Effect of Some Kindof Vegetable Oils on Hypercholesterolemic Rats

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ABSTRACT

The present study was carried out to investigate the effect of using some vegetable oils as (garlic oil, flaxseed oil, sesame oil, fenugreek oil, Nigella oil, soybean oil, cumin oil, onion oil and their oil blend) at ratio 15% level on daily food intake , body weight gain , feed efficiency ratio ,also on serum glucose level , serum blood lipids fraction, liver and kidney function on hypercholesterolemic rats.

A total of (66) male albino rats 120±5g body weight used in this study. Rats were divided into two main groups , the first group (A) 6 rats was used as a control negative group (-ve) and fed on the basal diet only , the second group (60 rats) fed on the hypercholesterolemic diet (1.5% cholesterol +0.25% bile salts) for two week to induce hypercholesterolemia and then divided randomly into (10 subgroups) one of them used as a control positive (+ve) fed on hypercholesterolemic diet only (group B).The other subgroups fed on hypercholesterolemic diet containing 15% of each of vegetable oils as substituent to corn oil.A blend of all oils at equal amounts was also used.

The results revealed that the feeding of hypercholesterolemic rats on all kinds of different oil increased significant of weight gain, food intake and FER as compared to (+ve) group. It showed significant reduction of serum total cholesterol, triglycerides, and serum glucose level compared to the control positive group (B).All experimental diet increased serum concentration of HDL-c, decreased concentration of serum AST, ALT enzymes, uric acid, urea nitrogen and creatinine of hypercholesterolemic rats.

This study revealed that the best result obtained with garlic oil for all parameters; this treatment showed nonsignificant change compared with control negative (A) group.

INTRODUCTION

Blood cholesterol concentrations are influenced by diet *(Clark et al., 1997)***.**The relation between a high intake of saturated fats and increased blood cholesterol concentrations is well documented. A high blood concentration of LDL cholesterol is an established risk factor for cardiovascular disease *(Ballantyne, 1998).*

Addition of cholesterol in the diet of male rabbits produced hypercholesterolemia, increased tissue cholesterol, and atheromatous changes in the aorta. Supplementation of garlic oil along with cholesterol significantly inhibited the hypercholesterolemia, decreased tissue cholesterol and minimized the atheromatous changes in the aorta . *(Jain and konar, 1978).*

On the other hand *Berthold etal.,* reported that the commercial garlic oil preparation investigated had no influence on serum lipoproteins , cholesterol absorption , or cholesterol synthesis of hypercholesterolemia .

The effect of a combined supplementation of fish oil with garlic pearls on the serum lipid profile of hypercholesterolemic subjects was studied by ***Jeyaraj et al.(2005).***They found that significant reductions in all the lipid parameters (except high-density lipoprotein) which was increased in the test group compared to that of the control group.

Garlic and onion have been used for millennia in the traditional medical practice of many cultures to treat cardiovascular and other disorders. *Both Allium* species, their extracts, and the chemical constituents of these plants have been investigated for possible effects on cardiovascular disease risk factors; both definite (Hyperlipidemia, hypertension and hyperglycemia) and suspected (platelet aggregation and blood fibrinolytic activity). Action of these *Allium species* on blood coagulability is more clearly defined than their effect on the other risk factors. While many of the studies have serious methodological shortcomings, there is some evidence to suggest that use of certain formulations of garlic and/ or onion is accompanied by favorable effects on risk factors in normal subjects and in patients with atherosclerotic disease *(Kendler, 1987)*.

Phytochemicals present in the genus *Allium* have potential pharmacological effects, such as antimicrobial, antithrombotic, antitumor, hypolipidemic and hypoglycemic activities *(Seki et al., 2000).*

Diet has profound effects on the development of atherosclerosis. Fatty acid composition, antioxidants and other components such as lignans have major effects on the atherosclerosis process. Sesame oil has both mono-

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Received December1, 2007, Accepted December29, 2007

and polyunsaturated fatty acid constituents in equal proportions. In addition, it also has high levels of numerous antioxidant and inducers of peroxisome proliferators-activated receptor *(Bhaskaran et al., 2006).*

Sanker et al.,(2006) reported that sesame oil as edible oil lowered blood pressure, decreased lipid peroxidation, triglycerides and increased antioxidant status in hypertensive patients. Flaxseed and sesame seed both contain more than 40% fat, about 20% protein and vitamin E, mostly gamma-tocopherol. Furthermore, both contain considerable amounts of plant lignans. However, flaxseed contains 54% alpha-linolenic acid, but sesame seed only 0.6%, and the chemical structures of flaxseed and sesame lignans are different *(Yamashita et al., 2003).*

Flaxseed oil has very high content of alpha-linolenic acid (c18:3n, omega-3 fatty acid) *(Lee and Prasad 2003; Schwab et al., 2006***).**Based on the usefulness of n-3 fatty acid in fish oil against cardiovascular diseases, flaxseed oil is marketed as a health food. The n-3 fatty acid in flaxseed oil is different from that of fish oil. Indirect evidence suggests that the omega-3 fatty acid in flaxseed oil is not effective in lowering serum lipids on hypercholesterolemic atherosclerosis. The effective compound in lowering serum lipids on hypercholesterolemic atherosclerosis are not known *(Lee and Prasad 2003).*

Handa et al.,(2005) found that fenugreek seed extract reduced the body weight gain induced by a high-fat diet in obese mice . The extract decreased plasma triglyceride gain induced by oil administration. The major component of the extract, 4- hydroxyisoleucine, also decreased plasma triglyceride gain. Consequently, fenugreek seed extract is expected to prevent the obesity induced by a high-fat diet.

MATERIALS AND METHODS

Materials:

-All vegetable oils have been bought (from local markets, Egypt.); oil was mixed with standard diet at level of 15% on the expense of corn oil.

-Kits used to determine serum glucose; cholesterol, triglycerides, HDL-c, LDL-c, VLDL-c, urea, uric acid, creatinine, GOT and GPT were obtained from Egyptian American Company for Laboratory Service and supplied by Alkan Company. Cellulose was produced by El-Nasser Pharmaceutical Chemicals, Cairo, Egypt and supplied by El- Gomhorya Company. Corn oil and corn starch were obtained from the local market. Scientific names of vegetable oil sources are as followes:

Garlic	:	*Allium sativum*
Flaxseed	:	*Linum usitatissimum*
Sesame seeds	:	*Sesamum indicum*
Fenugreek seed	:	*Trigonella foenum graecum*
Nigella seeds	:	*Nigella sativa*.
Soybeam seeds	:	*Glycine max*
Cumin seeds	:	*Cuminum cyminum*
Onion	:	*Allium cepa*.

Experimental animals:

Sixty-six male albino rats, Sprague Dawley strain, weighing and average 120±g each were used in this study. All rats were housed in cages under hygienic laboratory conditions and fed with standard laboratory diet and water ad libitum for one week before the start of experiment.

Experimental design:

The basal diet used in experiment was formulated according to ***(AOAC, 1995).*** After one week period, the rats were divided into two main groups, the first group (6 rats) fed on basal diet and were used as negative control group (-ve) named (A), the second group (60 rats) fed on hypercholesterolemic diet (1.5%cholesterol;bile salts 0.25%) for two week to induce hypercholesterolemia in the rats according to *(Rodas et al.,1995)* and then divided randomly into (10 subgroup)as follows:

Subgroup (1) Fed on hypercholesterolemic diet only and were used as Positive control group (+ve) named (B)

Subgroup (2) Fed on hypercholesterolemic diet containing 15% of (garlic oil).

Subgroup (3) Fed on hypercholesterolemic diet containing 15% of (flaxseed oil).

Subgroup (4) Fed on hypercholesterolemic diet containing 15% of (sesame oil).

Subgroup (5) Fed on hypercholesterolemic diet containing 15% of (fenugreek oil).

Subgroup (6) Fed on hypercholesterolemic diet containing 15% of (*Nigella* oil).

Subgroup (7) Fed on hypercholesterolemic diet containing 15% of (soybean oil).

Subgroup (8) Fed on hypercholesterolemic diet containing 15% of (cumin oil).

Subgroup (9) Fed on hypercholesterolemic diet containing 15% of (onion oil).

Subgroup (10) Fed on hypercholesterolemic diet containing 15% of (oil blend).

Body weight, food consumption were measured and total food intake of experimental period (4 weeks) was calculated. Body weight gain percentage was determined according to *(Chapman et al., 1959).* The organs (liver, heart, kidney and spleen) were removed and weighted:

$$\text{Relative organs weight} = \frac{\text{Organs weight}}{\text{Animal body weight}} \times 100$$

Biochemical analysis of serum

At the end of the experiment period, the rats were fasted overnight, then the rats were anaesthetized and sacrificed, and blood samples were collected from aorta. Each sample was placed in a dry clean centrifuge tube, and then centrifuged for 10 minutes at 3000 round per minute to separate the serum. Serum was carefully transported into dry clean Wasserman tubes by using a Pasteur pipette, and kept frozen till analysis.

Glucose was determined in the serum according to the method described by *(Tietz, 1976).* Total cholesterol was determined in the serum according the method described by *(Allain et al., 1974)*. Triglycerides were determined in serum according to the method described by *(Trinder and Ann,1969)*.Determination of serum HDL-cholesterol was carried out according to the method of *(Fredewaid,1972 and Gordon and Amer,1977).*The determination of serum VLDL-cholesterol and LDL-c were carried out according to the method of*(Lee and Nieman,1996).* Determination of GOT(AST) and GPT(ALT)were carried out according to the method of*(Bergmeyer et al., 1985)*.Serum creatinine was determined according to the method described by *(Henry,1974).*Serum uric acid was determined according to the method described by*(Fossat.,1980)* .Serum urea nitrogen was determined according to the method described by*(Patton and Crouch,1977).*

Atherogenic index was calculated according to *(Hayakawa et al., 1998)*

$$\frac{(LDL\text{-}c + VLDL\text{-}c)}{HDL\text{-}c}$$

The obtained data were statistically analyzed by using computer. The results were tested for significance using one-way analysis of variance (ANOVA) test according to *(Armitage and Berry, 1987).*

RESULTS AND DISCUSSION

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

Table (1) results showed that, there was a significant decrease (P<0.05) in body weight gain %(BWG %) for control positive group (B) as compared to the negative control group (A). BWG% of all treated hypercholesterolemic rats with different sources of plant oils increased significantly (P<0.05)as compared to(B) group, and decreased significantly as compared to (A) group except value for group fed on blend oil which showed no significant change .Our results are in agreement with *Choi et al., (2004)* who found that feeding hydrogenated soybean oil to normal rats decreased body weight gain. In this respect *Sanker et al.,(2006)* found that the effect of sesame oil in hypertensive patients revealed a significant reduction was noted in body weight and body mass index. *Handa et al.,(2005)* confirmed that fenugreek seed extract reduced the body weight gain induced by a high-fat diet in obese mice. *Vijaimohan et al.,(2006)* found that flaxseed oil supplementation in high fat diet fed rats significantly lowered the increase in body weight gain .

The results of table (1) indicated a significant change in feed efficiency ratio between group (A and B) and there is nonsignificant change for all groups treated hypercholesterolemic rats with different sources of plant oils compared to control (A group) except one group only which fed on onion oil exhibited a markedly significant decrease .

Basal diet used to negative control (A) group increased food intake values compared to the positive control (B) group. On the other hand, the mean values of food intake of all treated groups, increased significantly as compared to group (B).

Table1. Body weight gain (BWG %), feed efficiency ratio (FER) and daily food intake (FI) of hypercholeserolemic rats as fed with different vegetable oils

Groups	BWG%	FER	Food Intake(g/day)
Group(Control-ve)(A)	64.35±1.12a	0.213±0.022a	13.41±0.24a
Group(Control +ve)(B)	18.77±1.54h	0.071±0.004d	10.34±1.12d
Garlic	64.11±1.66b	0.212±0.053a	11.85±1.05bc
Flaxseed	62.86±2.02c	0.211±0.015a	11.68±0.68bc
Sesame	60.71±1.65d	0.209±0.023a	11.65±0.7bc
Fenugreek	59.83±1.77e	0.207±0.066a	11.95±0.42bc
Nigella	59.86±1.83e	0.206±0.071a	11.75±1.66bc
Soybean	58.18±1.5f	0.205±0.041a	11.4±0.11c
Cumin	57±1.5g	0.201±0.06a	11.33±0.32c
Onion	56.87±1.1g	0.192±0.013b	12.84±0.65d
Blend	65.35±1.17a	0.211±0.017a	12.88±1.1ab

All results are expressed as mean ± SD.
Values in each column which have different letters are significantly different (P<0.05)

Effect different sources of vegtable oils on organs weight to body ratio of hypercholesterolemic rats:

Table (2) results showe the effect of different sources of plant oils on weight of kidney, liver, heart, lungs and spleen to body weight %. The mean value ±SD of liver weight to body weight % of control group (B) was 3.85 ±0.95% , being higher compared to 2.07±0.02% in the negative control group (A). These results are agreement with those obtained by *Omage et al.,(1998);Doaa , (2006)* and *El- Mallah, Maysa ,(2007)* , they reported that feeding of high fat diet increased liver ,kidney , heart and spleen weights of rats compared with those in rats fed with normal diet.

All treated experimental diets showed a significant decrease (P<0.05)in liver weight , kidneys weight and heart weight to body ratio(%) compared to group (B). Results of present work however, do not agree with that of *Sheen et al., (1999)* who found that feeding garlic oil to rats fed high fat diets increased the spleen weight and spleen weight-to-body weight ratio (P<0.05). Concerning lungs weight to body weight % the results showed that the mean value ±SD of lungs weight to body weight % in hypercholesterolemic control rats (group B) was 1.6±0.05% while the mean value ±SD was 0.82 ±0.03% for the control group (A). All tested experimental diets showed nonsignificant change with exception of three cases that were garlic oil; *Nigella* oil and oil blend compared to control positive group (B).

Effect different sources of vegetable oils on serum glucose levels in hypercholesterolemic rats:

Data of table (3) showed that the (final) serum glucose level of tested groups treated with different sources of vegetable oil, recorded highly significant lower value in group (A) compared with group (B).The mean value ±SD of final serum glucose level in the control positive (B group) was 187±0.83 mg/dl, while it was 85±1.6 mg/dl in the control negative (A group). On the other side all treated groups showed significant decrease P<0.05 in serum glucose as compared to control positive (B group). *Zhang et al., (2001)* noted that garlic oil leads to significant difference effect for glucose in men, and they are confirmed that preformed bioactive agents present in garlic oil are efficiently released . Treatment of diabetic rats with garlic oil (10 mg/kg) for 15 days observed that decreased significantly blood glucose. These results suggest that garlic oil may effectively normalize the impaired antioxidants status in streptozocin induced – diabetes. The effects of these antioxidants may be useful delaying the complicated effects of diabetes *(Anwar and Meki,2003*). *Ramesh et al .,(2005)* found that when diabetic rats fed with sesame oil a significant reduction in levels of blood glucose , thus , sesame oil consumption influences beneficially the blood glucose.

Table2. Effect different sources of vegetable oil on organs weight to body ratio of hypercholesterolemic rats

Groups	Relative weights (%) of				
	Liver M±SD	**Kidney M±SD**	**Spleen) M±SD**	**Lungs M±SD**	**Heart M±SD**
Group(Control-ve)(A)	2.07±0.2b	1.5±0.05bc	0.45±0.1e	0.82±0.03b	0.35±0.22f
Group(Control +ve)(B)	3.85±0.95a	2.65±0.25a	1.6±0.05a	1.6±0.05a	1.25±0.05a
Garlic	2±0.55b	1.45±0.2bc	0.35±0.05e	0.85±0.25b	0.3±0.07f
Flaxseed	2.16±0.2b	1.5±0.35bc	0.4±0.03e	1.35±0.45a	0.55±0.06e
Sesame	2.27±0.92b	1.55±0.92bc	0.55±0.2d	1.5±0.1a	0.6±0.09e
Fenugreek	2.3±0.25b	1.64±0.15bc	0.62±0.45d	1.55±0.4a	0.8±0.2d
Nigella	2.3±0.3b0.7b	1.66±0.35bc	0.64±0.04d	0.55±0.35b	0.8±0.11d
Soybean	2.47±0.7b	1.84±0.15bc	0.95±0.02b	1.6±0.2a	0.94±0.06c
Cumin	2.53±0.3b	1.95±0.35bc	0.85±0.05c	1.7±0.02a	1±0.15bc
Onion	2.6±0.2b	2.13±0.05bc	0.82±0.05c	1.75±0.08a	1.1±0.04b
Blend	2.05±0.65b	1.4±0.15c	0.35±0.04e	0.99±0.3b	0.35±0.01f

All results are expressed as mean ± SD.
Values in each column which have different letters are significantly different (P<0.05)

Table3. Effect different sources of vegetable oil on serum glucose levels of hypercholesterolemic rats

Groups	Glucose(mg/dl) M±SD
Group(Control-ve)(A)	85±1.6d
Group(Control +ve)(B)	187±0.83a
Garlic	84.16±0.2d
Flaxseed	85.43±0.5d
Sesame	87.25±0.06c
Fenugreek	89.2±2b
Nigella	88.9±1.2b
Soybean	89.22±1.5b
Cumin	89.6±0.9b
Onion	89.95±1.3b
Blend	84.64±0.13d

All results are expressed as mean ± SD.
Values in each column which have different letters are significantly different (P<0.05)

Effect different sources of vegetable oils on serum lipid profile in hypercholesterolemic rats:

Table (4) illustrates the mean value of lipid profile. In case of the experimental group fed on hypercholesterolemic diet, the results showed that the mean values of serum total cholesterol, triglycerides, LDL-c and VLDL-c were high significantly increased as compared with values of control negative (A) group. All tested vegetable oils resulted in a significant reduction in the mean of total cholesterol, triglycerides, LDL-c and VLDL-c as compared to the positive (B) group. Except flaxseed oil didn't change VLDL-c compared to group (B). On the other hand, all treated groups of vegetable oils showed a higher mean value of HDL-c as compared with the two control groups (A and B).

These results are in agreement with those obtained by *Kritchvesky et al., 1983)* who reported that long term feeding of saturated fat has been associated with increased level of plasma cholesterol in both animals and human. *Abdel-Hameed, (2002)* indicated that feeding of hypercholesterolemic diet raises serum plasma cholesterol, triglycerides, LDL-c and VLDL-c, but HDL-c was reduced. Also**,** *Augusti et al., (2005**)*** reported that feeding on hypercholesterolemic diet showed negative effect on serum lipid profile .*Vidya et al., (2004)* and *Doaa, (2006)* reported that sesame oil diet lowered serum total cholesterol, triglycerides, LDL-c and total lipids significantly as compared with control positive group.

Lipid levels in rats fed ethanol and high lipid diet garlic oil enhances the catabolism of dietary cholesterol with garlic oil were significantly reduced to levels near to those seen in untreated control rats. Probably the and fatty acids *(Shoetan et al., 1984)*.Phytochemicals present in the *genus Allium*(garlic and onion oil) have potential pharmacological effects, such as antimicrobial, antithrombotic, antitumor, hypolipidemic and hypoglycemic activities *(Seki et al ., 2000)*.

Results of study effects of diet therapy including linseed oil on several parameters of lipid metabolism in patients are in the line with the finding of *Meshcheriakova et al.,(2001)* who found that omega-3 PUFA-enriched diet has a beneficial effects on lipid metabolism . However, *Lee and Prasad, (2003)* suggested that flaxseed oil does not produce an alteration in serum lipids or in the extent of hypercholesterolemic atherosclerosis. The ineffectiveness of flaxseed oil was associated with its ineffectiveness in altering the levels of oxidative stress. *Harper et al.,(2006-a,b**)*** suggested alpha-linolenic acid (ALA) does not decrease CVD risk by altering lipoprotein particle size or plasma lipoprotein concentrations.

A variety of soybean oils were developed with improved oxidative stability and functional characteristics for use as alternatives to partially hydrogenated fat. *Lichtenstein et al.,(2006)* found that nonsignificant effects were observed on VLDL-c ,triacylglycerol, lipoprotein(a) or on ratios of LDL-c to apolipoprotein B (apo B) and HDL-c to apo A-I. Total cholesterol: HDL-c was lower after subjects consumed the unhydrogenated soybean oils than after they consumed the Hydrog-So diet.

Choi et al.,(2004) showed that plasma triglycerides (TG) and total cholesterol (TC) concentrations were beneficially decreased and HDL-c to TC ratio was also beneficially increased by hydrogenated soybean oil (SHSO) supplementation (P<0.05, P<0.001 and P<0.01 , respectively) in rats . Also the study observed that body composition and plasma lipids were beneficially modulated by SHSO supplementation to the rat diets at least 3% levels, and suggested that SHSO is a useful fat source because of high level of conjugated linolenic acid (CLA). *Anwar and Meki,(2003)* reported that total lipid, triglyceride and cholesterol were decreased significantly in diabetic rats after treatment with garlic oil .The effect of six weeks garlic oil administration was observed on cardiac performance and exercise tolerance in 30 patients of coronary artery disease studied by *Verma et al.,(2005)* who found that garlic oil significantly (P<0.01) reduced heart rate at peak exercise and also significantly reduced the work load on the heart resulting in better exercise tolerance (P<0.05) as compared to the initial test . It appears to be a good adaptogen to be utilized in patients with coronary artery disease.

Table4. Effect different sources of vegetable oil on serum lipids profile of hypercholesterolemic rats

Groups	Cholesterol (mg/dl) m±sd	Triglyceride (mg/dl) m±sd	HDL-c(mg/dl) m±sd	LDL-c (mg/dl) m±sd	VLDL-c (mg/dl) m±sd
Group(Control -ve)(A)	71.5±0.5bc	32.5±2.5bcd	34.5±0.5c	30.5±0.5b	6.5±0.5bc
Group(Control +ve)(B)	180.2±0.3a	40.5±5.5a	34±1.11c	129.06±1.06a	8.1±1.1a
Garlic	57.1±0.2e	30.2±0.3de	35.1±0.2c	16±0.12e	6±0.05bc
Flaxseed	71±3bc	41±0.1a	43±1.5a	19.8±1d	8.2±0.01a
Sesame	66±2.5d	35.5±2.5b	39.5±0.2b	19.4±1d	7.1±0.5b
Fenugreek	68.5±1.5cd	35±0.4bc	4.1±2ab	20.5±0.5d	7±1.4b
Nigella	66.5±3d	33±0.6bcd	39±3.5b	20.9±0.7d	6.6±1.2bc
Soybean	68.5±2.5cd	29.5±0.9de	39.5±2.5b	23.1±0.1cd	5.9±1.1bc
Cumin	69±0.6cd	27.5±0.3e	39.1±1b	24±4.3c	5.5±0.7c
Onion	73±0.7b	28±1e	39±4b	28.4±3.2b	5.6±0.2c
Blend	67.2±0.25d	31.1±0.45cde	41.1±0.1ab	19.9±1.01d	6.3±0.09bc

All results are expressed as mean ± SD.
Values in each column which have different letters are significantly different (P<0.05)

*El-Dakhakhny et al.,(2000)*showed that a favorable effect on serum lipid pattern where the administration of the Nigella sativa l. oil (800 mg/kg orally for 4 weeks) to rats caused a significant decrease in serum total cholesterol, low density lipoprotein, triglyceride and a significant elevation of serum high density lipoprotein level.

Kokdil et al., (2006) reported that serum total cholesterol, triglycerides, LDL-c and VLDL-c decreased significantly following administration of *Nigella* oils to wistar Kyoto rats for 4 weeks.

Atherogenic Index (AI):

Effect of different sources of vegetables on atherogenic index in hypercholesterolemic rats is recorded in table (5).The mean value ±SD of atherogenic index calculated in hypercholesterolemic control group (B) were 3.19± 0.2 compared to 1.07±0.1 for the control group (A).

All different sources of oil used to fed hypercholesterolemic group induced a significant decrease (P<0.05) compared to positive control group (B), and there are no significant changes as compared to negative control group (A) (normal rats).

In study by *El-Tahir et al.,(1993)* about the effects of the volatile oil (V.O) of the black seed (*Nigella Sativa*) on the arterial blood pressure and heart of urethane-anaesthetized rats, the results suggested that V.O induced cardiovascular depressant effects were mediated mainly centrally via indirect and direct

Table5. Effect different sources of vegetable oil on atherogenic index (AI) of hypercholesterolemic rats

Groups	AI(mg/dl) M±SD
Group(Control-ve)(A)	1.07±0.1b
Group(Control +ve)(B)	3.19±0.2a
Garlic	0.63±0.01b
Flaxseed	0.65±0.03b
Sesame	0.67±0.2b
Fenugreek	0.71±0.6b
Nigella	0.67±0.1b
Soybean	0.73±0.02b
Cumin	0.77±0.03b
Onion	0.87±0.01b
Blend	0.64±0.02b

All results are expressed as mean ± SD.
Values in each column which have different letters are significantly different (P<0.05)

mechanisms that involved both 5-hydroxyptaminergic and muscarinic mechanisms. The direct mechanisms may be due to the presence of thymoquinone (T.Q) in the V.O. The V.O. seemed to possess the potential of being a potent centrally acting antihypertensive agent. *Lichtenstein et al.,(2006)* observed lower total cholesterol: HDL-c after subjects consumed the unhydrogenated soybean oils than after they consumed the Hydrog-So diet, and concluded that all varieties of soybean oils resulted in more favorable lipoprotein profiles than did the partially hydrogenated form. These soybean oils may provide a viable option for reformulation of products to reduce the content of tran's fatty acids.

Ingram et al.,(1995) reported that flaxseed oil is a rich source of alpha-linolenic acid , an 18:3n3 (omega-3 fatty acid) which has anti-atherogenic and anti-inflammatory properties and have proven cardio-protective properties. Dietary flaxseed oil to rats has a favorable effect on blood pressure and plasma lipids. *Alekseeva et al.,(2000)* and *Harper et al.,(2006)* who found that a diet supplemented with linseed oil did not increase the effect of dietary therapy in correction of glycaemia hypertension and atherogenic lipid level. It was not the activation of lipid peroxidation and alpha-linolenic acid (ALA) does not decrease CVD risk by altering lipoprotein particle size or plasma lipoprotein concentration.

Ramesh et al.,(2005) observed that sesame oil consumption influences beneficially lipid peroxidation and antioxidant levels in diabetic rats . *Bhaskaran et al.,(2006*) reported that sesame oil could inhibit atherosclerosis lesion formation effectively, perhaps because of the synergistic actions of fatty acid and nonsaponifiable components. *Skanker et al.(2006)* found that plasma levels of sodium reduced while potassium elevated upon the substitution of sesame oil. Lipid peroxidation (thiobarbituric acid reactive substances [TBARS]) decreased while the activities of super oxide dismutase (SOD) , catalase (CAT) and the levels of vitamin C ,Vit. E, Beta- carotene and reduced glutathione (GSH) were increased. The results suggested that sesame oil as edible oil lowered blood pressure, decreased lipid peroxidation and increased antioxidant status in hypertensive patients.

A randomized trial of the effects of garlic oil upon coronary heart disease risk factors in trained male runners was studied by *Zhang et al.,(2001)* who found that trends with garlic oil were mostly towards CHD risk.

Supplementation of garlic oil along with cholesterol significantly inhibited the hypercholesterolemia, decreased tissue cholesterol and minimized the atheromatous changes in the aorta. These results show that the active constituents in garlic responsible for its anti-atherogenic action is present in the oily fraction of garlic *(Jain and Konar ,1978)*.

Onion and garlic oils components of are anti-aggregating activity and there are a direct correlation between inhibition of platelet fatty acid oxygenases and this anti-aggregating activity. Onion and garlic oil also inhibited fatty acid oxygenases from sheep vesicular gland preparations as shown by both decreased oxygen consumption and decreased formation of prostaglandin E_2 (PGE_2) and PGD_2 from (1-c^{14}) AA. Onion oil was approximately ten times more effective in inhibiting the platelet oxygenases than the oxygenases from the vesicular gland *(Jack et al., 1980).*

Effect different sources of vegetable oils on liver function of hypercholesterolemic rats:

The effects of different sources of vegetable oil on activity of aspartate amine transferase (AST) and alanine amine transferase (ALT) enzyme of hypercholesterolemic rats are presented in table (6).Values of AST and enzyme activity for the positive control group showed significant increase (P<0.05), as compared to the negative control group (89.63 ±0.6 and 74.5± 0.2 vs. 31.95± 3.0 and 35.62± 1.3 respectively). These results agreed with those obtained by *Abdel-Hameed (2002);Augusti et al., (2005)* and *Doaa,(2006).*

Liver function AST and ALT for all treated groups with a different sources of plant oil recorded significant decrease (P<0.05) , as compared to (B) group. The best result in these treatments were observed in the group of rats fed on hypercholesterolemic diet containing garlic oil followed by the diet containing mixture of oils (blend oil). Garlic oil treatment showed nonsignificant changes in all liver function parameters, as compared to the negative control group . These results agreed with obtained by *Sheen et al.,(1999)*who found that hepatic antioxidant enzyme activities were modulated by garlic oil (and inhibited glutathione peroxidase activity) (P<0.05). While *El-Dakhakhny et al.,.,(2000)* reported that daily administration of Nigella oil did not adversely effect the serum transaminases (ALT and AST) in normal albino rats . *Kokdil et al., (2006)* showed that Nigella oil significantly reduced aspartate amine transferase (AST)& alkaline phosphatase (ALP) in rats, and caused a significant increase in the total antioxidant status in rats .

In accordance with results of table (6) *Sasser et al.,(1996)*reported that sesame oil lowered SGOT and SGPT. *Nakai et al., (2003)* reported that sesamin has anti-oxidative activity in the liver by conversion to prominent anti-oxidative metabolites, where they exert protective action against oxidative damage in the liver.

Vidya et al.,(2004) reported that incorporation of sesame oil in the diet at level of 10% can successfully withstand lipid peroxidation in vivo and also can enhance the activities of different antioxidant enzymes.

Effect different sources of vegetable oils on kidney function of hypercholesterolemic rats:

The effects of different sources of vegetable oil on serum uric acid, urea nitrogen and creatinine (mg/dl) of hypercholesterolemic rats are presented in table (7).The mean values of urea nitrogen ,uric acid and creatinine

Table6. Effect different sources of vegetable oil on liver function of hypercholesterolemic rats

Groups	GOT(u/L) M±SD	GPT(u/L) M±SD
Group(Control-ve)(A)	31.95±3i	35.62±1.3f
Group(Control +ve)(B)	89.63±0.6a	74.5±0.2a
Garlic	30.42±1.5i	34.11±2f
Flaxseed	38.15±2.5g	35.23±3f
Sesame	40.34±3f	38.25±1.5e
Fenugreek	44.15±2.5e	40.1±1.7e
Nigella	41.02±0.7f	39.37±0.5e
Soybean	48.36±1.4d	43±2d
Cumin	50.42±0.7c	48.3±4.1c
Onion	56.3±1.6b	51.38±1.1b
Blend	35.26±2.5h	34.27±1.5f

All results are expressed as mean ± SD.
Values in each column which have different letters are significantly different (P<0.05)

Table7. Effect different sources of vegetable oil on kidney function of hypercholesterolemic rats

Groups	Urea nitrogen (mg/dl)M±SD	Uric acid(mg/dl) M±SD	Creatinine (mg/dl) M±SD
Group(Control-ve)(A)	29.5±0.3f	2.03±0.4c	0.58±0.02b
Group(Control +ve)(B)	49.6±0.52a	5.14±0.8a	1.73±0.04a
Garlic	30.08±1.01f	1.9±0.7c	0.58±0.1b
Flaxseed	63.33±0.57e	2±0.1c	0.6±0.4b
Sesame	36.5±0.5e	2.1±0.2c	0.61±0.3b
Fenugreek	40.5±2.5cd	2.8±0.3bc	0.67±0.2b
Nigella	38.5±2.3de	2.37±1.5c	0.64±0.1b
Soybean	42±4c	3±0.6bc	0.68±0.2b
Cumin	42.5±2.5c	3.17±0.5bc	0.68±0.1b
Onion	45.5±3.5b	3.95±0.4b	0.71±0.03b
Blend	35.5±4.5e	1.96±0.4c	0.59±0.1b

All results are expressed as mean ± SD.
Values in each column which have different letters are significantly different (P<0.05)

(mg/dl) for the positive control group showed significant increase (P<0.05), as compared to the negative control group (49.6±52 ; 5.14± 0.8 and 1.73 ±0.04 vs. 29.5 ± 0.3 ; 2.03 ±0.4 and 0.58 ±0.02 respectively).These results agreed with those obtained by *Ell-Mallah, Maysa (2007)* who found that feeding of high fat diet increased kidney serum (uric acid, urea nitrogen and creatinine) values of rats compared with those in rats fed with normal diet.

Kidney functionparameters (urea nitrogen,uric acid and creatinine) for all treated groups with a different sources of vegetable oil recorded significant decrease (P<0.05) as compared to (B)group .The best result of these treatment was observed in group of rats fed on hypercholesterolemic diet containing garlic oil, because this treatment showed nonsignificant changes in all kidney function parameters , as compared to (A)group . For in uric acid all oil sources as garlic, blend, flaxseed and *Nigella* oil showed non-significant changes as compared to (A) group. Also all treated group with all sources of vegetable oil showed nonsignificant changes in serum creatinin as compared to (A) group.

These results agreed with those obtained by *Ingram et al.,(1995)* who reported that the dietary flaxseed and flax oil attenuated the decline in renal function. In related studies by *Anwar and Meki, (2003)* it was found that treatment of diabetic rats with garlic oil (10 mg/kg i.p.) for 15 days significantly increased plasma levels of total thiol, ceruloplasmin activities& albumin. Uric acid decreased significantly after treatment with garlic oil.

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الملخص العربي

تأثير بعض أنواع من الزيوت النباتية علي الفئران المصابة بارتفاع مستوي الكولسترول

إيمان عبد الهادي مُحَّد البلوني

أجريت هذه الدراسة لمعرفة تأثير إضافة بعض أنواع من الزيوت النباتية منها (زيت الثوم ،زيت بذر الكتان ، زيت السمسم، زيت الحلبة، زيت حبة البركة ، زيت فول الصويا ، زيت الكمون ، زيت البصل ثم خليط من هذه الزيوت) بنسبة 10% (بديلا عن زيت الذرة) ، وذلك لمعرفة تأثيرها علي معدل استهلاك الغذاء، الزيادة في الوزن، معدل التحول الغذائي وكذلك علي كل من مستويات السكر ودهون الدم وأيضا علي وظائف الكبد والكلي في الفئران المصابة بارتفاع مستوي الكولسترول.

وقد أستخدم عدد 66 فأر ألبينو ذكر تم تقسيمهم إلي مجموعتين الأولي عددها 6 فئران تغذت علي الغذاء الأساسي (B.D) واعتبرت مجموعة ضابطة سالبة وسميت مجموعة (A) بينما المجموعة الثانية وكان عددها 60-فأراً تم تغذيتهم علي الغذاء الأساسي مضافا إليه الكولسترول بنسبة 1.5% لمدة أسبوعين وذلك لإحداث ارتفاع في مستوي الكولسترول بالدم في هذه الفئران. ثم قسمت هذه المجموعة إلي (10 مجموعات فرعية) واستخدمت إحداهن كمجموعة ضابطة موجبة وسميت بالمجموعة(B). وغذيت طول فترة التجربة علي عليقه عالية الكولسترول فقط، بينما غذيت باقي المجموعات علي عليقه رافعة للكولسترول مع استبدال زيت الذرة بنوع أخر من الزيوت النباتية المدروسة فى التجربة بنسبة15%.

أظهرت النتائج أن تغذية الفئران المصابة بارتفاع مستوي الكولسترول بالدم علي العلائق المحتوية علي الزيوت المختبرة أدت إلي زيادة معنوية في وزن الفئران ،معدل استهلاك الغذاء وكذلك زيادة معنوية في معدل التحول الغذائي بالمقارنة بالمجموعة الضابطة الموجبة(B) كما أدت إلي نقص معنوي في مستوي الكولسترول الكلي والجليسريدات الثلاثية وجلوكوز الدم وكذلك معامل التصلب (الأثير وجنيك) بالمقارنة بالمجموعة الضابطة الموجبة .

- جميع الزيوت المستخدمة أدت إلي زيادة معنوية في البروتينات الدهنية عالية الكثافة ونقص معنوي في أنزيمات الكبد وكذلك وظائف الكلي.

- أشارت نتائج هذه الدراسة أن استخدام زيت الثوم أعطي أفضل النتائج في جميع المقاييس الكيموحيوية حيث لم تظهر أي فروق معنوية بمقارنتها بالمجموعة الضابطة السالبة (A).