucose level of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for group rats fed on 5% cinnamon powder with significant difference, the mean values were 103.55 and 150.94 mg/dl, respectively. The lowest liver functions (ALT, AST and ALP) enzyme of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for group rats fed on 10% cinnamon powder with significant difference. The lowest total cholesterol and triglycerides of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for group rats fed on 5% cinnamon powder with significant difference, the mean values were 58.52 & 96.93 and 52.60 & 85.39 mg/dl, respectively. The highest HDL-c of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the lowest value recorded for group rats fed on 5% cinnamon powder with significant difference. The

lowest LDL-c and VLDL-c of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for group rats fed on 5% cinnamon powder with significant difference. The highest serum uric acid, urea and creatinine level of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% cinnamon powder. While, the lowest value recorded for group rats fed on 5% coriander powder with significant difference.

Key words: Spices, Rats, Diabetic, Hyperlepedemia and Biochemical analysis.

INTRODUCTION

Diabetes mellitus (DM) is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves **(Nagappa *et al.,* 2003).**

Since, ancient times, plants have played an important role in the treatment of many diseases. Different parts of medicinal plants such as leaf, root, flower and seed are used as extracts and chemical compounds to produce drugs **(Ozgen *et al.,* 2009)**.

According to world Health Organization (WHO), 80% of the World's population is dependent on the traditional medicine **(Maiyo *et al.,* 2010)**.

Diabetes is the world's largest endocrine disease associated with increased morbidity and mortality rate. Diabetes mellitus is also associated with long term complications including retinopathy, nephropathy, neuropathy and angiopathy and several others **(Sharma *et al.,* 2010)**.

A variety of ingredients present in medicinal plants are thought to act on a variety of targets by various modes and mechanisms. They have potential to impart therapeutic effect in complicated disorders like diabetes and its complications **(Tiwari and Rao, 2002)**.

Medicinal plants are gradually gaining global acceptability given their potential as bioactive agents to be used as pharmaceuticals. New hypoglycemic agents derived from plants have shown both hypoglycemic action and the ability to improve some of the secondary complications of diabetes such as kidney damage, fatty liver, and oxidative stress. In addition, some tropical herbs offer both benefits as it has been recently informed in experimental models **(Fonseca *et al.,* 2012).**

Hyperlipidemia is a common predicament in society due to change of lifestyle and food practice. Besides medication, diet also plays an important role in the management of lipid and lipoprotein concentrations in blood. Previous studies have shown that the uncontrolled consumption of high fat diet also leads to insulin resistance (IR) because the saturated fatty acids (SFA) interfere with the action of insulin **(Park *et al.,* 2011)**.

The bark of various cinnamon species is one of the most important and popular spices used worldwide not only for cooking but also in

traditional and modern medicines. Overall, approximately 250 species have been identified among the cinnamon genus, with trees being scattered all over the world **(Tanaka *et al.,* 2008)**.

A study comparing the insulin-potentiating effects of many spices revealed that the aqueous extract of cinnamon was 20-fold higher than the other spices. Methyl hydroxyl chalcone polymer (MHCP) is the purified polymer of hydroxyl chalcone with the ability to stimulate glucose oxidation **(Jarvill-Taylor *et al.,* 2001)**.

A study by **Lee *et al.,* (2003)** showed that the suitable doses of cinnamon (5, 10, and 20 mg/kg) of the linalool chemo-type were found to help with glycemic control in diabetics due to enhanced insulin secretion. It is plausible that the amelioration of oxidative stress and the pro-inflammatory environment in the pancreas may confer protection to pancreatic cells. Others found that flavonoids compounds of cinnamon are responsible for increasing the level of HDL and decreasing in LDL and VLDL concentration in Hypercholesterolemic **(Patel, *et al*., 2009)**.

Coriander seeds, leaves, flowers and fruit exhibit a wide range of pharmacological activities such as: antibiotic anti-oxidant, anti-diabetic, anti-cholinesterase, anti-helminthic, sedative-hypnotic, anticonvulsant, cholesterol lowering, anti-cancer, and hepatoprotective activity among other functions **(Wangensteen *et al*., 2004)**.

Coriander has been identified as one of the herbs that can be used to treat diabetes and alleviate the effects of other markers of metabolic syndrome. Coriander seeds are rich in essential oils which have been shown to possess hypoglycaemic and hypolipidaemic effects in the obese and diabetics **(Aissaoui *et al*., 2011)**.

This work was conducted to study the effect of different concentrations of cinnamon and coriander as powder on biochemical analysis and lipid profile of hyperlepedemic and diabetic rats.

Material and Methods

Materials:

Commercially dried spices cinnamon (*Cinnamon zeylanicum*) and coriander (*Coriandrum sativum,* L.) were obtained from local market in 2016 from Menoufia Governorate.

Cholesterol powder:

Alloxan, it was pure chemical fine product (DBH) were purchased from SIGMA Chemical Co., (USA), and was used for induction of diabetes among rats.

Casein, cellulose, choline chloride, and DL Methionine:

Casein, cellulose, choline chloride powder, and DL methionine powder, were obtained from Morgan Co. Cairo, Egypt.

Experimental animals:

A total of 36 adult normal male albino rats Sprague Dawley strain weighing 140±10 g were obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt.

The chemical kits:

Chemical kits used for determination the (TC, TG, HDL-c, ALT, AST, ALP, urea, uric acid and creatinine) were obtained from Al-Gomhoria Company for Drugs, Chemicals
and Medical Instruments, Cairo, Egypt.

Methods:

Preparations of coriander:

To prepare the dried coriander, this was obtained from local market. Coriander was washed thoroughly under running tap water, shade dried, and ground to a fine powder using an air mill.

Experimental design:

Thirty adult male white albino rats, Sprague Dawley Strain, 10 weeks age, weighing (140±10g) were used in this experiment. All rats were fed on basal diet (casein diet) prepared according to **AIN, (1993)** for 7 consecutive days. After this adaptation period, rats are divided into 5 groups, each group which consists of six rats as follows: group (I): rats were fed on basal diet as negative control. Group (2): A Hypercholesterolemic were injected by alloxan a dose of 150 mg /kg of rat's body weight and used as a positive control group. Group (3): A group infected Hypercholesterolemic and diabetic fed on cinnamon as powder by 5% of the weight of basal diet. Group (4): A group infected Hypercholesterolemic and diabetic fed on persimmon fruit as powder by 10% of basal diet. Group (5): A group infected Hypercholesterolemic and diabetic fed on coriander as powder by 5 % of basal diet. Group (6): A group infected Hypercholesterolemic and diabetic fed on coriander as powder by 10 % of basal diet. During the experimental period, the body weight and feed intake were estimated weekly and the general behavior of rats was observed. The experiment period was take 28 days, at the end of the experimental period each rat weight separately then, rats are slaughtered and collect blood samples. Blood samples were centrifuged at 4000 rpm for ten minute to separate blood serum, and then kept in deep freezer till using.

Blood sampling:

After fasting for 12 hours, blood samples in initial times were obtained from retro orbital vein, while it obtained from hepatic portal vein at the end of each experiment. Two kinds of blood samples were taken. The first parts of blood samples were collected into a dry clean centrifuge glass tubes and left to clot in water bath (37°C) for 30 minutes, then centrifuged for 10 minutes at 4000 rpm to separate the serum, which were carefully aspirated and transferred into clean cuvette tube and stored frozen in deep freezer till analysis according to method described by **Schermer (1967)**.

Body weight gain (BWG), feed intake (FI), and feed efficiency ratio (FER):

During the experimental period (28 days) the net feed intake was daily recorded, while body weight was weekly recorded. The net feed intake and gained body weight were used for the calculation of feed efficiency ratios (FER) according to **Chapman *et al.*, (1959)** as follow:

$$\text{FER \%} = \frac{\text{Body weight gain (g)}}{\text{Food intake (g)}} \times 100$$

Biochemical analysis:

Lipids profile:

Determination of total cholesterol:

Serum total cholesterol was determined according to the colorimetric method described by **Thomas (1992)**.

Determination of serum triglycerides:

Serum triglyceride was determined by enzymatic method using kits according to the **Young, (1975) and Fossati, (1982)**.

Determination of high density lipoprotein (HDL-c):

HDL-c was determined according to the method described by **Friedewaid (1972) and Grodon and Amer (1977)**.

Calculation of very low density lipoprotein cholesterol (VLDL-c):

VLDL-c was calculated in mg/dl according to **Lee and Nieman (1996)** was using the following formula:

VLDL-c (mg/dl) = Triglycerides / 5

Calculation of low density lipoprotein cholesterol (LDL-c):

LDL-c was calculated in mg/dl according to **Lee and Nieman (1996)** as follows:

LDL-c (mg/dl) = Total cholesterol – HDL-c – VLDL-c

Liver functions:

Determination of serum alanine amino transferase (ALT), serum asparatate amino transferase (AST), serum alkaline phosphatase (ALP) were carried out according to the method of **Hafkenscheid (1979), Clinica Chimica Acta (1980)**, **and Moss (1982**), respectively.

Kidney functions:

Determination of serum urea:

Urea was determination by enzymatic method according to **Patton and Crouch (1977)**.

Determination of serum uric acid:

Serum uric acid was determined calorimetrically according to the method of **Barham and trinder (1972)**.

Determination of serum creatinine:

Serum creatinine was determined according to the method described by **Henry (1974)**.

Determination of blood glucose:

Enzymatic determination of plasma glucose was carried out calorimetrically according to the method of **Tinder (1969).**

Statistical analysis:

The data were analyzed using a completely randomized factorial design **(SAS, 1988)** when a significant main effect was detected; the means were separated with the Student-Newman-Keuls Test. Differences between treatments of ($P \leq 0.05$) were considered significant using Costat Program. Biological results were analyzed by One Way ANOVA.

Results and Discussion

Effect of cinnamon and coriander as powder on glucose levels of Hypercholesterolemic and diabetic rats:

Data given in table (1) show the effect of cinnamon and coriander as powder on glucose of Hypercholesterolemic and diabetic rats. It is evident that there are significant differences between negative control group and positive control group. The mean values were 91.50 and 222.78 mg/dl, respectively. The lowest glucose level of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder with significant difference ($P < 0.05$), the mean values were 103.55 and 150.94 mg/dl, respectively. These results are in agreement with that of **Deepa and Anuradha, (2011)**, they found that

incorporation of ground coriander seed extract in diet led to marked decline in blood glucose and rise in levels of insulin in diabetic rats.

Effect of cinnamon and coriander as powder on liver functions of Hypercholesterolemic and diabetic rats:

Data presented in Table (2) show the effect of pomegranate peels powder and it extracts on liver functions of obese rats. It is clear to notice that ALT liver function enzyme showed a significant difference between negative control group and positive control group. The mean values were 41.43 and 93.68 U/L, respectively. The lowest ALT enzyme of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 10% cinnamon powder with significant difference ($P< 0.05$), the mean values were 33.94 and 52.20 U/L, respectively. In case of AST data showed that there is a significant difference between negative control group and positive control group. The mean values were 31.96 and 84.77 IU/L, respectively. The lowest AST enzyme of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 10% cinnamon powder with significant difference ($P< 0.05$), the mean values were 37.52 and 50.03 U/L, respectively. It is evident that ALP liver function enzyme showed a significant difference between negative control group and positive control group. The mean values were 38.20 and 72.96 IU/L, respectively. The lowest ALP enzyme of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 10% cinnamon powder with significant difference ($P< 0.05$), the mean values were 56.68 and 50.03 U/L, respectively. The obtained data are agreement with **EL-Yamani (2010),** they reported that all spices (cinnamon, cardamom and ginger) treatments decreased the liver enzymes activies; maximum reduction of GOT& GPT was recorded for the combined spices formulation, this was also noticed for ALP in case of 7% cinnamon treatment. Appreciable decrease of liver enzymes was also observed for cardamom. Also, **Tim *et al.*, (2006)** found that cinnamon diets lowered the liver enzymes of patients.

Effect of cinnamon and coriander as powder on serum total cholesterol and triglycerides of Hypercholesterolemic and diabetic rats:

Data given in table (3) show the effect of cinnamon and coriander as powder on serum total cholesterol and triglycerides of Hypercholesterolemic and diabetic rats. It is clear to mention that, there are significant differences between negative control group and positive control group in total cholesterol levels. The mean values were 69.08 and 155.85 mg/dl, respectively. The lowest total cholesterol of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder with significant difference ($P< 0.05$), the mean values were 58.52 and 96.93 mg/dl, respectively. In case of triglycerides, data indicated that there are significant differences between negative control group and positive control group. The mean values were 125.89 and 62.20 mg/dl, respectively. The lowest triglycerides of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder with significant difference ($P< 0.05$), the mean values were 52.60 and 85.39 mg/dl, respectively. These results are in agreement with **Cao *et al.*, (2007)** they reported that cinnamon improves the lipid profile of people with type 2diabetes. Also, **Chithra and Leelamma, (2000)** reported that reduced the total cholesterol and triglycerides in group rats fed on coriander seeds was observed.

Effect of cinnamon and coriander as powder on (HDL_{-C}), (LDL_{-C}) and ($VLDL_{-C}$) of Hypercholesterolemic and diabetic rats:

Data presented in Table (4) show the effect of cinnamon and coriander as powder on high density lipoprotein cholesterol, low density lipoprotein cholesterol and very low density lipoprotein cholesterol of Hypercholesterolemic and diabetic rats. It is evident that, high density lipoprotein cholesterol (HDL-c) showed significant differences between negative control group and positive control group. The mean values were 33.67 and 53.19g/dl, respectively. The highest HDL-c of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the lowest value recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon

powder with significant difference (P< 0.05), the mean values were 50.48 and 39.79 g/dl, respectively. In case of low density lipoprotein cholesterol (LDL-c) levels, data indicated that there are significant differences between negative control group and positive control group. The mean values were 28.33 and 147.36 g/dl, respectively. The lowest LDL-c of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder with significant difference (P< 0.05), the mean values were 18.56 and 74.20 g/dl, respectively. On the other hand, there are significant differences between negative control group and positive control group in very high density lipoprotein cholesterol (VHDL-c). The mean values were 12.44 and 25.18 g/dl, respectively. The lowest VLDL-c of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 10% coriander powder. While, the highest value recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder with significant difference (P< 0.05), the mean values were 10.52 and 17.08 g/dl, respectively. These results are in agreement with **Patil, *et al*., (2004)** mention that improving level of HDL and LDL in groups treated with cinnamon may be due to the increase in hepatic HDL binding activity and increase in hepatic LDL receptors activity and increasing in the action of lecithin cholesterol acyl transferase, which has a role in the regulation of serum lipids. Also, **Patel, *et al*., (2009)** found that flavonoids compounds of cinnamon are responsible for increasing the level of HDL and decreasing in LDL and VLDL concentration in hypercholesterolemic rats.

Effect of cinnamon and coriander as powder on uric acid, urea and creatinine of Hypercholesterolemic and diabetic rats:

The effect of cinnamon and coriander as powder on serum uric acid, serum urea and creatinine of Hypercholesterolemic and diabetic rats are shown in Table (5). It is clear to notice that the serum uric acid of positive control group recorded higher value when compared with negative control group with significant differences. The mean values were 8.73 and 5.97 mg/dl, respectively. On the other hand, the highest serum uric acid level of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder. While, the lowest value recorded for Hypercholesterolemic and diabetic group rats fed on 5% coriander powder with significant difference (P< 0.05), the mean values were 6.90 and 5.20 mg/dl, respectively. In case of serum urea,

data indicated that the positive control group recorded higher value when compared with negative control group with significant differences. The mean values were 33.80 and 23.31 mg/dl, respectively. On the other hand, the highest serum urea level of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder. While, the lowest value recorded for Hypercholesterolemic and diabetic group rats fed on 10 % coriander powder with significant difference ($P< 0.05$), the mean values were 26.10 and 18.43 mg/dl, respectively. On the other hand, serum creatinine of positive control group recorded higher value when compared with negative control group with significant differences. The mean values were 1.41 and 0.89 mg/dl, respectively. On the other hand, the highest serum creatinine level of treated group recorded for Hypercholesterolemic and diabetic group rats fed on 5% cinnamon powder. While, the lowest value recorded for Hypercholesterolemic and diabetic group rats fed on 10 % coriander powder with significant difference ($P< 0.05$), the mean values were 0.94 and 0.72 mg/dl, respectively. These results are in agreement with **Sayed (2012)** reported that an increase in serum urea, creatinine, uric acid, and urine albumin was disrupted by diabetes induction in the positive control group (G2). This result is consistent with the fact that STZ induced diabetes leads to diabetic nephropathy. Also, **Kumar *et al.*, (2014)** found that treated the diabetic rats with *L. sativum* and cinnamon, respectively, showed a significant decrease in serum urea, creatinine, uric acid, and urine albumin and increase in urine creatinine.

Table (1): Effect of cinnamon and coriander as powder on glucose levels of Hypercholesterolemic and diabetic rats

Treatment/Parameter	Glucose levels (mg/dl)
Control group (-)	91.50 ± 0.04^{f}
Control group (+)	222.78 ± 0.31^{a}
Group (3)	150.94 ± 0.10^{b}
Group (4)	114.91 ± 0.01^{d}
Group (5)	126.12 ± 0.32^{c}
Group (6)	103.55 ± 0.34^{e}

Each value is presented as mean ± standard deviation (n = 6).

Means under the same line bearing different superscript letters are different

significantly ($p < 0.05$).

Table (2): Effect of cinnamon and coriander as powder on liver function of Hypercholesterolemic and diabetic rats

Treatment/Parameter	ALT (U/L)	AST (U/L)	ALP (U/L)
Control group (-)	41.43±0.01^{c}	31.96±0.31^{d}	38.20±0.04^{d}
Control group (+)	93.68±0.03^{a}	84.77±0.02^{a}	72.96±0.01^{a}
Group (3)	44.06±0.20^{c}	46.99±0.01^{b}	42.91±0.01^{c}
Group (4)	52.20±0.01^{b}	50.03±0.04^{b}	56.68±0.06^{b}
Group (5)	40.71±0.05^{c}	41.78±0.20^{c}	50.30±0.31^{b}
Group (6)	33.94±0.10^{d}	37.52±0.03^{c}	42.09±0.14^{c}

Each value is presented as mean ± standard deviation (n = 6).

Means under the same line bearing different superscript letters are different significantly ($p < 0.05$).

Table (3): Effect of cinnamon and coriander as powder on serum total cholesterol and triglycerides of Hypercholesterolemic and diabetic rats

Treatment/Parameter	Total cholesterol (mg /dl)	Triglycerides (mg /dl)
Control group (-)	69.08±0.12^{d}	62.20±0.05^{c}
Control group (+)	155.85±0.01^{a}	125.89±0.02^{a}
Group (3)	96.91±0.11^{b}	85.39±0.20^{b}
Group (4)	85.81±0.03^{c}	70.84±0.03^{c}
Group (5)	65.42±0.02^{d}	55.52±0.04^{d}
Group (6)	58.52±0.14^{e}	52.60±0.12^{d}

Each value is presented as mean ± standard deviation (n = 6).

Means under the same line bearing different superscript letters are different significantly ($p < 0.05$).

Table (4): Effect of cinnamon and coriander as powder on(HDL_{-C}), (LDL_{-C}) and ($VLDL_{-C}$) of Hypercholesterolemic and diabetic rats

Treatment/Parameter	(HDL_{-C}) (g/dl)	LDL_{-C}) (g/dl)	($VLDL_{-C}$) (g/dl)
Control group (-)	53.19 ± 0.01^{a}	28.33 ± 0.20^{d}	12.44 ± 0.01^{d}
Control group (+)	33.67 ± 0.11^{d}	147.36 ± 0.15^{a}	25.18 ± 0.30^{a}
Group (3)	39.79 ± 0.03^{c}	74.20 ± 0.10^{b}	17.08 ± 0.02^{b}
Group (4)	46.84 ± 0.05^{b}	53.14 ± 0.02^{c}	14.17 ± 0.01^{c}
Group (5)	45.92 ± 0.21^{b}	30.60 ± 0.51^{d}	11.10 ± 0.41^{d}
Group (6)	50.48 ± 0.10^{a}	18.56 ± 0.01^{e}	10.52 ± 0.10^{d}

Each value is presented as mean ± standard deviation ($n = 6$).

Means under the same line bearing different superscript letters are different significantly ($p < 0.05$).

Table (5): Effect of cinnamon and coriander as powder on uric acid, urea and creatinine of Hypercholesterolemic and diabetic rats

Treatment/Parameter	Uric acid (mg/dl	Urea (mg/dl)	Creatinine (mg/dl)
Control group (-)	5.97 ± 0.21^{c}	23.31 ± 0.23^{c}	0.89 ± 0.03^{c}
Control group (+)	8.73 ± 0.03^{a}	33.80 ± 0.01^{a}	1.41 ± 0.02^{a}
Group (3)	6.90 ± 0.01^{b}	26.10 ± 0.04^{b}	0.94 ± 0.06^{b}
Group (4)	6.52 ± 0.11^{b}	21.61 ± 0.12^{c}	0.86 ± 0.41^{c}
Group (5)	5.20 ± 0.23^{d}	19.40 ± 0.02^{d}	0.79 ± 0.01^{d}
Group (6)	5.34 ± 0.05^{d}	18.43 ± 0.14^{d}	0.72 ± 0.13^{d}

Each value is presented as mean ± standard deviation ($n = 6$).

Means under the same line bearing different superscript letters are different significantly ($p < 0.05$).

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تأثير القرفة والكزبرة على الفئران المصابة بأرتفاع الكوليستيرول والسكر

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الملخص العربى

تم فى هذه الدراسة تقييم تأثير تركيزات مختلفة (5 ، 10٪) من القرفة والكزبرة كمسحوق على تحسين صورة الدهون فى الفئران المصابة بأرتفاع الكوليستيرول والسكر. وتم استخدام عدد 36 فأر من نوع الألبينو من الذكور وقسمت إلى 6 مجموعات، كل مجموعة (6) فئران .مجموعة ضابطة سالبة وتم تغذيتها على الغذائ القياسى . بينما باقى المجاميع المصابة بأرتفاع الكوليستيرول والسكر بواسطة الكوليستيرول والألوكسان (150 ملجم / كجم) من وزن الجسم إحداها استخدمت كمجموعة ضابطة موجبة، باقى المجموعات المصابة اضيفت لها مسحوق القرفة والكزبرة .وأظهرت النتائج وجود فروق معنوية بين المجموعة الضابطة السالبة والمجموعة الضابطة الموجبة. أقل مستوى للجلوكوز من المجموعة المعالجة سجلت مع الفئران التى تغذت على 10٪ مسحوق الكزبرة .في حين سجلت أعلى قيمة لمجموعة الفئران التي تغذت على 5٪ مسحوق القرفة مع وجود فروق معنوية ، حيث كان متوسط القيم 103,55، 150,94 ملجم / ديسيلترعلى التوالي. أقل قيم من إنزيمات وظائف الكبد (ALT,AST, ALP) من المجموعة المعالجة سجلت مع مجموعة الفئران التى تغذت على 10٪ مسحوق الكزبرة .في حين سجلت أعلى قيمة مع مجموعة الفئران التي تغذت على مسحوق القرفة بنسبة 10٪ مع وجود فروق معنوية .أقل نسبة من الكوليسترول الكلي والدهون الثلاثية للمجموعة المعالجة سجلت مع مجموعة الفئران التي تغذت على 10٪ مسحوق الكزبرة في حين سجلت أعلى قيمة مع مجموعة الفئران التي تغذت على 5٪ مسحوق القرفة مع وجود فروق معنوية ، حيث كان متوسط القيم 58,52 ، 96,93 ، 52,60 ، 85,39 ملجم / ديسيلتر على التوالي .أعلى قيم من البروتين عالى الكثافة سجلت مع مجموعة الفئران التي تغذت على 10٪ مسحوق الكزبرة .

بينما سجلت أقل قيمة مع مجموعة الفئران التي تغذت على مسحوق القرفة بنسبة 5٪ مع وجود فروق معنوية .أقل قيم من البروتين منخفض الكثافة ومنخفض الكثافة جدا سجل مع مجموعة الفئران التى تغذت على 10٪ مسحوق الكزبرة .في حين أعلى قيمة سجلت مع مجموعة الفئران التى تغذت على مسحوق القرفة 5٪ مع وجود فروق معنوية. أعلى قيم لمستوى حمض اليوريك واليوريا والكرياتينين من مجموعة الفئران المعالجة سجل مع مجموعة الفئران التي تغذت على10٪ مسحوق القرفة. في حين أقل قيمة مع المجموعة التي تغذت على 5٪ مسحوق الكزبرة مع وجود فروق معنوية.

الكلمات الأفتتاحية: التوابل **.** الفئران . السكر . الكوليسترول . التحاليل الكيميائية الحيوية