EFFECT OF DILL (*ANETHUM GRAVEOLENS*) AND PARSLEY (*PETROSELENIUM CRISPUM*) ESSENTIAL OILS ON DIABETIC RATS

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Abstract

In an attempt for utilization of Dill (*Anethum graveolens*) and Parsley (*Petroselenium crispum*) essential oils because of their flavoring and antioxidative activity. The aim of the study is to investigate the effect of essential oils as anti-diabetic or anti-hyperglycemic on the occurrence of oxidative stress in serum of induced diabetic rats by measuring the extent of oxidative damage as well as the status of the antioxidant defense system. Albino rats weighing (140-160gm) were injected with STZ (50 mg/kg) intraperitoneally for induction of diabetes mellitus. Rats were divided into 11 groups (each 6 rats) of non-diabetic, diabetic non-treated and diabetic treated rats with essential oils and its mixtures. After 6 weeks, the diabetic rats fed on essential oils significantly decreased levels of blood glucose and significantly increased insulin level. The treatment also resulted in a significant improvement in lipid profile. However, a significant increment in the activity of reduced glutathione was observed in blood of diabetic rats treated with all of essential oils and its mixtures. Since the study of induction of the redox enzymes is considered to be a reliable marker for evaluating the anti-peroxidative efficacy of the essential oils, these findings suggest a possible anti-peroxidative role derived from such essential oils.

Key words: Dill, Parsley essential oils and mixtures, diabetes, lipid profile.

INTRODUCTION

Free radicals may be involved in several pathologic conditions. Oxidation of LDLs plays an important role in the development of atherosclerosis. Free radicals are apparently involved at different stages of cancer development. Free radicals may contribute to autoimmune destruction of β-cells, leading to diabetes, and may impair insulin action *(Ceriello, 2000).* Diabetes mellitus (DM) is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin metabolism and impaired function in carbohydrate, lipid and protein metabolism that leads to long-term complications. Although the pharmacological treatment of DM is based on oral hypoglycemic agents and insulin injection, in rural parts of worldwide societies traditional remedies are frequently employed. Also in Turkey, many types of plant

extracts are widely used as a folk remedy to reduce hyperglycemia *(A*ylin *et. al. 2007).*

The essential oils may prove useful in the battle against insulin resistance and type 2 diabetes mellitus. Safety wise, essential oils have been in the food chain for centuries, and various oils have been in the market as therapeutic agents for years without the occurrence of significant adverse health effects. Accordingly some essential oils may be added to the long list of natural products that can affect insulin sensitivity, thus essential oils may have a beneficial duel therapeutic role of being antidiabetic *(Talpur et. al. , 2005).*

THE AIM OF THE INVESTIGATION

Study the effect of the essential oils of dill and parsley herbs in reducing the level of blood glucose of STZ induced diabetic rats.

MATERIALS AND METHODS

Herbs: Dill plant (*Anethum graveolens*) and Parsley plant (*Petroselenium crispum*) were obtained from Pharmaceutical Science Laboratory, National Research Center, Giza, Egypt.

Streotozotocin (STZ): was obtained from Sigma, St. Louis, MO, USA.

Citric acid anhydrous: was obtained from Sigma-Aldrich Chemie GmbH, Riedstr Co., Switzerland.

Tri sodium citrate A.R. ($Na_3C_6H_5O_7.2H_2O$): was obtained from Brixworth. Northants Co., United Kingdom.

Starch: was obtained from Edwic Co., Egypt.

Casein and Cellulose: were obtained from Edwic Co., Egypt.

Vitamins: were obtained from Roch vitamins and fine chemicals (USA).

Minerals: were obtained from Edwic Co., Egypt.

Adults male albino rats (140-160gm): were obtained from the animal house in Food Technology Research Institute, Agricultural Research Center, Giza, Egypt.

Kits (Total lipids, Triglycerides, Total cholesterol, high density lipoprotein, Insulin, Glutathione): were obtained from Biodiagnostic Co., Dokki, Giza, Egypt.

Biological experiments:

Experimental animals: Male albino rats Sprague Dawley strain (66 animals) weighing 140-160g provided from the animal house in Food Technology Research Institute, Agricultural Research Center, Giza, Egypt. Animals were housed in individual cages with screen bottoms and fed on basal diet for one week. It consisted of casein

10%, corn oil 10%, cellulose 5%, salt mixture 4%, vitamin mixture 1% and corn starch 70%. After feeding on basal diet for one week, rats were divided into two groups. The first group (6 rats) was fed on basal diet for another 6 weeks and was considered as positive control group (control A). The second group (60 rats) was injected intravenously by streptozotocin 50 mg/Kg body weight, was dissolved in 0.1 M fresh cold citrate buffer at pH 4.5 to induce hyperglycemia and then the whole group was fed on basal diet for 72 h. where hyperglycemia was developed. To ensure occurrence of diabetes in rats, blood sample was withdrawn after 72 h of injection. The diabetic group was divided into ten subgroups (6 rats each). The first one subgroup was continued to be fed on basal diet and considered as negative control group (control B). Other subgroups were fed on different diets according to the following scheme:

Group (1, 2 and 3): hyperglycemic rats' received basal diet and orally dill essential oil (100, 200 and 300 mg/kg of basal diet), respectively.

Group (4, 5 and 6): hyperglycemic rats' received basal diet and orally parsley essential oil (100, 200 and 300 mg/ kg of basal diet), respectively.

Group (7): hyperglycemic rats' received basal diet and orally dill and parsley essential oils mixture ((50mg + 50mg)/kg of basal diet)

Group (8): hyperglycemic rats' received basal diet and orally dill and parsley essential oils mixture ((100mg +100mg)/kg of basal diet)

Group (9): hyperglycemic rats' received basal diet and orally dill and parsley essential oils mixture ((150mg + 150mg)/kg of basal diet)

Blood sampling: The blood samples were collected before administration of each treatment (zero-time) and after 2, 4 and 6 weeks, from administration, blood samples were received from the retro-orbital plexus veins by a fine capillary glass tube into a clean centrifuged tube and left to clot at room temperature, blood samples were centrifuged at 3000 rpm for 10 min and the supernatant sera were then pipetted into epindorff tubes and kept frozen at -20^{o}C until analysis.

Analytical methods:

Determination of Glucose, Glutathione, Total lipids, Total cholesterol, HDL-cholesterol, LDL-Cholesterol, Very low density lipoprotein cholesterol (VLDL-C) and Triglycerides.

Determination of Insulin: The Biosource Europe S.A.,(B-1400 Nivelles, Belgium) INS-EASIA according to the procedure of *Temple et. al. , (1992)* is a solid phase Enzyme Amplified sensitivity Immunoassay performed on microtiterplates**.**

Statistical analysis: The collected data of biological examinations were statistically analyzed by the least significant differences (LSD) at the level 5% of probability procedure according to *Snedecor and Cochran (1980).*

RESULTS AND DISCUSSION

Biological evaluated of dill and parsley essential oils:

Body weight: This experiment was conducted to study the effect of dill or parsley and mixture of dill and parsley 1:1 essential oils on decreasing the rate of both serum glucose and serum cholesterol of experimental rats. The effect of administration of dill and parsley essential oils for a period of 6 weeks on body weight of rats and the results had been summarized in table (1).

Table 1. Effect of feeding with different experimental diets on body weight (gm) of rats.

Treatments	Body weight (gm)	
	Initial	Final
G1	$139.7^{a}\pm3.07$	$146.3^{b}\pm4.58$
G2	$139.0^{a}\pm2.05$	$128.7^{c}\pm3.84$
Dill essential oil		
G3	$139.7^{a}\pm3.47$	$151.3^{ab}\pm1.19$
G4	$139.0^{a}\pm2.05$	$156.7^{ab}\pm4.01$
G5	$139.0^{a}\pm1.70$	$160.3^{a}\pm2.23$
Parsley essential oil		
G6	$139.0^{a}\pm2.49$	$150.3^{ab}\pm1.19$
G7	$139.0^{a}\pm2.16$	$154.7^{ab}\pm2.23$
G8	$139.3^{a}\pm1.96$	$157.3^{a}\pm2.13$
Mix essential oil		
G9	$140.0^{a}\pm0.94$	$150.3^{ab}\pm2.76$
G10	$139.3^{a}\pm2.68$	$153.7^{ab}\pm1.96$
G11	$139.7^{a}\pm1.45$	$157.0^{a}\pm1.70$
LSD	8.179	10.42

Each value represents the mean ±S.E.

The mean value with different superscript alphabets in a column indicate significant differences ($P<0.05$) using LSD test.

As shown from the data in table (1) non significant differences were found between the body weight of rats (in grams) for normal control and all treatments at zero time. From second to six weeks the highest gain body weight was pronounced for all animal groups. Meanwhile, groups fed on dill and parsley essential oils gave significantly the highest increased in body weight compared to control group. This

might be due to increase of fed intake of these tested groups which had acceptable taste or flavor for the animals. The above mentioned data was found in harmony with the findings of *(Doaa, M., 2005).*

In this study, the characteristic loss of body weight associated with STZ induced diabetes is due to increased muscle wasting in diabetes *Shirwaikar et. al. , 2005).* A decreased in body weight was registered in the case of STZ diabetic control group rats while in the treated group the weight loss was reversed. The ability of the aqueous extract to protect body weight loss seems to be as a result of its ability to reduce hyperglycemia *(Singh et. al. , 2007).* Decreased body weight observed in diabetic rats is due to excessive breakdown of tissue proteins *(Ravi et. al. , 2004).*

In this study, administration of essential oils for 45 days caused an increase in body weights in the diabetic groups. In diabetic + parsley group, body weight did not change significantly. This may be as a result of the diuretic effect of parsley *(Ozlem et. al. , 2006).*

Serum glucose: Oxidative free radicals have been implicated in the pathogenesis of type-I diabetes mellitus. In addition, diabetic patients have significant defects of antioxidant protection, and it is believed that the metabolic disorders in type-I diabetes mellitus may be due to increasing cellular oxidative stress and reduced antioxidant protection *(Stefano et. al. , 1997).*

The antidiabetic action of essential oils seems to be mediated through: (i) stimulation of the pancreas to produce and recreate insulin, (ii) interference with dietary glucose absorption and (iii) insulin sparing action of the constituent bioactive compounds *(Srinivasan, 2005b).*

The results in table (2) showed that glucose level in the negative control (normal group) rat and diabetic rats formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300 ppm). Glucose level in blood serum in normal group (negative group) and diabetic group (positive group) were 99.33 and 289.0 mg/dL, respectively at zero time and non significant during experimental period (6 weeks). While, positive control group (diabetic control) was increased to 0.35% at the end of experimental period (45 days). On the other hand, after feeding group with diet formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300 ppm) were increased and all data were significant compared to diabetic diet during experimental period (6 weeks).

Table 2. Effect of feeding with different experimental diets on serum glucose (mg/dL) of rats.

Treatments	Weeks				X
	0	2	4	6	
Control (-)	99. 3^{c} ±1.45	100.3^{c} ±0.88	99.7^{c} ±1.20	98.7^{c} ±0.88	99.59^{I}
Control (+)	289^{A} ±1.15	288^{A} ±1.15	288.3^{A} ±1.20	288.0^{A} ±1.15	288.3^{A}
Dill essential oil					
Dill 100	288^{A} ±1.53	190.3^{F-J} ±4.91	172.0^{K-P} ±5.51	142.7^{U-Z} ±7.97	193.3^{D}
Dill 200	287.3^{A} ±1.45	193.7^{E-I} ±2.60	163.0^{O-S} ±8.66	136.0^{W-Z} ±4.62	189.6E
Dill 300	289^{A} ±2.08	186.3^{G-K} ±3.71	161.0^{O-T} ±10.69	127.3^{Za} ±5.24	184.3G
Parsley essential oil					
Parsley 100	288.7^{A} ±2.33	213.7^{BC} ±4.91	175.3^{J-O} ±6.17	151.0^{R-W} ±8.19	200.9B
Parsley 200	288.7^{A} ±1.76	196^{D-H} ±3.61	167.3^{L-Q} ±7.13	147.0^{T-X} ±5.20	193.2D
Parsley 300	288.7^{A} ±1.20	192.7^{E-I} ±3.18	164.0^{O-S} ±7.23	131.3^{XYZa} ±3.53	186.1F
Mix essential oil					
Mix 100	289^{A} ±1.86	193.7^{E-I} ±4.84	172.3^{K-P} ±5.93	149.0^{S-W} ±6.81	194.6C
Mix 200	289.3^{A} ±2.03	187^{G-K} ±6.36	166.0^{N-R} ±6.81	141.7^{V-Z} ±5.49	189.1E
Mix300	288.3^{A} ±1.53	180^{I-N} ±9.85	159.7^{O-T} ±5.55	119.0^{b} ±5.51	177.6H
X	271.4^{A}	192.8^{C}	171.7^{E}	148.3^{G}	

Each value represents the mean ±S.E.

The mean value with different superscript alphabets in a column indicate significant differences ($P<0.05$) using LSD test.

A=LSD between treatments was 47.837 and B=LSD between rows (weeks) was 39.68

Interaction between A x B was 15.80

Moreover, addition of dill, parsley and mixtures essential oils (1:1) at all concentrations serum glucose increased by (47.69-54.52 %) in different dill groups, (50.45-55.95 %) in different parsley groups and (48.49-58.82 %) in different mixtures essential oils (1:1) groups, at the end of experimental period (6 weeks). These results were in agreement with Ozlem *et. al.* , (2006), who mentioned that the observed significant increase in the level of blood glucose in STZ- induced diabetic rats, could be due to the destruction of pancreatic cells by streptozotocin. In other study, noted that parsley extract decreased blood glucose levels by facilitating glucose usage via extra-pancreatic ways (Yanardage *et. al.* , 2003). The decreased level of blood glucose may be due to the higher rate of glycolysis, probably by the high activity of hexokinase and phosphoglucomutase, two of the key enzymes of glycolysis which enhanced by some essential oil. Gray and Flatt (1999) who mentioned that coriander have evidenced the antidiabetic potential of coriander fruits in streptozotocin-induced diabetic mice and simulated insulin secretion thus enhance diabetic mice and it simulated insulin secretion, thus enhance the uptake and metabolism of glucose by muscles and simulate glycogenesis.

Insulin: Thus, the results in table (3) discussed the administration of normal (negative control), diabetic (positive control), dill, parsley and their mixture essential oils (1:1) at (100, 200 and 300 ppm). Data given in table (3) showed that the insulin in the group that received normal group was 42.02 mg/dL*,* the level of insulin in that group was significantly higher than diabetic group, which had insulin level 23.93 mg/dL. Other groups which received dill, parsley and mixture essential oils (1:1) were insignificantly higher than the diabetic group (positive group).Diabetes is a chronic metabolic disorder affecting a major proportion of the population worldwide. A sustained reduction in hyperglycemia will decrease the risk of developing microvascular diseases and reduce their complications *(Kim et. al. , 2006).* The conventional therapies for diabetes have many shortcomings like side effects and high rate of secondary failure. On the other hand herbal extracts are expected to have similar efficacy without side effects as that of conventional drugs. The present investigation reports the anti-diabetogenic and hypoglycemic effects of phenols rich fraction of essential oils on STZ induced diabetic rats. STZ injection resulted in diabetes mellitus, which is probably due to the destruction of β cells of islets of Langerhans as proposed by many authors *(Beppu et. al. , 2006).* It is generally accepted that SD is of IDDM type and MD is of NIDDM type *(Maiti et. al. , 2005).* This effect is being depicted by the high level of blood glucose in animals.

Serum reduced glutathione: The results in table (3) discussed the administration of normal (negative control), diabetic (positive control), dill, parsley and mixture

essential oils (1:1) at (100, 200 and 300 ppm). Data given in table (3) showed that the GSH in the group that received normal group was 28.21 mg/dL, the level of GSH in that group was significantly higher than diabetic group, which had GSH level 23.93 mg/dL. Other groups which received dill, parsley and mixture essential oils (1:1) were insignificantly higher than the diabetic group (positive group).

Table 3. Effect of feeding with different experimental diets on serum reduced glutathione (mg/dL) and insulin (mg/dL) of rats.

Treatments	reduced Glutathione	Insulin
G1	$28.21^{a}\pm0.216$	$42.02^{a}\pm0.21$
G2	$17.16^{h}\pm0.19$	$23.93^{k}\pm0.21$
Parsley essential oil		
G3	$18.35^{g}\pm0.167$	$28.63^{j}\pm0.18$
G4	$19.47^{e}\pm0.13$	$31.42^{g}\pm0.196$
G5	$20.72^{d}\pm0.13$	$33.44^{e}\pm0.15$
Dill essential oil		
G6	$18.79^{f}\pm0.107$	$29.89^{i}\pm0.126$
G7	$20.36^{d}\pm0.14$	$32.48^{f}\pm0.14$
G8	$22.46^{c}\pm0.119$	$36.71^{c}\pm0.119$
Mix essential oil		
G9	$20.71^{d}\pm0.095$	$30.50^{h}\pm0.207$
G10	$22.56^{c}\pm0.111$	$34.14^{d}\pm0.127$
G11	$24.43^{b}\pm0.12$	$38.54^{b}\pm0.24$
L.S.D.	0.3958	0.5194

Each value represents the mean of 6 rats at 0.05% $\pm$ S.E.

The mean value with different superscript alphabets in a column indicate significant differences ($P<0.05$) using LSD test.

Based on *Arun and Nalini (2002)* findings, GSH is a major non-protein thiol in living organisms which plays a central role in coordinating the body's antioxidant defense process. It is involved in the maintenance of normal cell structure and function, probably through its redox and detoxification reactions. GSH levels were lowered in diabetic rats and they were near normal on treatment of diabetic rats with dill, parsley or mixture essential oils (1:1). Due to that theory, the present study achieved that dill, parsley and mixture essential oils (1:1) represent hypoglycemic effect and increasing in GSH levels in treated groups. Thus current results

demonstrate that dill, parsley essential oils may play a protective role in human body. In addition, the obtained data were in the line with *Srinivansan, (2005a, b)* who mentioned that coriander essential oil has linalool as a predominate compound in the essential oil. This compound inhibited lipid preoxidation by endogenous antioxidant enzymes, superoxide dismutase, catalase, glutathione peroxidase and glutathione transferase .GSH acts as an antioxidant, functions as free radical scavenger and in the repair of radically caused biological damage (*Ananthan et. al. , 2004*), and its level reduced in diabetes mellitus. The decrease in GSH levels represents increased utilization due to oxidative stress *(Venkateswaran and Pari, 2003).* The elevated level of GSH protects cellular proteins against oxidation through the glutathione redox cycle and also directly detoxifies reactive oxygen species generated from exposure to STZ *(Latha and Pari, 2003).*

Serum total lipids: The serum total lipids values of rats fed on different diets under investigation during feeding period (6 weeks) are presented in table (4) .The results showed that the total lipids in normal group were 295.70 mg/dL and non significant differences compared to all treatments at zero time. Meanwhile, positive control group (diabetic control) was increased in total lipids to 28.94% at the end of experimental period (6 weeks).While, after feeding group with diet formulated with dill, parsley and mixtures essential oils (1:1) at all concentrations were increased and all data were significant compared to diabetic diet during experimental period (45 days). On the other hand, addition of dill, parsley and mixtures essential oils (1:1) at all concentrations increased total lipids to (12.64-7.56%) in different dill groups, (14.56-9.22%) in different parsley groups and (9.25-3.82%) in different mixtures essential oils (1:1) groups, at the end of experiment (6 weeks).

Serum Triglycerides (TG): Data in table (4) showed that the level of triglycerides in normal group rat and hyperglycemic rats supplemented with dill, parsley and mixtures essential oils. Triglycerides level in blood serum at zero time was 119.3 mg/dl and show non significant during the experimental period (6 weeks). Meanwhile, positive control group (diabetic control) was increased to TG 46-61 % at the end of experimental period (45 days). After feeding group with diet formulated with dill, parsley and mixtures (100, 200 and 300 ppm) essential oils were increased and all data were significant compared to positive control diet during experimental period (6 weeks).

On the other hand, addition of dill, parsley and mixtures essential oils at all concentrations increased TG by (7.51-3.03%) in different dill diabetic groups, (15.03-3.94%) in different parsley groups and (6.73-1.17%) in different mixtures groups, at the end of experiment (6 weeks). These results are also agree with those of *2001 Jafarnejad et. al. , 2008,* who found that administration of the essential oil of *dill*

(Anethum graveolens) at two different doses reduced the triglycerides levels by almost 42%.The increase of TG-rich lipoproteins that have been shown in diabetes could be a consequence of the reduction of lipoprotein lipase (LPL) activity due to its glycation and a dearangement in the lipid metabolism *(Pruneta-Deloche, et. al. , 2004).*

Serum total Cholesterol (TC): The obtained results tabulated in table (5), represented serum total cholesterol of rat normal group and diabetic rats fed on diet formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300ppm). TC level in blood serum in normal group (negative group) was 86.41mg/dL and non significant differences compared to all treatments. The results in table (5) did not show any significant differences between negative control groups during the experimental period (45 days).Meanwhile, positive control group (diabetic control) was increased to TC 54.9 % at the end of experimental period (45 days). On the other hand, after feeding group with diet formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300 ppm) were increased and all data were significant compared to diabetic diet during experimental period (6 weeks). While, addition of dill, parsley and mixtures essential oils (1:1) at all concentrations increased TC were reduced by (15.98-9.43%) in different dill groups, (19.39-15.41%) in different parsley groups and were reduced by (10.53-6.69%) in different mixtures groups essential oils (1:1) at the end of experiment (6 weeks). The administration of phenols rich extract significantly decreased serum triglycerides and cholesterol in diabetic rats. In consistence with the present data, other workers have also reported that the administration of essential oils extract to streptozotocin induced diabetic rats improved the serum cholesterol and triglyceride levels as compared to control and this effect was also similar to insulin treatment *(Ravi et. al. , 2005).* Cholesterol lowering property of dill and parsley extract could be attributed to several factors like: presence of hypocholesterolemic compounds that may act as inhibitors for some enzymes such as hydroxyl methyl glutaryl CoA reductase, which participates in cholesterol synthesis or reduces the absorption of cholesterol from intestine *(Sharma et. al. , 2003)* or the extract might stimulate the production of insulin which in turn inhibits lipoprotein lipase activity *(Ravi et. al. , 2005)* or reduces lipid peroxidation *(Ravi et. al. , 2004).*

Serum high density lipoprotein cholesterol (HDL-C): As shown in table (5) , results of serum HDL-C of normal group rats and diabetic rats fed on diet formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300 ppm). HDL-C level in blood serum in normal group (negative group) was 59.60 mg/dL at zero time and non significant during experimental period (6 weeks). While, positive control group (diabetic control) HDL-C was decreased by 24.94% at the end of experimental period (45 days).

On the other hand, after feeding group with diet formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300 ppm) HDL-C were increased and all data were significant compared to diabetic diet during experimental period (6 weeks). While, addition of dill, parsley and mixtures essential oils (1:1) at all concentrations HDL-C were decreased by (10.60-0.33 %) in different dill groups, by (9.25-2.34 %) in different parsley groups and by (4.93-0.76 %) in different mixtures groups essential oils (1:1) at the end of experiment (6 weeks).

Serum low density lipoprotein cholesterol (LDL-C): The results in table (6) showed that LDL-C level in the negative control (normal group) rat and diabetic rats formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300 ppm). LDL-C level in blood serum in normal group (negative group) was 3.29 mg/dL at zero time and non significant during experimental period (6 weeks). While, positive control group (diabetic control) LDL-C was increased by 97 % at the end of experimental period (45 days). On the other hand, after feeding group with diet formulated with dill, parsley and mixtures essential oils (1:1) at (100, 200 and 300 ppm) LDL-C were increased and all data were significant compared to diabetic diet during experimental period (6 weeks). Moreover, addition of dill, parsley and mixtures essential oils (1:1) at all concentrations LDL-C were increased by (85.68-71.1 %) in different dill groups, by (86.63-82.87 %) in different parsley groups and by (76.69-60.86%) in different mixtures essential oils groups, at the end of experimental period (6 weeks). It has been reported that glycated- and oxidized-LDL increase in diabetes *(Triau et. al. , 1986)* and this may be the reason for the inability of this modified LDL to be recognized by the LDL-receptor and thus, its accumulation in plasma.

Serum very low density lipoprotein cholesterol (VLDL-C): The results in table (6) showed the level of VLDL-C in normal group rats and diabetic rats supplemented with dill, parsley and mixtures essential oils at (100, 200 and 300 ppm). VLDL-C level in blood serum in normal group (negative group) was 23.87 mg/dL at zero time and non significant during experiment period (6 weeks). While, positive control group (diabetic control) VLDL-C was increased to 46.61% at the end of experimental period (45 days). On the other hand, after feeding group with diet formulated with dill, parsley and mixtures essential oils (100, 200 and 300 ppm) VLDL-C were increased and all data were significant compared to diabetic diet during experimental period (6 weeks). Moreover, addition of dill, parsley and mixtures essential oils at all concentrations VLDL-C were increased by (7.52-3.11%) in different dill groups, (17.60-3.90%) in different parsley groups and by(6.74-1.08%) in different mixtures groups, at the end of experiment (6 weeks).

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تأثير الزيوت العطرية المستخلصة من نباتي الشبت والبقدونس على الفئران المصابة بمرض السكر

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في هذة الدراسة تم تجربة مدى صلاحية استخدام الزيوت العطرية لنباتي الشبت والبقدونس وذلك بسبب الروائح الذكية المنبعثة منها وكذلك محتواها من مضادات الاكسدة والتي ترجع أساسا لوجود الفينولات. ويهدف هذا البحث لدراسة تأثير الزيوت العطرية على جهد الأكسدة الناتج في سيرم فئران التجارب المصابة بمرض السكر. وكانت الفئران المستخدمة في التجربة يتراوح وزنها بين (140–160 جم) وتم الحقن بمادة STZ في الغشاء البروتني بجرعة (50 ملجم/كجم وزن الجسم). قسمت الفئران الى 11 مجموعة كل مجموعة تحتوي 6 فئران (الغير مصابة – مصابة – المصابة وتأخذ المعاملات من الزيوت العطرية أو مخاليط) . وبعد 6 أسابيع من بداية التجربة والتغذية على المعاملات المختلفة لوحظ حدوث انخفاض في نسبة السكر وزيادة نسبة الانسولين في السيرم.

وكذلك لوحظ زيادة معنوية في نشاط انزيم الجلوتاثيون المختزل في الفئران المصابة بالسكر والتي تناولت الزيوت العطرية. ووجد زيادة نشاط انزيمات الأكسدة والتي تعتبر من الدلائل الموثوق بها لتقييم فاعلية الزيوت العطرية كمضادات للأكسدة. وتفيد نتائج هذا البحث أن لهذه الزيوت العطرية دورا هاما كمضادات للأكسدة. بالاضافة الى تأثيرها الفعال في خفض السكر في الدم وبالتالي يمكن استخدامها للأغراض الوقائية والعلاجية.