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# *Influence of Virgin Coconut and Sesame Oils on Diabetic Male Rats*

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## *Abstract*

This study was carried out to investigate the effects of virgin coconut and sesame oils on the lipid profile and glucose level of diabetic male rats. Fifty-six adult male albino rats of the Sprague Dawley strain were divided into 8 groups. The administration, of alloxan (150 mg/kg BW) was done only once intraperitoneally for the groups from 2 - 8 to induce diabetes. After the hyperglycemia appeared, groups 3 – 8 were treated with 5 and 10 % virgin coconut oil, 5 and 10 % sesame oil, 5+5% and 2.5+2.5% of oils mixture for six weeks. The mean values of feed intake, body weight gain and feed efficiency ratio were improved in all tested groups except group 8 which was fed 2.5% virgin coconut+2.5% sesame oils mixture when compared with the + ve control group. While biochemical parameters such as insulin level, glucose level, aspartate aminotransferase

(AST), alanine aminotransferase (ALT), total protein (TP), and albumin, creatinine, urea, total cholesterol, triglycerides (TG), high density lipoprotein (HDL), very low-density lipoprotein (VLDL), low density lipoprotein (LDL), catalase and malondialdehyde (MDA) were improved compare with the + ve control group. According to the above findings this research recommended that usage of virgin coconut oil, sesame oil and 5% virgin coconut 5% sesame oils mixture had beneficial effects on diabetes. So more scientific researches must be done on this oils treatment effects on human beings.

## *Introduction*

Diabetes mellitus is one of the most common disease in the world and Egypt. Diabetes Mellitus (DM) is an endocrinological disorder and not a single disorder which is a group of metabolic disorder resulting from an irregularity in insulin secretions and insulin actions or both ***(Lyons & Benvenuti, 2016)*****.** Absence or reduced insulin in turn leads to persistent abnormally high blood sugar and glucose intolerance ***(Jahan et al., 2015).*** Untreated diabetes mellitus causes more several complications as disorders in liver functions, diabetic renal dysfunction and hyperlipidemia ***(Elshemy, 2018).*** Scientists have devised different ways of alienating this problem. One of the cheapest options is herbal medicine. Herbs have been used over the years for treatment of various diseases ***(Modi et al., 2007).***

Sesame seed oil (SSO) is an excellent source of unsaturated fatty acids with 37% from oleic and 46% from linoleic fatty acids ***(Weiss, 2000).*** Which have been shown to improve insulin sensitivity and thus glucose regulation through increasing the presence of unsaturated fatty acids in the sarcolemma ***(Martin et al., 2009).*** Sesame seeds also contain appreciable amounts of bioactive components, including tocopherols, polyphenols, phytosterols, and flavonoids ***(Reshma, 2010).***

Additionally, sesame oil has a concentration of 1% to 2% of phenolic lignans, sesamin, and sesamolin which bioactive components are considered protective and act as antioxidant, cardioprotective properties, reduce blood glucose levels and lipid peroxidation for which sesame seed oil is known ***(Wan et al., 2015).***

Virgin coconut oil is a vegetable origin oil, which is well-known for its medicinal and nutritional value. It has high levels of saturated fatty acids. The two major fatty acids are lauric acid and myristic acid. Saturated fats that is rich in lauric acid provide a favorable lipid profile and so, virgin coconut oil helps in the prevention of cardiovascular atherosclerotic diseases. The consumption of virgin coconut oil exhibits anti-inflammatory, anti-oxidant, and antidiabetic properties ***(Santana et al., 2016).***

Antioxidant properties and phenolic compounds as tocophenol and tocotrienol in virgin coconut oil aid in the prevention of many diseases. Virgin coconut oil increases high density lipoprotein cholesterol and reduces the level of low-density lipoprotein cholesterol in serum and tissue ***(Iranloye et al., 2013).*** Most of the fatty acids in virgin coconut oil are composed of medium chain fatty acids. So, they are directly absorbed by intestine and sent to liver to be used as energy source ***(Boemeke et al., 2015).*** The main objective of the present study is to investigate the effect of virgin coconut and sesame seeds oils on hyperglycemia induced by recrystallized alloxan in male albino rats.

## *Materials and Methods*

Fifty-six adult Sprague Dawley male rats weighing ١8٠± 10 g, were obtained from Animal House Colony of The Agricultural Research Center, Ministry of Agriculture and Land Reclamation, Cairo, Egypt.

Alloxan (5, 5-Dihydroxybarbituric acid), was obtained from Elgomhoria Company, Cairo, Egypt. A dose of 1٥0 mg/kg body weight of alloxan was administered only once intraperitoneal (i.p). After the hyperglycemia was assessed by the diaper test the experiment was started.

Casein, all vitamins, minerals, cellulose and choline bitartrate were obtained from El-Gomhoria Company, Cairo, Egypt.

Virgin coconut and sesame seeds oils were obtained from Agricultural Research Center, Cairo, Egypt.

### *Experimental Design*

Fifty-six adult male rats were fed on basal diet formulated according to ***(Reeves et al., 1993)*** for one week before the experiment for adaptation. The animals housed individually in stainless steel cages under controlled condition, at the Animal House Colony of The Agricultural Research Center, Ministry of Agriculture and Land Reclamation, Giza, Egypt. Rats were randomly classified into eight groups (7 rats each) as follow: group 1(-ve control) was fed on basal diet +5% soy bean oil throughout the experiment (6 weeks), group 2(+ve control) as the same of group 1 and was injected with alloxan, group 3 as the same of group 2 and was received 10% virgin coconut oil in replacement of soy bean oil, group 4 as the same of group 2 and was received 5% virgin coconut oil in replacement of soy bean oil, group 5 as the same of group 2 and was received 10% sesame oil in replacement of soy bean oil, group 6 as the same of group 2 and was received 5% sesame oil in replacement of soy bean oil, group 7 as the same of group 2 and was received 5% sesame oil + 5% virgin coconut oil in replacement of soy bean oil and group 8 as the same of group 2 and was received 2.5% sesame oil + 2.5% virgin coconut oil in replacement of soy bean oil.

Feed intake was calculated daily and the body weight gain was recorded weekly. Feed efficiency ratio was calculated according to the method of ***(Chapman et al., 1959).***

**Biochemical analysis of serum**

Insulin activity was estimated using enzyme linked immunosorbent assay ELISA method as described by ***Temple et al., (1992).*** Glucose level was determined according to ***Astoor & King, (1954).*** Calorimetric determination of total cholesterol and triglycerides were carried out according to the method of ***Burtis & Ashwood, (2001), Fossati & Principe, (1982)*** and ***McGowan et al., (1983),*** respectively. Determination of HDL-c level was carried out according to the method of ***Burtis & Ashwood, (2001).*** VLDL-c and LDL-c were calculated according to the equation of ***Friadwald et al., (1972).***

Serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were determined according to method of ***IFCC, (1980).*** Serum total protein (TP) and serum albumin (ALB) were carried out according to the method of ***Henry, (1974)*** and ***Doumas et al., (1971)*****,** respectively**.** Serum creatinine level and urea level were determined by the method ***Jaffe, (1986)*** **and** ***Villanova, (1994),*** respectively. Malondialdehyde (MDA) was determined according to the method described by ***Satoh, (1978).***

Catalase was determined according to the method described by ***Aebi, (1984).***

**Statistical analysis**

The obtained data were statistically analyzed using statistical analysis system ***(SAS, 2006).*** One way analysis of variance (ANOVA) was used to test the variations among groups and post Hoc test (Duncan's test) was used to compare group means.

## *Results*

Table (1) illustrate the effect of feeding rats on diet containing different levels of sesame oil and virgin coconut oil on feed intake, body weight gain and feed efficiency ratio. The mean value of daily feed intake in the positive control group was significantly decreased when compared with the negative control group. While the feed intake for experimental groups 3, 4,6 and 7 showed significant increase in this parameter when compared with the positive control group. The body weight gain mean value of the positive control group was significantly decreased when compared with the negative control group. While the body weight gain for experimental groups 3, 4, 5, 6 and 7 were significantly increased when compared with the positive control group, the best result of body weight gain was in group 6, which fed on 5% sesame oil. The feed efficiency ratio mean value of the positive control group was significantly decreased when compared with the negative control group. While the feed efficiency ratio for experimental groups 3, 4, 5, 6 and 7 were significantly increased when compared with the positive control group, the best result of feed efficiency ratio was in group 6, which fed on 5% sesame oil.

The mean value of insulin level in the positive control group was significantly decreased as compared to the negative control group as illustrated in Table (2), while the insulin level mean values of the tested groups 3, 4, 5, 6 and 7 were significantly increased compared with the positive control group. The best result for insulin level recorded in the group 7, which fed on a 5% sesame oil + 5% coconut oil mixture. The blood glucose level mean value of the positive control group was significantly increased as compared to the negative control group, while the blood glucose level mean values of the tested groups 3, 4, 5, 6 and 7 were significantly decreased compared with the positive control group. The best result of blood glucose level was in group 7 and group 5, which were fed on diet containing 5% sesame oil + 5% coconut oil mixture and 10% sesame oil, respectively.

The effect of virgin coconut oil and sesame oil on the lipid profile of diabetic rats were illustrated in Table (3). The mean values of total cholesterol, TG, VLDL-c and LDL-c of the positive control group were significantly increased, while the mean value of HDL-c decreased as compared to the -ve control group. The mean values of total cholesterol, TG, VLDL-c and LDL-c in diabetic tested groups 3, 4, 5, 6 and 7 were significantly decreased compared with the positive control group, while HDL-c mean values of the same groups increased significantly compared with the positive control group. Group 7, which was fed a diet containing 5% sesame oil + 5% coconut oil mixture, had the best results for total cholesterol, TG, VLDL-c, LDL-c and HDL-c.

The effect of virgin coconut oil and sesame oil on the liver function of diabetic rats were illustrated in Table (4). The mean values of serum alanine amino transaminase and aspartate aminotransferase of the positive control group were significantly increased, while the mean values of total protein and albumin decreased significantly as compared to the -ve control group. The alanine amino transaminase and aspartate aminotransferase mean values of the tested groups 3, 4, 5, 6 and 7 were significantly decreased compared with the positive control group, while the total protein and albumin mean values of the tested groups 3, 4, 5, 6 and 7 were significantly increased compared with the positive control group. The best results for alanine transaminase, aspartate aminotransferase, total protein and albumin were found in group 7, which was fed on diet containing 5% sesame oil + 5% coconut oil mixture.

The effect of virgin coconut oil and sesame oil on the kidney function of diabetic rats were illustrated in Table (5). The mean values of urea and creatinine of the positive control group were significantly increased as compared to -ve control group. The urea and creatinine mean values of tested groups 3, 4, 5, 6 and 7 were significantly decreased compared with the positive control group. The best urea and creatinine results were obtained in group 7, which was fed on diet containing 5% sesame oil + 5% coconut oil mixture.

The effect of virgin coconut oil and sesame oil on the catalase and malondialdehyde of diabetic rats were illustrated in Table (6). The mean value of malondialdehyde of the positive control group was significantly increased, while the mean value of catalase of the positive control group was significantly decreased as compared to -ve control group. The malondialdehyde mean value of tested groups 3, 4, 5, 6 and 7 were significantly decreased compared with the positive control group, while catalase mean value of the same tested groups increased significantly, as compared to the positive control group. The best malondialdehyde and catalase results were obtained in group 7, which was fed on diet containing 5% sesame oil + 5% coconut oil mixture.

## *Discussion*

Sesame seed oil and virgin coconut oil have medicinal and nutritional importance. Virgin coconut oil and sesame oil are antioxidant and hypoglycemic. Virgin coconut oil (VCO) is composed mainly of saturated fatty acids, the main fatty acids found are lauric, myristic and palmitic. Most of the fatty acids in virgin coconut oil are composed of medium chain fatty acids. So, they are directly absorbed by intestine and sent to liver to be used as energy source. ***Elshemy, (2018).*** Sesame seed oil has been reported to contain about 80% unsaturated fatty acids and many bioactive components including tocopherols, phytosterols and lignans (including sesamolin, sesamin, and sesamol) ***(Dossa et al., 2018).***

In this study, the administration, of alloxan (150 mg/kg BW) was done only once intraperitoneally induced diabetes by destruction of the beta cells in pancreas that produce insulin. This damage caused diabetes mellitus, as it reduces insulin production. Diabetes mellitus, if left untreated, has numerous degenerative effects that decrease (body weight gain, feed efficiency ratio, feed intake, liver and pancreas relative weights, insulin level, HDL, total protein (TP), and albumin of rats and cats) and increase (blood glucose level, total cholesterol, LDL-c, VLDL-c, triglycerides, alanine transaminase (ALT), aspartate aminotransferase (AST), urea and creatinine levels and malondialdehyde) of rats, these obtained results matched with ***(Elshemy, 2018).***

As regards to the obtained results, groups 3, 4, 5, 6, and 7 were treated with 5 % and 10 % of virgin coconut oil and sesame oil respectively, and virgin coconut and sesame oils mixture for six weeks. Feed intake, body weight gain and feed efficiency ratio mean values were improved in all tested groups except group 8 which was fed diet containing 2.5% virgin coconut oil plus 2.5 % sesame oil mixture. While serum biochemical parameters such as insulin level, glucose level, aspartate aminotransferase, alanine aminotransferase, total protein, and albumin, creatinine, urea, total cholesterol, triglycerides, high density lipoprotein, very low-density lipoprotein, low density lipoprotein, catalase and malondialdehyde were values improved compare with the + ve control group.

This results agree with ***Kasai et al., (2003)*** who reported that medium chain fatty acids (MCFA) which help in management, improve of body weight, feed efficiency ratio and proved that the effect of MCFA on insulin secretion depends upon its chain length. Among all MCFA capric acid and lauric acid were observed to display the most potent effects on insulin secretion. Another study proved that, as compared to other oils, coconut oil in the diet enhanced insulin action and improved binding affinity ***(Kappally et al., 2015),*** which improve feed intake (FI), body weight gain (BWG) and feed efficiency ratio (FER) of rats.

It is reported by ***Đurašević et al (2020)*** found that, coconut oil exerts significant effects on glucose and lipid balance in non-diabetics and rats with alloxan-induced diabetes. In non-diabetic animals effects are mostly preventative - there is an improvement in insulin sensitivity, The ability to control blood sugar.

***Maidin & Ahmed (2015)*** showed also, the VCO have an ameliorative effect on regenerating pancreatic islets while also having a favorable effect on blood glucose levels, it implies VCO to be beneficial in managing and preventing diabetes mellitus. VCO consumption can be claimed to ameliorate lipid levels in diabetes mellitus ***(Akinnuga et al., 2014).***

On the other hand, virgin coconut administration resulted in a significant reduction in alloxan-induced elevation of serum cholesterol, triglycerides, VLDL and LDL levels and a significant elevation in serum HDL levels. This revealed that virgin coconut oil ameliorates the damaging effect of alloxan on the lipid profile. These results matched with ***(Chinwong et al., (2017),*** on the other hand virgin coconut oil decrease the triglycerides levels ***(Ooyama et al., 2008).***

It is reported by ***Elshemy, (2018)*** virgin coconut oil is effective in alleviation hyperglycemia, hyperlipidemia, renal and hepatic dysfunctions induced by alloxan. Virgin coconut oil mitigates these harmful effects caused by alloxan. This ensures that the coconut oil help in reduce or remove damaged liver and improve liver function**,** Virgin coconut oil (VCO) is effective in preventing liver and renal damage in diabetic patients ***(Akinnuga et al., 2014).*** Virgin coconut oil (VCO) improved the antioxidant status, as was evident from increased catalase, superoxide dismutase, glutathione peroxidase and glutathione reductase activities in tissues ***(Arunima & Rajamohan, 2013).***

Sesame seed oil (SSO) is an excellent source of unsaturated fatty acids with 37% from oleic and 46% from linoleic fatty acids which have been shown to improve insulin sensitivity and thus glucose regulation through increasing the presence of unsaturated fatty acids in the sarcolemma ***(De Santa Olalla et al., 2009).*** Sesame seed oil also contain significant quantities of bioactive elements, such tocopherols, polyphenols such as sesamin and sesamolin, phytosterols and flavonoids ***(Reshma, 2010).*** All those bioactive components must be regarded protecting and likely to contribute to the antioxidant, anti-diabetic, anti-inflammatory and cardiovascular characteristics for which sesame seed oil is known to have a synergistic effect ***(Wan et al., 2015)*** and improve, feed intake, body weight gain and feed efficiency ratio of rats.

It is reported by ***Taha et al., (2014)*** SSO is a source of healthy fatty acids that protect thyroid gland and keep it functioning normally, which play important role in body weight. In an earlier study by ***(Ramesh et al., 2018*)** the consumption of 6% sesame seed oil added to normal rat diet was shown to significantly reduce blood glucose levels, lipid peroxidation, and antioxidant status in normal and diabetic female rats. SSO may be a viable functional food to help reduce the detrimental effects of diabetes ***(Aslam et al., 2017).*** Sesamin has been improve the insulin-binding capacity to liver crude plasma membrane, thus ameliorating insulin resistance ***(Hong et al., 2012).***

***Hina et al., (2021)*** reported that Impacts of sesame and sesame oil in lessening glycemia and improving the diabetes status and its entanglements have for some time been illustrated. In another study, the result of study SSO consumption appears to improve glycaemic control markers in males and improve functions of liver and kidney compared with CO in patients with type 2 diabetes

***(Raeisi-Dehkordi et al., 2020).*** Sesame seeds can improve lipid profile by help on reduce or decrease on total cholesterol, LDL, VLDL and triglycerides of rats and increase on HDL of rats ***(Aslam et al., 2020).*** Consumption of SSO positively influences blood glucose, oxidative stress, hepatica antioxidant enzyme activity, and cardiac, liver, and kidney function in adolescent participants with T2DM ***(Aslam et al., 2017).***

***Taha et al., (2014)*** report that sesame oil treatment indicated that sesame oil was more effective for the treatment of high-fat diet toxicity through its ability to decrease the elevated activity of ALT and AST at the cellular level, as SSO contain some powerful antioxidants (lignin and vitamin E,) which may prevent free radical formation and scavenge free radicals that already formed. Similar results were found by ***Rezq, (2019).*** Also, ***Vishwanath et al., (2012),*** found that sesame oil consumption helped in hypertensive patients remarkably reduced oxidative stress and simultaneously increases glutathione peroxidase (GPx), superoxide dismutase (SOD) and catalase, this action effect on increase on catalase level decrease on malondialdehyde (MDA) ***(Aslam et al., 2020).***

**Table (1):**

Effect of different level of sesame oil and virgin coconut oil on body weight gain, feed efficiency ratio and feed intake of diabetic rats

| Groups | FI (g/d) | BWG % | FER |
|---|---|---|---|
| G1 | 19.67 ±0.98[b] | 1.90 ± 0.14[c] | 0.097 ±0.009[c] |
| G2 | 18.00 ±1.14[c] | 1.26 ± 0.18[d] | 0.071 ±0.011[d] |
| G3 | 21.33 ±2.25[a] | 2.37 ± 0.49[b] | 0.111 ±0.019[b] |
| G4 | 19.42 ±0.97[b] | 2.49 ± 0.50[b] | 0.128 ±0.024[a] |
| G5 | 18.67 ±1.17[c] | 1.71 ± 0.13[c] | 0.092 ±0.003[c] |
| G6 | 22.50 ±2.66[a] | 2.91 ± 0.46[a] | 0.129 ±0.008[a] |
| G7 | 21.00 ±2.28[a] | 2.38 ± 0.57[b] | 0.112 ±0.019[b] |
| G8 | 16.50 ±0.55[d] | 1.22 ± 0.13[d] | 0.074 ± 0.005[d] |

--All values represented as mean ± SD.

-Means with different superscript are significantly different at (P<0.05).

-G1 (-ve control), G2 (+ve control), G3 (10% virgin coconut oil), G4 (5% virgin coconut oil), G5 (10% sesame oil), G6 (5% sesame oil), G7 (5% sesame oil + 5%virgin coconut oil). G8 (2.5% sesame oil + 2.5% virgin coconut oil).

**Table (2):**

Effect of different level of sesame oil and virgin coconut oil on insulin level and blood glucose level of diabetic rats

| Groups | Insulin level (IU/dL) | Blood glucose (mg/dL) |
|---|---|---|
| G1 | 3.60 ± 0.53[a] | 100.50 ± 7.34[e] |
| G2 | 1.20 ± 0.45[c] | 316.17 ± 16.38[b] |
| G3 | 2.70 ± 0.26[b] | 127.33 ± 8.31[d] |
| G4 | 2.50 ± 0.31[b] | 141.83 ± 8.86[c] |
| G5 | 2.90 ± 0.25[b] | 127.50 ± 3.83[d] |
| G6 | 2.60 ± 0.29[b] | 139.83 ± 6.46[c] |
| G7 | 3.10 ± 0.31[a] | 127.00 ± 4.82[d] |
| G8 | 0.80 ± 0.39[d] | 395.00± 5.48[a] |

--All values represented as mean ± SD.

-Means with different superscript are significantly different at (P<0.05).

-G1 (-ve control), G2 (+ve control), G3 (10% virgin coconut oil), G4 (5% virgin coconut oil), G5 (10% sesame oil), G6 (5% sesame oil), G7 (5% sesame oil + 5%virgin coconut oil). G8 (2.5% sesame oil + 2.5% virgin coconut oil).

**Table (3):**

Effect of different level of sesame oil and virgin coconut oil on total cholesterol (TC), HDL-c, LDL-c, VLDL-c and triglycerides (TG) of diabetic rats

| Groups | TC | HDL-c | LDL-c | VLDL-c | TG |
|---|---|---|---|---|---|
| | mg/dL | | | | |
| G1 | 101.00 ± 2.28[d] | 43.83 ± 0.75[a] | 39.33 ± 2.16[d] | 17.84 ± 1.17[c] | 89.20 ± 2.50[e] |
| G2 | 183.50 ± 2.67[a] | 22.33 ± 0.82[d] | 106.50 ± 2.26[a] | 54.67 ± 1.37[a] | 273.35 ± 5.56[a] |
| G3 | 115.67 ± 2.25[c] | 33.67 ± 2.25[b] | 51.00 ± 0.89[c] | 31.00 ± 0.89[c] | 155.00 ± 1.79[c] |
| G4 | 126.83 ± 4.22[b] | 28.67 ± 2.25[c] | 62.67 ± 5.20[b] | 35.49 ± 1.38[b] | 177.45 ± 1.38[b] |
| G5 | 115.50 ± 1.98[c] | 35.17 ± 1.84[a] | 50.17 ± 1.17[c] | 30.16 ± 1.72[c] | 150.80 ± 3.97[c] |
| G6 | 125.33 ± 5.39[b] | 30.33 ± 2.42[c] | 61.17 ± 2.32[b] | 33.83± 1.94[b] | 169.15 ± 6.97[b] |
| G7 | 114.67 ± 2.73[c] | 35.67 ± 1.21[b] | 49.83 ± 1.60[c] | 29.17± 1.17[c] | 145.85 ± 4.64[d] |
| G8 | 176.50 ± 0.55[a] | 24.00 ± 2.19[d] | 97.50± 0.55[a] | 55.00± 1.10[a] | 275.00 ± 8.22[a] |

--All values represented as mean ± SD.

-Means with different superscript are significantly different at ($P<0.05$).

-G1 (-ve control), G2 (+ve control), G3 (10% virgin coconut oil), G4 (5% virgin coconut oil), G5 (10% sesame oil), G6 (5% sesame oil), G7 (5%

sesame oil + 5%virgin coconut oil). G8 (2.5% sesame oil + 2.5% virgin coconut oil).

**Table (4):**

Effect of different level of sesame oil and virgin coconut oil on alanine transaminase, aspartate aminotransferase, total protein and albumin of diabetic rats

| Groups | ALT (U/L) | AST (U/L) | TP (g/dL) | Albumin (g/dL) |
|---|---|---|---|---|
| G1 | 23.55 ± 0.94[e] | 45.87 ± 0.70[e] | 6.65 ± 0.24[a] | 3.50 ± 0.16[a] |
| G2 | 108.00 ± 1.67[a] | 119.33 ± 0.65[a] | 3.50 ± 0.18[d] | 2.00 ± 0.19[c] |
| G3 | 41.00 ± 1.79[b] | 57.57 ± 1.22[d] | 5.30 ± 0.23[b] | 2.90 ± 0.09[a] |
| G4 | 50.48 ± 0.52[b] | 68.98 ± 0.30[c] | 4.37 ± 0.14[c] | 2.35 ± 0.19[b] |
| G5 | 39.97 ± 0.55[c] | 55.63 ± 0.90[d] | 5.18 ± 0.33[b] | 2.95 ± 0.29[a] |
| G6 | 45.25 ± 1.17[b] | 64.30 ± 1.63[c] | 4.77 ± 0.16[c] | 2.40 ± 0.11[a] |
| G7 | 35.25 ± 0.69[d] | 55.08 ± 0.64[d] | 5.65 ± 0.35[b] | 3.00 ± 0.29[a] |
| G8 | 92.70 ± 0.88[a] | 100.50 ± 0.99[b] | 3.90 ± 0.05[d] | 2.15 ± 0.05[c] |

--All values represented as mean ± SD.

-Means with different superscript are significantly different at (P<0.05).

-G1 (-ve control), G2 (+ve control), G3 (10% virgin coconut oil), G4 (5% virgin coconut oil), G5 (10% sesame oil), G6 (5% sesame oil), G7 (5% sesame oil + 5%virgin coconut oil). G8 (2.5% sesame oil + 2.5% virgin coconut oil).

**Table (5):**

Effect of different level of sesame oil and virgin coconut oil on urea and creatinine levels of diabetic rats

| Groups | Urea (mg/dL) | Creatinine (mg/dL) |
|---|---|---|
| G1 | 38.87 ± 0.78[e] | 0.67 ± 0.03[d] |
| G2 | 78.48 ± 1.84[a] | 3.68 ± 0.37[a] |
| G3 | 49.70 ± 0.54[d] | 1.64 ± 0.02[b] |
| G4 | 53.17 ± 1.72[b] | 2.25 ± 0.03[b] |
| G5 | 47.33 ± 1.86[c] | 1.70 ± 0.04[b] |
| G6 | 54.83 ± 1.17[b] | 2.13 ± 0.02[b] |
| G7 | 42.83 ± 2.32[d] | 1.59 ± 0.07[c] |
| G8 | 75.00 ± 3.83[a] | 3.50 ± 0.11[a] |

--All values represented as mean ± SD.

-Means with different superscript are significantly different at ($P<0.05$).

-G1 (-ve control), G2 (+ve control), G3 (10% virgin coconut oil), G4 (5% virgin coconut oil), G5 (10% sesame oil), G6 (5% sesame oil), G7 (5% sesame oil + 5%virgin coconut oil). G8 (2.5% sesame oil + 2.5% virgin coconut oil).

**Table (6):**

Effect of different level of sesame oil and virgin coconut oil on catalase (CAT) and malondialdehyde (MDA) of diabetic rats

| Groups | CAT (mM/L) | MDA (µmol/dL) |
|---|---|---|
| G1 | 77.00 ± 5.50[a] | 89.00 ±5.70[e] |
| G2 | 38.50 ± 7.30[d] | 255.00 ± 12.60[a] |
| G3 | 50.50 ± 9.40[c] | 114.50 ± 6.30[d] |
| G4 | 62.50± 7.40[b] | 143.50 ± 7.20[c] |
| G5 | 55.00 ± 8.20[c] | 105.00 ± 5.70[d] |
| G6 | 63.00 ± 6.80[b] | 135.00 ± 8.30[c] |
| G7 | 65.00 ± 6.90[b] | 98.00 ± 6.70[e] |
| G8 | 40.00 ± 8.30[d] | 235.00 ± 9.80[b] |

--All values represented as mean ± SD.

-Means with different superscript are significantly different at (P<0.05).

-G1 (-ve control), G2 (+ve control), G3 (10% virgin coconut oil), G4 (5% virgin coconut oil), G5 (10% sesame oil), G6 (5% sesame oil), G7 (5% sesame oil + 5%virgin coconut oil). G8 (2.5% sesame oil + 2.5% virgin coconut oil).

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# تأثير زيوت جوز الهند والسمسم علي ذكور الفئران المصابة بمرض السكري

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## المستلخص العربي

تهدف هذه الدراسة إلى معرفة تأثيركلا من زيوت جوز الهند والسمسم على ومستوى دهون الدم ، و تركيز الأنسولين ، و الجلوكوزفي السيرم ، على ذكور الفئران المصابة بمرض السكري . تم استخدام ستة وخمسين من ذكور الفئران الألبينو البالغة من سلالة سبراجو، وتم تقسيم الفئران إلى ٨ مجموعات، وتم الحقن بالألوكسان (١٥٠ مجم / كجم من وزن الجسم) مرة واحدة فقط داخل الغشاء البروتوني ،و ذلك للمجموعات ٢ ،٣ ،٤ ،٥ ،٦ ،٧ و ٨ و ذلك لأحداث مرض

البول السكري. بعد ظهور أرتفاع السكر في الدم ، ( 150 >مجم / ديسيلتر) ، بدأت التجربة. تمت معالجة هذه المجموعات ٤،٣ ،٥ ،٦ ،٧ و ٨ بنسبة ٥٪ و ١٠٪ من زيت جوز الهند وزيت السمسم و كذلك خلط من زيت جوز الهند وزيت السمسم لمدة ستة أسابيع. وقد أشارت النتائج إلى تحسن تناول الغذاء ، وزيادة وزن الجسم ، ومعدل كفاءة الغذاء بالمقارنة مع المجموعة الضابطة الموجبة. في حين أظهرت نتائج العوامل البيوكميائية في سيرم الدم مثل مستوى الأنسولين ومستوى الجلوكوز و أنزيمات الكبد والبروتين الكلي والألبومين والكرياتينين واليوريا والكوليسترول الكلي والدهون الثلاثية والبروتين الدهني عالي الكثافة والبروتين الدهني منخفض الكثافة والبروتين الدهني منخفض الكثافة جدا والكاتلاز ، والمالونديالديهيد إلي تحسن مستوهم بالمقارنة مع المجموعة الضابطة الموجبة. وفقًا للنتائج المذكورة أعلاه ، يوصى هذا البحث بأن أستخدام زيت جوز الهند البكر وزيت السمسم و خليط ٥٪ زيت جوز الهند البكر بالإضافة إلى ٥٪ زيت السمسم له آثار مفيدة على مرض السكري ، لذلك يجب إجراء المزيد من الأبحاث العلمية حول التأثير المعالج لهذه الزيوت على المرضي.