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RESEARCH ARTICLE

EFFECT OF *Trigonella foenum* SEEDS POWDER ON LIPIDS PROFILE IN FED RATS

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ABSTRACT

Twenty Wistar albino rats were divided into four groups named A, B, C and D of five rats each. Group A was given the basal diet and served as control, group B was given basal diet and 1% cholesterol added to the basal diet, group C was given basal diet and 1% cholesterol and 4% TSP added to the basal diet and group D was given basal diet and 1% cholesterol and 8% TSP added to the basal diet for four weeks. Blood samples were collected from all groups after four weeks. The level of total cholesterol and LDL-c was significantly (P› 0.05) decreased in group C and D compared to group B. while the level not significantly different in group C, and D compared to group B. the level of HDL-c were significantly (P› 0.05) decreased in group C and D compared to B. there was non- significant difference in the levels of total cholesterol, LDL-c, HDL-c and triglycerides in group C and D compared to the control group.

INTRODUCTION

Hyperlipidemia is an abnormally high level of fatty substances called lipids, largely cholesterol and triglycerides, in the blood. It is also called hyperlipiproteinemia, because these fatty substances travel in the blood by attaching to proteins forming large molecules called lipoproteins. A subcategory of hyperlipidemia is hypercholesterole mia, in which there is a high level of total cholesterol. Hypertriglyceridemia refers to high triglyceride levels in the blood. [1]. Maintenance of cholesterol homeostasis is vital for healthy status and achieved through a regulatory network consisting of genes involved in cholesterol synthesis, absorption, metabolism and elimination. Imbalance of cholesterol level as a result of environmental and genetic factors leads to hypercholesterolemia, a predominant risk factor for atherosclerosis and associated coronary and cerebrovascular diseases [2,3,4]. Hypercholesterolemia and its associate cardiovascular diseases represent one of the greatest worldwide economic, social and medical challenges that we are facing now [5, 6]. In blood plasma, cholesterol is transported by liporoteins, which can be mainly categorized into four classes, based on the size of cholesterol-lipoprotein complexes: the very-low-density lipoproteins (VLDL), the intermediatedensity lipoproteins (IDL), the low-density lipoproteins (LDL), and the high-density lipoproteins (HDL) [1, 3]. Control of cholesterol levels through therapeutic drugs have significantly reduced the risk for developing atherosclerosis and associated cardiovascular diseases [7,8,9,10]. Fenugreek (Trigonella foenum graecum) natively known as Hulabah is one of the oldest medicinal plant, originating in India and Northern. Fenugreek seeds have been shown to have hypoglycaemic and anticholesterolemic action [11] Fenugreek leaves and seeds are consumed in different countries around the world for different purposes such as medicinal uses (anti-diabetic, lowering blood sugar and cholesterol level, anti-cancer, anti-microbial, etc.) [12]. Fenugreek seeds have been known and valued as medicinal material from very early times. Fenugreek as a chemurgic crop has a wide use for industrial purposes. Its seeds are considered to be of commercial interest as a source of a steroid diosgenin, which is of importance to the pharmaceutical industry [13, 14, 15]. The biological and pharmacological actions of fenugreek are attributed to the variety of its constituents, namely: steroids, N-compounds, polyphenolic substances,volatile constituents, amino acids, etc [15].Fenugreek seed contains 45-60% carbohydrates, mainly mucilaginous fiber (galactomannans), 20-30% roteins high in lysine and tryptophan, 5 - 10% fixed oils (lipids), pyridine alkaloids, mainly trigonelline (0.2 - 0.38%), choline (0.5%), gentianine and carpaine, the flavonoids apigenin, luteolin,orientin, quercetin, vitexin and isovitexin, free amino acids, such as 4-hydroxyisoleucine (0.09%), arginine, histidine and lysine, calcium and iron, saponins (0.6 - 1.7%), glycosides yielding steroidal sapogenins on hydrolysis (diosgenin, yamogenin, tigogenin, neotigogenin), cholesterol and sitosterol, vitamins A, B1, C and nicotinic acid and 0.015% volatile oils (n-alkanes and sesquiterpenes) [15, 16, 17].

The aim of the study was to evaluate the effect of the trigonella foenum garaecum seeds powder (TSP) on lipid profile in cholesterol fed rat

Experimental Procedure

All the animals were weighed and divided into four groups of five animals each .Group I. Normal control fed on basal diet (Wheat flour, Dry meat. Sodium chloride and Oil). Group II. Cholesterol control. Animals of this group were fed cholesterol at a dose of 1% added to the basal diet.Group III. Animals of this group were fed 1% cholesterol and 4% *Trigonella foenum graecum* seed powder added to the basal diet .Group IV. Animals of this group were fed 1% cholesterol and 8% *Trigonella foenum graecum* added to the basal diet. Group V. Animals of this group were fed cholesterol as in group II and Aloe vera (L) extract at a dose of 5 mg/kg body weight for 21 days and insect diet. Blood samples were collected after two week

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following treatment so as to confirm the induction of hypercholesterolemia. The after another two weeks the blood samples were taken for the determination of lipid fractions concentration.

Blood sampling

One and half ml of blood was collected from the rats orbital plexus after an overnight fast by capillary tubes and was put in heparin zed containers , the blood was centrifuged at 5000 rpm for 10 minutes . Then the plasma was placed into plane containers and used immediately.

Statistical Analysis

Student's t-test (MS Excel) was used. A *p*-value < 0.05 was taken as statistically significant. The serum cholesterol, levels were compared to the levels of the normal control and the change was calculated [18].

RESULTS

Table (1) show the results of plasma total cholesterol of group A,B, C and D. The level of plasma total cholesterol in group B is significantly (P<0.05) higher than the levels of plasma total cholesterol in group A, C and D. in group C the level of plasma total cholesterol is significantly higher than that of group A and non significantly different from group D, and significantly (P < 0.05) lower than the level of plasma total cholesterol in group B. However, in group D the level of plasma total cholesterol is significantly (P < 0.05) lower than the level of plasma total cholesterol in group B but non- significantly different form group A and group C. The level of plasma HDL-c in group B is significantly (P< 0.05) lower than the levels of plasma HDL-c in group A, C and D. In group C the level of plasma HDL-c is non-significantly different compared to the levels of plasma HDL-c of group A and group D, and significantly (P < 0.05) higher than the level of plasma HDL-c in group B. However, in group D the level of plasma HDL-c is significantly (P < 0.05) lower than the level of plasma HDL-c in group B but non- significantly different form group A and group C. (Table 1).

The level of plasma LDL-c in group B is significantly (P< 0.05) higher than the levels of plasma LDL-c in group A and D. in group C the level of plasma LDL-c is non-significantly different compared to the levels of plasma LDL-c of group A and group D, and significantly (P < 0.05) lower than the level of plasma LDL-c in group B. However, in group D the level of plasma LDL-c is significantly (P < 0.05) lower than the level of plasma LDL-c in group B but non- significantly different form groups A and group C. (Table 1) The level of plasma VLDL-c values non- significantly differences of each groups, in group C the level of plasma VLDL-c is non-significantly different compared to the levels of plasma VLDL-c of group A,B and group D, and group D non-significantly (P < 0.05) than the level of plasma VLDL-c in group C. (Table 1). The level of plasma triglycerides in group B is non -significantly higher than the levels of plasma triglycerides in group A, C and D. In the group C the level of plasma triglycerides is non-significantly lower than the levels of plasma triglycerides of group B, and non-significantly higher than the level of plasma triglycerides in group A. However, in group D the level of plasma triglycerides is non-significantly lower than the level of plasma triglycerides in the group B and C. (Table 1) .

DISCUSSION

The results showed that the plasma total cholesterol and LDL-c levels were significantly increased (P< 0.05) following administration of 1% cholesterol powder mixed with the basal diet after two weeks in group B compared to group A (control), but there was a significant (P< 0.05)decrease in HDL-c level. The level of plasma total cholesterol was decreased significantly (P<0.05) after the administration of 4% and 8% TSP compared to the control , is may be due to impairment of fats absorption due to the presence of fiber in the seeds and increased conversion of hepatic cholesterol to bile salts which is lost in the faces together with fenugreek fiber and Saponins , in addition to the presence of pectin which is sticky substance is working on the configuration of the cholesterol prevents its absorption by the intestine. Also the hypocholesterolemic effect of TSP may be due to the improvement of insulin secretion because insulin has an inhibitory action on HMG-CoA reductase, a key rate limiting enzyme responsible for the synthesis of cholesterol. . These results were in agreement with the study of Sharma [11] who reported decrease in triglycerides and total cholesterol level of the diabetics were observed by feeding fenugreek seeds by various workers. Fenugreek seed's gum and saponin fractions showed a hypocholesterolemic effect. Saponin of fenugreek may compete with cholesterol at binding site or interfere with cholesterol biosynthesis in liver. In the present study addition of 8 % of TSP to the basal diet of an induced hypercholesterolemic Wistar albino rats resulted in a significant increase of Plasma HDL-c. compared to group B and C , may be due to the high fiber and unsaturated/ saturated fatty acids ratio contents of the seeds which decrease VLDL and increase HDL-c production. [19]. The level of Plasma LDL-c decreased significantly (P<0.05) after the administration of 4% and 8% TSP. The reduction of LDL-c level by TSP is due to the high fiber and saponins contents of the TSP which increases LDL-c receptors activity that enhance the uptake of LDL-c particles by cells. Also the fiber and saponins contents of the TSP reduce the release of LDL-c particles from the hepatocytes. These results were in agreement with the study of [20], who reported that fenugreek seed powder significantly (p < 0.001) reduced serum total cholesterol, serum triacylglyceride level and serum LDL-cholesterol level in hyperlipidemic type 2 diabetic patients. The serum HDL-cholesterol level increased but not significantly by the fenugreek seed powder. Also the results were in line with the result obtained by Shela *et al*. [21] who reported that administration of 1% cholesterol powder to rabbits resulted in an increase total and LDL-c, but the HDL-c was reported to be decreased. In the present study addition of 4% and 8% of TSP to the basal diet of an induced hypercholesterolemic Wistar albino rats resulted in a non significant decease of plasma triglycerides level and VLDL-c. may be due to the short duration of this experiment. Fenugreek seeds also lower serum triglycerides, total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C). These effects may be due to sapogenins, which increase biliary cholesterol excretion in

Table (1). The effect of feeding fenugreek seeds powder on plasma total cholesterol, low density lipoprotein-cholesterol, high density lipoprotein-cholester very high density lipoprotein-cholesterol and triglycerides level in an induced hypercholesterolemia in Wister albino rats:

Parameters / Groups	T-cholesterol (mg/ dl)	HDL-c (mg/dl))	LDL-c (mg/dl)	VLDL (mg/dl)	Triglycerides (mg/dl)
A	172.0 ± 0.6 [c]	43.00 ± 0.58 [a]	112.7 ± 1.10 [b]	16.30 ± 0.06 [a]	81.50 ±0.29 [a]
B	191.0 ± 1.2 [a]	40.00 ± 0.58 [b]	133.0 ±1.o4 [a]	18.00 ± 0.69 [a]	90.00 ± 3.46 [a]
C	187.5 ± 0.3 [ab]	41.00 ± 0.58 [b]	129.7 ±o.64 [a]	16.80 ±0.23 [a]	84.00 ± 1.15 [a]
D	177.5 ± 6.1 [bc]	43.00 ± 0.58 [a]	118.0 ±6.93 [b]	16.50 ±0.29 [a]	82.50 ± 1.44 [a]

Means ± SE within the same column having different superscript small letters are significantly different at (P < 0.05) based on t- test.
Group A: fed basal diet. Group B: fed 1% cholesterol basal diet. Group C: fed 1% cholesterol and 4% TSP added to the basal diet. Group D: fed 1% cholesterol and 8% TSP added to the basal diet

liver, leading to lowered serum cholesterol levels [22,23]. The lipid-lowering effect of fenugreek might also be attributed to its oestrogenic constituent, indirectly increasing the thyroid hormone T4.

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