البحث رقم (٤)

# Anti-diabetic Effect of Cinnamon and Cloves oils in Alloxan-Induced Diabetic Rats

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**Abstract**

Diabetes is the world's largest endocrine disease associated with increased morbidity and mortality rate. Diabetes mellitus (DM) comprises a group of common metabolic disorders characterized by hyperglycemia. The effect of different concentrations (0.25 and 0.5%) of cinnamon oil, cloves oil and their mixture on diabetic rats was evaluated. Forty eight male Albino rats were used in this study and divided into 8 groups, each group contain 6 rats. Rats were treated by alloxan (150mg/kg B.W) to induced diabetic. Serum liver functions (ALT, GOT, and GPT), total cholesterol, triglycerides, lipoprotein fraction (HDL-c, LDL-c, VLDL-c), glucose level, kidney functions (urea, uric acid and creatinine) were determined, Data from diabetic rats revealed that the 0.5 % mixture oils (cinnamon and cloves) showed significant changes in the tested biochemical parameters. As conclusion, diabetic rats treated with 0.5% mixture oils powders had significantly improvement glucose level, lipid profile, liver and kidney functions compared with other concentrations.

**Key words:** Spices oil, Rats, Anti-diabetic and Biochemical analysis.



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## 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)**.



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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).**

Cinnamon is the bark of the *Cinnamon cassiae*, it contain cinnamon anhydride, tannin, cinnamic acid and methyl-hydroxychalcone polymer (MHCP) etc. Cinnamon has a long history as an anti-diabetic spice, but trials involving cinnamon supplementation have produced contrasting results **(Kirkham *et al.*, 2009)**.

Cinnamon is mainly used in the aroma and essence industries due to its fragrance, which can be incorporated into different varieties of foodstuffs, perfumes, and medicinal products. The most important constituents of cinnamon are cinnamaldehyde and *trans*-cinnamaldehyde (Cin), which are present in the essential oil, thus contributing to the fragrance and to the various biological activities observed with cinnamon **(Goni *et al.*, 2009)**.

**Raol and Gan, (2014)** mentioned that cinnamon has been used as a spice in daily life without any side effects. Several reports have dealt with the numerous properties of cinnamon in the forms of bark, essential oils, bark powder, phenolic compounds, flavonoids, and isolated components. Each of these properties plays a key role in the advancement of human health. The



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antioxidant, antimicrobial activities and anti-diabetic activities occur indirectly via receptor-mediated mechanisms. The significant health benefits of numerous types of cinnamon have been explored.

**Mang *et al*., (2006)** show that cinnamon extract seems to have a moderate effect in reducing fasting plasma glucose concentrations in diabetic patients with poor glycaemic control.

Clove belongs to a tree Eugenia caryophyllata (*Syzygium aromaticum*), is used as a spice in almost all the world's fare. Bud Oil of Clove has natural behavior and the main properties include antioxidant, insecticidal, antifungal and antibacterial properties. By tradition, it has been used in food preservation as flavoring and antimicrobial sub-stance **(Velluti *et al.*, 2003)**.

## Material and Methods

### Materials:

Cinnamon (*Cinnamon zeylanicum*) and Cloves (*Syzygium aromaticum*) oil were obtained from local market, Shibin El-Kom City, Menoufia Governorate, Egypt.

### 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.



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**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 48 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 Chemical, Drug and Instruments, Cairo, Egypt.

**Methods:**

**Experimental design:**

Forty eight 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 fed on basal diet as negative control. Group (2): 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 diabetic fed on cinnamon oil by 0.25% of the weight of basal diet. Group (4): A group infected diabetic fed on cinnamon oil by 0.5% of basal

diet. Group (5): A group infected diabetic fed on cloves oil by 0.25 % of basal diet. Group (6): A group infected diabetic fed on cloves oil by 0.5 % of basal diet. Group (7): A group infected diabetic fed on mixture of cinnamon and cloves oil by 0.25 % of basal diet. Group (8): A group infected diabetic fed on mixture of cinnamon and cloves oil by 0.5% 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 experiments. 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)**.



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**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)** 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**

**Determination of total lipids:**

Determination of total lipids in serum was colorimetrically determined according to **Schmitt and Drevon (1964)**.



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**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:**

Serum urea and serum creatinin were determinated by enzymatic method according to **(Henry (1974)** and **Patton & Crouch 1977)**.

**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

Data given in Table (1) show the changes of body weight, feed intake and feed efficiency ratio of diabetic rats fed diet supplemented with cinnamon, cloves oils and their mixture. The obtained results showed that the body weight gain (BWG) g/28 day of negative control recorded the higher


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value when compared with positive control with significant difference. The mean values were 23.60 and 22.31 g/28 day, respectively. From diabetic rat groups, it is clear to notice that the highest (BWG) % recorded for 0.25 % cinnamon oil, while the lowest BWG% recorded for 0.25 % cloves oil with significant difference. The mean values were 26.37 and 16.99 g/28 day, respectively.

In case of feed intake, it could be notice that the feed intake (FI) g/ day of positive control recorded the higher value when compared with negative control with significant difference. The mean values were 18.46 and 18.39 g/ day, respectively. While, 0.25 % cinnamon oil recorded the higher FI while the lowest value recorded for 0.25 % cloves oil with significant difference. The mean values were 20.29 and 16.07 g/ day, respectively.

On the other hand, feed efficiency ratio (FER) of negative positive control recorded the higher value when compared with positive control with significant difference. The mean values were 0.046 and 0.043 %, respectively. In case of treated rat groups, it clear to mention that 0.5 % cinnamon oil recorded the higher FER while, the lower value recorded for 0.25% cloves oil and 0.5% mixture oils. The mean values were 0.057 and 0.038 %, respectively. These results are in agreement with **Kota *et al.*, (2012)**, they found that there were an association between hyperglycemia and decrease body weight of diabetic animals, diabetes induced reduction in body weight, and the body's inability to store or use glucose causes hunger and weight loss.



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Data presented in Table (2) show the effect of cinnamon oil, cloves oils and their mixture on glucose levels of diabetic rats. The obtained results indicated that the highest glucose level recorded for positive control group, while the lowest level recorded for negative control group with significant differences. The mean values were 230 and 108 mg/dl, respectively. On the other hand, rats fed on 0.5 % mixture oils recorded the lower glucose level with significant differences being, 97.53 mg/dl. While, the higher glucose level in diabetic rats recorded for 0.25 % cloves oil with significant differences. The value was 124.5 mg/dl. It could be concluded that increasing mixture oils levels showed highest reduction in glucose level. These results are in agreement with **Ping *et al.*, (2010)** they reported that administrated at doses of 25, 50 and 100 mg/Kg of cinnamon oil for 35 days blood glucose concentration was significantly decreased ($p$<0.05) with the 100 mg/Kg group ($p$<0.01) compared to diabetic control group.

Data tabulated in Table (3) show the effect of cinnamon oil, cloves oils and their mixture on (ALP), (GOT) and (GPT) of diabetic rats. The obtained results indicated that the ALT liver enzyme of positive control rats group recorded the higher value when compared with negative control group with significant difference. The mean values were 175.0 and 93.0 U/L, respectively. While, the higher ALT liver enzyme of treated group recorded for group fed on 0.25 % cinnamon oil but, the lowest value recorded for group fed on 0.5% mixture oils with significant difference. The mean values were 133.0 and 87.0 U/L, respectively.



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On the other hand, GOT liver enzyme of positive control rats group recorded the higher value when compared with negative control group with significant difference. The mean values were 54.82 and 8.22 U/L, respectively. While, the highest GOT liver enzyme of treated group recorded for group fed on 0.25 % cinnamon oil fruits but, the lowest value recorded for group fed on 0.5% mixture oils with significant difference. The mean values were 38.4 and 11.21 U/L, respectively.

In case of GPT liver enzyme of positive control rats group recorded the higher value when compared with negative control group with significant difference. The mean values were 19.70 and 5.50 U/L, respectively. While, the highest GPT liver enzyme of treated group recorded for group fed on 0.5 % cinnamon oil but, the lowest value recorded for group fed on 0.5% mixture oils with significant difference. The mean values were 9.93 and 5.0 U/L, respectively. These results are in agreement with, they reported that **Longe *et al.*, (2015)**, they found that the extract of cinnamon oil caused significant decrease ($P<0.05$) in the activity of AST, ALT and ALP values.

The effect of cinnamon oil, cloves oils and their mixture on the serum lipid profiles of diabetic rats are shown in Table (4). The obtained results indicated that the triglyceride of positive control group recorded the higher value when compared with negative control group with significant difference. The mean values were 221.2 and 81.30 mg/dl, respectively. While, the lowest triglyceride recorded for group fed on 0.25 % cinnamon oils while the higher value recorded for 0.5% mixture oils with significant


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difference. The mean values were 159.10 and 69.50 mg/dl, respectively. In the other hand, the cholesterol levels of positive control group recorded the higher value when compared with negative control group with significant difference. The mean values were 97.0 and 63.5 mg/dl, respectively. While, the lowest cholesterol levels recorded for group fed on 0.5 % mixture oils while the higher value recorded for 0.5% cinnamon oil with significant difference. The mean values were 64.6 and 82.6 mg/dl, respectively. These results are in agreement with **Blevins *et al.*, (2007)**, they reported that cinnamon extract lowered plasma TC, TG, LDL-C levels and increase HDL-C concentrations in the treated rats, and this could account for its use in traditional medicine for the treatment of diabetes and hypertension.

Data presented in Table (5) show the effect of cinnamon oil, cloves oils and their mixture on the serum lipid profiles of diabetic rats. The results indicated that the HDL-c of negative control rats group recorded the higher value when compared with positive control group with significant difference. The mean values were 53.30 and 23.30 mg/dl, respectively. While, the higher HDL-c of treated group recorded for group fed on 0.5 % mixture oils but, the lowest value recorded for group fed on 0.25% cinnamon oil with significant difference. The mean values were 41.0 and 27.30 mg/dl, respectively.

On the other hand, the LDL-c of positive control rats group recorded the higher value when compared with negative control group with significant difference. The mean values were 29.06 and 13.94 mg/dl, respectively. While, the highest LDL-c of treated group recorded for group fed on 0.25%



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cinnamon oil but, the lowest value recorded for group fed on 0.5% mixture oils with significant difference. The mean values were 11.48 and 4.50 mg/dl, respectively.

In case of VLDL-c, the positive control rats group recorded the highest value when compared with negative control group with significant difference. The mean values were 44.64 and 16.26 mg/dl, respectively. While, the higher VLDL-c of treated group recorded for group fed on 0.25% cinnamon oil but, the lowest value recorded for group fed on 0.5% mixture oils with significant difference. The mean values were 33.82 and 29.10 mg/dl, respectively. These results are in agreement with **Al Logmani and Zari, (2011)**, they reported that clove oil exhibited remarkably ameliorated effects; there were an improvement in cholesterol, TAG, LDL and HDL levels in both doses when compared with untreated diabetic group. On the other hand the mean values of lipid profile decrease gradually by increasing the doses of clove oil.

Data presented in Table (6) show the effect of cinnamon oil, cloves oils and their mixture on urea, uric acid and creatinine of diabetic rats. The obtained results indicated that the urea level of positive control rats group recorded the higher value when compared with negative control group with significant difference. The mean values were 73.65 and 42.2 mg/dl, respectively. While, the higher urea level of treated group recorded for group fed on 0.25% cinnamon oil but, the lowest value recorded for group fed on



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0.5% mixture oils with significant difference. The mean values were 58.27 and 46.25 mg/dl, respectively.

On the other hand, the uric acid level of positive control rats group recorded the higher value when compared with negative control group with significant difference. The mean values were 4.97 and 2.11 mg/dl, respectively. While, the higher uric acid level of treated group recorded for group fed on 0.25% cinnamon oil but, the lower value recorded for group fed on 0.5% mixture oils with significant difference. The mean values were 3.77 and 1.95 mg/dl, respectively.

In case of creatinine, the level of positive control rats group recorded the higher value when compared with negative control group with significant difference. The mean values were 1.13 and 0.87 mg/dl, respectively. While, the highest creatinine level of treated group recorded for group fed on 0.25 % cloves oil but, the lower value recorded for group fed on 0.5% mixture oils with significant difference. The mean values were 0.99 and 0.89 mg/dl, respectively. These results are in agreement with **Hassanen, (2010)**, they reported that 300 and 600 mg/kg of clove oil showed significant decrease in the levels of serum creatinine and urea as compared to untreated diabetic rats. The mean values of serum creatinine and urea were decrease gradually with increasing the dose of clove oil.



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**Table (1): Effect of cinnamon and cloves oil and their mixture on body weight, feed intake and feed efficiency ratio of diabetic rats**

| Groups | BWG (g/28 day) | FI (g/day) | FER (%) |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | Mean ± SD |
| G1 control (-) | $23.60^{c}$ ±0.40 | $18.39^{b}$± 0.70 | $0.046^{d}$ ± 0.07 |
| G2 Control (+) | $22.31^{d}$ ±0.20 | $18.46^{b}$ ± 0.60 | $0.043^{d}$ ± 0.02 |
| G3+ 0.25% cinnamon oil | $27.37^{a}$ ±0.80 | $20.29^{a}$ ±1.00 | $0.048^{c}$ ± 0.05 |
| G4 +0.5% cinnamon oil | $25.78^{b}$± 0.60 | $16.21^{c}$ ±0.20 | $0.057^{a}$±0.03 |
| G5 + 0.25% cloves oil | $16.99^{f}$ ±0.90 | $16.07^{c}$ ± 0.50 | $0.038^{e}$ ±0.04 |
| G6 + 0.5% cloves oil | $20.46^{e}$ ±0.50 | $18.96^{b}$ ±0.70 | $0.039^{e}$±0.08 |
| G7+ 0.25% Mixture oil | $20.80^{e}$ ±0.30 | $19.29^{a}$ ±0.40 | $0.039^{e}$±0.05 |
| G8+0.5% Mixture oil | $20.50^{e}$ ±0.60 | $19.46^{a}$ ±0.50 | $0.038^{e}$±0.04 |
| LSD P≤0.05 | 1.092 | 1.18 | 0.009 |

BWG=Body weight gain, FI=Feed intake, FER =Feed efficiency ratio.
Each value is represented as mean ± standard deviation ($n$ = 3).
Mean with the same letters in the same horizontal column are not significantly different at P≤0.05.



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**Table (2): Effect of Effect of cinnamon and cloves oil and their mixture on glucose level of diabetic rats**

| Groups | Glucose (mg/dl) |
|---|---|
| G1 control (-) | $108^{d} \pm 0.70$ |
| G2 Control (+) | $230^{a} \pm 1.10$ |
| G3+ 0.25% cinnamon oil | $111.7^{d} \pm 0.50$ |
| G4 +0.5% cinnamon oil | $115.2^{c} \pm 0.80$ |
| G5 + 0.25% cloves oil | $124.5^{b} \pm 0.90$ |
| G6 + 0.5% cloves oil | $119.0^{c} \pm 0.40$ |
| G7+ 0.25% Mixture oil | $109.21^{d} \pm 0.80$ |
| G8+0.5% Mixture oil | $97.53^{e} \pm 0.90$ |
| LSD P≤0.05 | 4.53 |

Each value is represented as mean ± standard deviation ($n$ = 3).

Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$).

**Table (3): Effect of cinnamon and cloves oil and their mixture on (ALP), (GOT) and (GPT) of diabetic rats**

| Groups | (ALT) U/L | (GOT) U/L | (GPT) U/L |
|---|---|---|---|
| G1 control (-) | $93^{f} \pm 1.70$ | $8.22^{g} \pm 1.10$ | $5.50^{f} \pm 0.80$ |
| G2 Control (+) | $175^{a} \pm 0.90$ | $54.82^{a} \pm 1.35$ | $19.70^{a} \pm 0.40$ |
| G3+ 0.25% cinnamon oil | $133^{b} \pm 2.10$ | $38.4^{b} \pm 2.05$ | $8.20^{c} \pm 1.20$ |
| G4 +0.5% cinnamon oil | $121^{c} \pm 0.50$ | $30.0^{c} \pm 0.60$ | $9.93^{b} \pm 0.90$ |
| G5 + 0.25% cloves oil | $103^{d} \pm 1.10$ | $26.15^{d} \pm 1.25$ | $7.81^{c} \pm 0.50$ |
| G6 + 0.5% cloves oil | $97^{e} \pm 0.80$ | $16.21^{e} \pm 0.90$ | $7.4^{d} \pm 0.60$ |
| G7+ 0.25% Mixture oil | $95^{e} \pm 0.30$ | $15.21^{e} \pm 0.90$ | $7.0^{e} \pm 0.60$ |
| G8+0.5% Mixture oil | $87^{g} \pm 0.50$ | $11.21^{f} \pm 0.90$ | $5.0^{f} \pm 0.60$ |
| LSD P≤0.05 | 2.3 | 2.23 | 1.15 |

Each value is represented as mean ± standard deviation ($n$ = 3).
Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$).



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**Table (4): Effect of cinnamon and cloves oil and their mixture on serum cholesterol and triglyceride of diabetic rats**

| Groups | TG (mg/dl) | TC (mg/dl) |
|---|---|---|
| | Mean ± SD | Mean ± SD |
| G1 control (-) | 81.3±2.61$^{h}$ | 63.5±2.28$^{f}$ |
| G2 Control (+) | 223.2±2.83 $^{a}$ | 97.0±3.69$^{a}$ |
| G3+ 0.25% cinnamon oil | 169.1±2.83$^{b}$ | 82.6±3.41$^{b}$ |
| G4 +0.5% cinnamon oil | 153.5±3.16$^{c}$ | 75.6±3.35$^{c}$ |
| G5 + 0.25% cloves oil | 145.9±3.22$^{d}$ | 74.6±3.35$^{c}$ |
| G6 + 0.5% cloves oil | 135.9±3.30$^{e}$ | 70.0±3.35$^{d}$ |
| G7+ 0.25% Mixture oil | 115.9±3.15$^{f}$ | 67.5±2.61$^{e}$ |
| G8+0.5% Mixture oil | 95.5±3.23$^{g}$ | 64.6±1.30$^{f}$ |
| LSD P≤0.05 | 3.67 | 1.27 |

Each value is represented as mean ± standard deviation ($n$ = 3).
TG= Triglyceride. TC= Total Cholesterol,
Mean with the same letters in the same horizontal column are not significantly different at P≤0.05

**Table (5): Effect of cinnamon and cloves oil and their mixture on the serum lipid profiles of diabetic rats**

| Groups | HDL-C (mg/dl) | LDL-C (mg/dl) | ($VLDL_C$) (mg/dl) |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | Mean ± SD |
| G1 control (-) | 53.3±2.61$^{a}$ | 13.94±3.16$^{b}$ | 16.26$^{a}$± 0.69 |
| G2 Control (+) | 23.3±3.16$^{f}$ | 29.06±2.28 $^{a}$ | 44.64$^{a}$± 1.20 |
| G3+ 0.25% cinnamon oil | 27.3±2.99 $^{e}$ | 11.48±2.98 $^{b}$ | 33.82$^{b}$ ± 1.72 |
| G4 +0.5% cinnamon oil | 28.5±3.42 $^{e}$ | 8.30±2.28 $^{c}$ | 30.70$^{b}$ ± 0.90 |
| G5 + 0.25% cloves oil | 35.0±2.20$^{d}$ | 5.72±2.28$^{c}$ | 29.18$^{c}$±2.20 |
| G6 + 0.5% cloves oil | 38.5±2.31$^{c}$ | 2.32±2.13$^{d}$ | 27.18$^{c}$±4.50 |
| G7+ 0.25% Mixture oil | 34.1±2.42$^{d}$ | 10.22±1.16$^{b}$ | 23.18$^{e}$±2.10 |
| G8+0.5% Mixture oil | 41.0±2.53$^{b}$ | 4.50±1.10$^{c}$ | 19.10$^{f}$±2.10 |
| LSD P≤0.05 | 2.63 | 3.02 | 3.01 |

HDL-C= High density lipoprotein Cholesterol. LDL =Low density lipoprotein Cholesterol
Each value is represented as mean ± standard deviation ($n$ = 3).
Mean with the same letters in the same horizontal column are not significantly different at P≤0.05



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**Table (6): Effect of cinnamon and cloves oil and their mixture on kidney functions of diabetic rats**

| Treatments / Groups | Urea (mg/dl) | Uric acid (mg/dl) | Serum creatinine (mg/dl) |
|---|---|---|---|
| **G1 control (-)** | $42.20^{f} \pm 2.10$ | $2.11^{c} \pm 0.20$ | $0.87^{a} \pm 0.577$ |
| **G2 Control (+)** | $73.65^{a} \pm 3.20$ | $4.97^{a} \pm 0.90$ | $1.13^{a} \pm 0.115$ |
| **G3+ 0.25% cinnamon oil** | $58.27^{b} \pm 0.90$ | $3.77^{b} \pm 0.20$ | $0.99^{a} \pm 0.025$ |
| **G4 +0.5% cinnamon oil** | $50.96^{c} \pm 1.60$ | $2.60^{c} \pm 0.30$ | $0.94^{a} \pm 0.177$ |
| **G5 + 0.25% cloves oil** | $52.27^{c} \pm 0.20$ | $3.50^{b} \pm 0.20$ | $1.03^{a} \pm 0.105$ |
| **G6 + 0.5% cloves oil** | $48.10^{d} \pm 0.50$ | $2.40^{c} \pm 0.30$ | $0.96^{a} \pm 0.020$ |
| **G7+ 0.25% Mixture oil** | $46.25^{d} \pm 0.50$ **3.24** | $2.27^{c} \pm 0.60$ **1.26** | $0.92^{a} \pm 0.010$ 2.14 |
| **G8+0.5% Mixture oil** | $44.20^{e} \pm 0.20$ | $1.95^{c} \pm 1.10$ | $0.89^{a} \pm 0.030$ |
| **LSD P≤0.05** | **3.36** | **1.08** | **0.31** |

Each value is represented as mean ± standard deviation ($n$ = 3).

Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$).



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# التأثير المضاد للسكر لزيت القرفة والقرنفل فى الفئران المصابة بالسكر بتأثير الألوكسان

**رهام البدراوى عبد الوهاب زهران**
**أخصائى تغذية بمستشفى نور الشروق – القاهرة**

**الملخص العربى**

مرض السكر هو أكبر مرض في الغدد الصماء في العالم مرتبط بزيادة معدل المراضة والوفيات. يحتوي مرض السكري (DM) على مجموعة من الاضطرابات الأيضية الشائعة التي تتميز بارتفاع السكر في الدم. تم تقييم تأثير تركيزات مختلفة (٠,٢٥ , ٠,٥ ٪) من زيت القرفة ، زيت القرنفل ومزيجها على الفئران المصابة بمرض السكر. تم استخدام ٤٨ من ذكور الفئران البيضاء في هذه الدراسة وتم تقسيمها إلى ٨ مجموعات ، كل مجموعة تحتوي على ٦ فئران. تم إصابة الفئران بواسطة مادة الألوكسان بتركيز ١٥٠ مجم /كجم من وزن الفأر. تم تقدير وظائف الكبد ( ALT، GOT، GPT)، الكوليسترول الكلي ، الدهون الثلاثية ، ( HDL–c، LDL–c، VLDL–c)، مستوى الجلوكوز ، وظائف الكلى (اليوريا ، حمض اليوريك والكرياتينين) ، اظهرت النتائج المتحصل عليها من الفئران المصابة بالسكر أن مخلوط الزيوت بتركيز ٠,٥ ٪ (القرفة والقرنفل) أظهرت تغييرات كبيرة في التحاليل الكيميائية الحيوية. كما استنتجت الفئران المصابة بمرض السكر التي تمت معالجتها بمخلوط الزيوت بنسبة ٠.٥أدى إلى تحسن ملحوظ في مستوى الجلوكوز ، وصورة دهون الدم ، وظائف الكبد والكلى مقارنة بالتركيزات الأخرى.

**الكلمات الكاشفة:** زيوت التوابل ـ الفئران . التأثير المضاد للسكر . التحاليل الكيميائية الحيوية.