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Effect of olive oil and sesame oil on some biochemical parameters in local male rabbits induced with diabetes

Shahad N. Al_azawi[1] , Zaid M. Mubark Al_mahdawi[2]

[1] Department of Biology , College of Education for Pure Science, Tikrit University , Tikrit , Iraq
[2] Department of Biology, College of Science, Tikrit University, Tikrit , Iraq

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Corresponding Author:

Name: Shahad N. Al_azawi
E-mail: ShhadNori26@gmail.com
Tel:

Abstract

This study was designed to investigate the effects and protective role of olive and sesame oil in the level of cholesterol, triglyceride, albumin, urea and glutathione in the blood of males rabbits which induced with diabetes by of Aloxan . The study was achieved in the Animal House of the Faculty of Veterinary Medicine\ University of Tikrit. The experiment included 20 local rabbits divided randomly into four groups: the first control group was treated with a 0.9% physiologic solution. The second group was treated with Aloxan at a concentration of 150 mg / kg. The third group was treated with Aloxan and olive oil at a concentration of 1.25 ml / kg. The fourth group was treated with Aloxan and sesame oil at a concentration of 0.5 ml / kg. The experiment lasted for 30 days then the animals were sacrifice and the serum kept for biochemical tests. The results showed that there was a significant increase ($P \leq 0.05$) in the concentration of cholesterol and a significant decrease in concentration of triglycerides, albumin, urea and glutathione.

Introduction

Diabetes is a combination of varying metabolic disorders and a high blood sugar concentration due to insulin deficiency or hypersensitivity to insulin tissues or both (1). Which leads to disturbances in the systematic metabolism of carbohydrates, fat and protein, The term diabetes is derived from the Greek language which refers to sugar(2). The apparent symptoms of this disease are increased polyurea (increased amount of urine) due to increased osmotic pressure and increased thirst, resulting in increased fluid intake to try to compensate urination, weight loss, severe and general fatigue despite regular eating and greater appetite for polyphagea food and slow healing (3). diabetes is associated with high blood cholesterol concentration, triglycerides, low-density lipoprotein cholesterol LDL-C, very low-density lipoproteins (VLDL-C) and low-density lipoprotein (HDL-C) , and all of these fats have an important role in the development of atherosclerosis, which is a complication of diabetes, and that the lack of activity of the enzyme Lipoprotein lipase leads to the accumulation of triglycerides in liver cells, and may be a reason to increase the total fat which associated with diabetes, so control the concentration Blood sugar is associated with reduced cholesterol concentration, which reduces the incidence of heart attacks (4).Olive oil can contribute in the improve health of diabetic patients and to protect them from the complications of the disease and the resulting disorders. This is explained by the ability of phenolic compounds and monounsaturated fatty acids such as oleic acid to improve blood sugar concentration by reducing insulin resistance in cells, And prevention of blood lipid disorders, which are often associated with hyperglycemia, help reduce LDL-C, TG concentrations, and improve HDL-C concentration. the phenolic compounds are important in stimulating insulin secretion to the blood, and this phenomena due to found oleuropein in olive oil and its role in the activation and release of insulin and increase glucose input of cells (5).Sesame oil is also an oil-seeded plant of the Pedaliaceae family and has many names that depend on the place where it is grown. In Europe it is called Ekuku-gogoro and in England it is called Ridi and Beni or Gingelly (6) sesame seeds contain 22.9% crude protein and about 60-50% oil and 7-6% fiber , sesame seeds possess amino acid composition Similar to those found in soybeans, but lysine is found to be lower in sesame (7) Sesame oil is mostly composed of unsaturated fatty acids that are not

deposited in human arteries, Sesame seed oil of high quality is not oxidized or rancidity because it contains Sesamol and Sesamoline antioxidants, which is different from most vegetable oils by containing natural anti-oxidants (8)

This study aimed to inrestigate the protective role of olive and sesame oil against diabetes mellitus .

Materials and methods

In this experiment, 20 male domestic rabbits bought from the local markets of Saladin province . they were breeded in a special room designed for this purpose in the Faculty of Veterinary Medicine and were placed individually in metal cages made of stainless steel. It was prepared for the purpose of breeding rabbits, with a floor covered with sawdust. The cleaning was observed by cleaning the cages and disinfecting them with disinfectants and changing the sawdust once or twice during the week. The animals were subjected to the appropriate laboratory conditions in terms of ventilation and temperature (25-28 C), and light period Suitable for 12 hours light and 12 hours of darkness, the animals were subjected to a preliminary period of ten days to acclimatize with the place and food , and ensure that they were free of diseases before the start of the experiment, and the weights of animals prepared for the experiment between (1350 -1700g) and the age between (6-12) months.The animals were divided into four equal groups, each group contains five animals, the first group consider as a control group, second group treated with Aloxan, third group treated with Aloxan and olive oil with a dose of 1.25 ml / kg and the fourth group treated with sesame oil at a dose of 0.5 mg / kg of body weight per day for 4 weeks by Mouth, and oils were obtained from local markets.

Blood samples

After the 30-day treatment period, the animals were starved for 12 hours and were anesthetic with chloroform. The blood was then pulled directly from the heart by heart puncher , 5_10 ml of blood was collected and placed in test tubes without anticoagulant, left the blood for 20 minutes in a 37 C, and then Serum was obtained by Centrifuge at 3000 cycles / minute for 15 minutes, the serum was kept in a special plastic tubes (-20 C) until biochemical tests will performance .

Biochemical tests

Cholesterol, Triglyceride, Albumin, Urea and Glutathione activity were determined of it by a special kits that supplied from Cayman Chemical Company (U.S.A).

statistical analysis

Results were statistically analyzed using the Sigma State program. For Windows Version 3.10Copyright © 2004Sytat, the Mean and standard error are estimated. The analyzes were analyzed using the one way analysis of variance, and the differences between the groups were determined using the Duncan multiple range test. The mean difference of all tests was at the probability level ($P \leq 0.05$).

Results

1- Determination cholesterol in the serum :

The results in Figure (1) showed that there was a significant increase ($P \leq 0.05$) in total cholesterol concentration in local male rabbits in the group treated with olive oil with a dose of 1.25 ml / kg body weight and the group treated with sesame oil with a dose of 0.5 ml / kg of body weight compared to the control group, and a significant decrease in the group treated with olive oil and the group treated with sesame oil compared to the group treated with Aloxan as a negative control group of the disease.

Figure (1) effects of treatment with sesame oil , olive oil and Aloxan in the level of Cholesterol

Groups / Standards	Control	Alloxan	Alloxan + olive oil	Alloxan + sesame oil
Cholesterol Mg/dl	61.075±1.638 h	305.15±2.08 A	182.95±2.05 C	97.793±1.809 E

Values represent the arithmetic mean ± standard error
Variable letters mean a significant difference at a significant level ($P \leq 0.05$)
Number of animals 5 per group

2- Determination of Triglyceride in the serum :

The results in Figure (2) showed that there was a significant decrease ($P \leq 0.05$) in the concentration of triglycerides in the local male rabbits in the group treated with olive oil with a dose of 1.25 mg / kg bw and the group treated with sesame oil compared to the control group. And significantly decrease in the group treated with Aloxan and olive oil and the group treated with Aloxan and sesame oil compared with the group treated with Aloxan as a negative control group of the disease.

Figure (2) effects of treatment with sesame oil , olive oil and Aloxan in the level of Triglyceride

Groups / Standards	Control	Alloxan	Alloxan+ olive oil	Alloxan + sesame oil
Triglyceride Mg/dl	**121.375±1.889 f**	**92.55± 2.59 h**	**66.400 ± 1.440 i**	**40.50± 2.02 j**

Values represent the arithmetic mean ± standard error
Variable letters mean a significant difference at a significant level ($P \leq 0.05$)
Number of animals 5 per group

3- Determination of Albumen in the serum:
The results in Figure (3) showed that there was a significant decrease (P≤0.05) in albumin concentration in local male rabbits in the group treated with olive oil with a dose of 1.25 ml / kg body weight and group treated with Aloxan with sesame oil in dose of 0.5 ml / kg Compared with the control group, and a significant decrease in the group treated with Aloxan and olive oil and the group treated with Aloxan and sesame oil compared to the group treated with Aloxan as a negative control group of the disease.

Figure (3) effects of treatment with sesame oil , olive oil and Aloxan in the level of Albumen

Groups / Standards	Control	Alloxan	Alloxan+ olive oil	Alloxan + sesame oil
Albumin Mg/dl	**4.364±0.188 b**	**5.082±0.263 a**	**2.748±0.189 c**	**3.3±0.389 bc**

Values represent the arithmetic mean ± standard error
Variable letters mean a significant difference at a significant level (P≤ 0.05)
Number of animals 5 per group

4- Determination of Urea in the serum :
The results in Figure (4) showed that there was a significant decrease (P≤ 0.05) in Urea concentration in local male rabbits in the group treated with olive oil with a dose of 1.25 mg / kg bw compared to the control group and a significant increase in treatment group with sesame oil compared to control group The results showed that there was a significant decrease in the group treated with Aloxan, olive oil and the group treated with Aloxan and sesame oil compared to the group treated with Aloxan as a negative control group of the disease.

Figure (4) effects of treatment with sesame oil , olive oil and Aloxan in the level of Urea

Groups / Standards	Control	Alloxan	Alloxan + olive oil	Alloxan + sesame oil
Urea Mg/dl	**41.75±1.593 c**	**26.52±2.91 g**	**24.63±2.53 g**	**32.775±1.979 f**

Values represent the arithmetic mean ± standard error
Variable letters mean a significant difference at a significant level (P≤ 0.05)
Number of animals 5 per group

5- Determination of Glutathione in the serum :
The results in Figure (5) showed that there was a significant increase (P≤ 0.05) in the concentration of glutathione in the blood of local male rabbits in the group treated with olive oil with a dose of 1.25 mg / kg body weight and the group treated with Aloxan and sesame oil compared to the control group. The results showed that there was a significant decrease in the group treated with Aloxan, olive oil and the group treated with Aloxan and sesame oil compared with the group treated with Aloxan as a negative control group of the disease.

Figure (5) effects of treatment with sesame oil , olive oil and Aloxan in the level of Glutathione

Groups / Standards	Control	Alloxan	Alloxan + olive oil	Alloxan + sesame oil
Glutathione mmol/l	**16.19±1.967 Bc**	**14 ±2.36 C**	**9.885±1.345 D**	**14.63±2.12 C**

Values represent the arithmetic mean ± standard error
Variable letters mean a significant difference at a significant level (P≤ 0.05)
Number of animals 5 per group

Discussion

The injection of Aloxan in this study led to a high level of blood cholesterol, and this is agreed with the results obtained by (9) in rats with diabetes-induced Aloxan, and observed that the lack of insulin in rabbits infected with diabetes, Led to a decrease in the level of ApoE mRNA and thus increase the level of blood cholesterol (10), and may be the increasing of cholesterol due to increase the activity of Cholesterol Transferaseacyl which responsible for the absorption of cholesterol from the intestine and its activity increase with the absence of insulin (11). In our current study, diabetes was associated with an increase in cholesterol level and using sesame oil there was a significant decrease in cholesterol level. The results obtained with(12) which explained the reason for the low cholesterol level due to the role of Sesame oil in the inhibition of the absorption and manufacture of cholesterol. Other researcher (13) which reported that sesame oil causes reduction the level of cholesterol in the blood because of the high content of unsaturated fatty acids, regarding olive oil it was found in the current study that olive oil helps control the level Cholesterol in Body, has agreed with (14) which explained the reason for this is that olive oil affects the manufacturing process, causing the cholesterol to prevent its manufacture or process contributes to metabolize cholesterol plant and thus reducing its level in the body. In our study we noted that the induced diabetes by Aloxan cause increase in

the level of Triglyceride in blood , our results agreed with (15) who reported that low insulin levels during this disease will causing decrease in the level lipoprotein lipase which responsible for converting the triglycerides into fatty acids and glycerol . while (9) explained that low level of insulin leads to stimulating hydrolysis of fats in the adipose tissues , leading to increased transmission of fatty acids from the fatty tissue and Triglycerides in the liver . It was also observed in the development of diabetes in rats that the level of triglycerides increased in the blood and this corresponds to (16) who explained this phenomena to increase level of glucose in blood because of lack of insulin. Other research (17) reported that Insulin stimulates the enzyme lipoprotein lipase, which converts the triglycerides into fatty acids and glycerol. In the absence of insulin, the level of triglycerides increases due to non-conversion to fatty acids and glycerol . (18) noted that the use of sesame oil in food contributes to the reduction of the level of glucose in the blood and reduce the risk of diabetes by reducing them to several parameters like triglycerides as vegetable oils, including sesame oil contains a large amount of acids In addition, sesame oil contains a high amount of fiber that contributes effectively to the control of atherosclerotic diseases, as well as olive oil contributes to reduce or control the triglycerides by containing olive oil high amount of unsaturated fats, which works to prevent diabetes . we also noted in this study This study significant decrease in the level of Albumen after inducing diabetes by Aloxan and this agreed with (19) who explained this case due to the dehydration as a result of expel large amounts of urine . in case of using olive oil, it reduces the level of glucose and improve the health of the patient by repairing the damage in beta pancreatic cells when compared with other infected groups. The research (20) reported in his study that olive oil contributes to the improvement of albumin levels when used in the case of diabetes and arteriosclerosis. This is due to the fact that olive oil contains high amounts of antioxidants. Sesame oil improves the level of albumin (21) and The reason is that sesame oil contains high amounts of unsaturated fatty acids that promote albumin in the body. Because of containing Olive oil polyphenols it reduces the level of urea and maintains its normal level against changes in the body. uria increases in the case of diabetes through diseases associated with atherosclerosis and kidney disease (22). (23) noted that diabetes and arteriosclerosis caused an increase in the level of urea due to pathological diseases affecting the urinary system, especially the kidney. This increase in the level of urea is caused by hyperactivity in the Xanthine oxidase. some Studies on the sesame oil at the level of urea were carried out by researchers (24) who found that sesame oil reduces the level of urea due to its high efficiency in preventing the breakdown of proteins and nucleic acids. (25) also found that urea was increase above normal level but soon returned to normal if sesame oil was used, due to the fact that sesame oil contained unsaturated fatty acids and sesame oil works to raise the level of glutathione in the body because of that sesame oil contains vitamin C, which contributes to the manufacture of glutathione and works as a carotene, which reduces the hardening of arteries in infected animals and this is what researchers (26). The results obtained in our current study showed that diabetes caused a decrease in the level of glutathione. The results were agreed with (27) which attributed the decrease in the level of glutathione to the occurrence of oxidative stress caused by hyperthyroidism Because of the increased glucose level in the case of diabetes, oxidative stress leads to a decrease in the level of antioxidants in general, including glutathione, and the researcher (28) Found in his results which agreed with the results obtained in our current study indicating that the reason for low level of glutathione Because of diabetes or atherosclerosis, glutathione contributes to the transformation of methyglyoxal into de-lactate and also contributes to the hydroxyl root and hydrogen peroxide compound. (29) noted when using olive oil, it helps maintain the natural level of antioxidants, including glutathione, and increases the level of glutathione because it contains antioxidant with high amounts . and when sesame oil, it works to raise the level of glutathione in the body because of the containment of sesame oil on vitamin C, which contributes to glutathione manufacturing as carotenoids found it works to reduce atherosclerosis happening in case in infection with diabetes mellitus .

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تأثير زيت الزيتون وزيت السمسم في بعض المعايير الكيموحيوية في ذكور الأرانب المحلية المستحثة بداء السكري

شهد نوري خباز العزاوي[1] ، زيد محمد مبارك المهداوي[2]

[1]قسم علوم الحياة ، كلية التربية للعلوم الصرفة ، جامعة تكريت ، تكريت ، العراق

[2]قسم علوم الحياة ، كلية العلوم ، جامعة تكريت ، تكريت ، العراق

الملخص

صممت هذه الدراسة لمعرفة تأثير زيت الزيتون وزيت السمسم في مستوى (الكولسترول cholesterol، الكليسريدات الثلاثية Triglyceride، الالبومين، اليوريا، الكلوتاثيون) في دم ذكور الارانب المحلية المصابة بداء السكري المستحث باستخدام الالوكسان، تم اجراء الدراسة في البيت الحيواني التابع لكلية الطب البيطري في جامعة تكريت، تم توفير الظروف المختبرية والغذاء والماء اللازمة لاجراء التجربة تضمنت التجربة 20من ذكور الارانب محلية قسمت عشوائيا الى اربع مجموعات: الاولى مجموعة السيطرة تم معاملتها بمحلول فسلجي 0.9%. المجموعة الثانية تم معاملتها بالالوكسان بتركيز(150 ملغم/كغم) والمجموعة الثالثة تم معاملتها بالالوكسان وزيت الزيتون بتركيز (1.25مل/كغم).والمجموعة الرابعة تم معاملتها بالالوكسان وزيت السمسم بتركيز(0.5 مل/كغم) استمرت التجربة لمدة 30 يوم بعدها تم التضحية بالحيوانات وحفظ المصل لاجراء الفحوصات الكيموحيوية. حيث بينت النتائج ان هنالك ارتفاعا معنويا ($P \leq 0.05$) في تركيز الكوليسترول وانخفاضا معنويا في تركيز كل من الكليسريدات الثلاثية، الالبومين، اليوريا والكلوتاثيون

الكلمات المفتاحية: داء السكري ، زيت الزيتون ، زيت السمسم .