

## The Effect of Feeding *Coriandrum sativum* Fruits Powder on the Plasma Lipids Profile in Cholesterol Fed Rats

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**Abstract:** The aim of this study was to investigate the effect of *Coriandrum sativum* fruits powder on plasma total cholesterol (TC), low density lipoprotein-cholesterol (LDL-c), high density lipoprotein-cholesterol (HDL-c), triglycerides (TG), and total lipid levels in an induced hypercholesterolemic Wistar albino rats. Twenty male Wistar albino rats were used in this study. They were divided into four groups A, B, C and D. Group A (control group) received a basal diet, group B received a basal diet with 2% cholesterol so as to induce hypercholesterolemia, group C received a basal diet with 2% cholesterol and 4% *Coriandrum sativum* fruits powder, group D received a basal diet with 2% cholesterol and 8% *Coriandrum sativum* fruits powder. The results showed that, plasma TC, LDL-c, TG and total lipid were increased significantly ( $P < 0.05$ ) in group B, while HDL-c level was decreased significantly compared to the control. In group C, the plasma levels of TC, LDL-c, TG and total lipid were non-significantly lower and HDL-c was non-significantly higher compared to group B. The plasma levels of TC, LDL-c, TG and total lipids in group C were significantly ( $P < 0.05$ ) higher compared to group D. The plasma levels of TC, LDL-c, TG and total lipid in group D were decreased significantly ( $P < 0.05$ ), while HDL-c was significantly ( $P < 0.05$ ) increased compared to group B. The levels of TC, LDL-c, HDL-c, TG and total lipid in group D were non-significantly different compared to the control.

**Key words:** *Coriandrum sativum*, total cholesterol, hypocholesterolemia

### INTRODUCTION

Lipids are one of the major constituents of food and important in diet that provide the major source of energy. This group of substances includes, triglycerides, diglycerides, monoglycerides, free fatty acids, phospholipids and cholesterol, but the triglycerides are the major component of most food. They represent 95 to 99% of the total lipid present in the body. The most important precursor and derived lipids is the cholesterol, the best known sterol, and it is a precursor of a large number of important steroids. Cholesterol is present mainly in blood in the lipoprotein fractions as low density lipoprotein (LDL-c) and high density lipoprotein (HDL-c).

There are many chemical drugs like statins, ezetimibe and nicotinic acid that lower cholesterol level but are more expensive and have many undesirable effects. Many herbal plants that lower cholesterol concentration were studied<sup>[19,4,23]</sup>.

*Coriandrum sativum* belongs to the family Apiaceae was considered to be native from Asia and Africa, and known locally in Sudan as Kazbra, It has

been reported that *Coriandrum sativum* fruits have a healing properties<sup>[14]</sup>, also it is considered as an antidiabetic plant<sup>[8]</sup>. The volatile oil found in the leaves may have antimicrobial properties<sup>[3]</sup>, and used for its anti-inflammatory effect, carminative and appetizer<sup>[24]</sup>. *Coriandrum sativum* was also found to relieves colds, combat diarrhea and intestinal poisoning, as well as for toothache and mouth wash<sup>[1]</sup>. The plant has anti-convulsant effect<sup>[9]</sup>, and reducing lipid profile<sup>[12,11]</sup>.

In Sudan *Coriandrum sativum* fruits are traditionally used in cooking and against flatulence. The first study of the hypolipidemic action of *Coriandrum sativum* has been recorded by Chithra and Leelamma,<sup>[2]</sup> in India, who reported that feeding of *Coriandrum sativum* resulted in a significant reduction in cholesterol and LDL-c. Another study in Southern republic of Korea, where *Coriandrum sativum* whole fruits were fed to Sprague-Dawley rats after feeding of a high fat diet, which lowered lipid profile levels and increased HDL-c levels. In Japan, Ertas and Guler<sup>[12]</sup> fed the Japanese quails *Coriandrum sativum* whole fruits after feeding of a high fat diet, which resulted in a significant decrease in the lipids profile levels.

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The objective of this study was to investigate the effect of feeding *Coriandrum sativum* fruits powder mixed with diet on the level of lipid profile in an induced hypercholesterolemic Wistar albino rats.

## MATERIALS AND METHODS

**Animals:** Twenty male albino rats, weighing 80-120g, were used in this experiment. They were kept at the Biochemistry Department laboratory, Faculty of Veterinary Medicine, Khartoum University. They were given food and water ad libitum. The animals were fed basal diet which was composed of wheat flour 710g, dry meat 167g, vegetable oil 120g and sodium chloride 3g, for 7 days, as an adaptation period.

**Plant Material:** *Coriandrum sativum* dry fruits brought from Omdurman local market, Sudan, were purified and powdered.

**Study Design:** The animals were divided into four groups of five animals each. Group A was given the basal diet and served as control. Cholesterolemia was produced by adding 2% cholesterol powder to the basal diet. Group B received the basal diet with 2% cholesterol; group C received the basal diet with 2% cholesterol and 4% powdered *Coriandrum sativum* fruits; while group D received 2% cholesterol and 8% *Coriandrum sativum* fruits powder added to the basal diet.

Blood samples were collected after one month for the determination of different lipid fractions.

**Sample Collection:** Blood was collected from the rat's orbital plexus according to<sup>[10]</sup> after an overnight fast by capillary tubes and was put in heparinized containers, the blood was centrifuged at 5000rpm for 10 min., then the plasma was collected and stored at -20°C until analysis.

**Analytical Methods:** All lipid profiles were determined by using Hitachi 902 analyzer except total lipid which was determined according to Frings *et al.*<sup>[6]</sup>.

**Statistical Analysis:** Comparison of lipid profile levels in all groups were carried using the Students t-test with significance set at 0.05 according to<sup>[15]</sup>.

## RESULTS AND DISCUSSION

The results of lipids profile are summarized in table (1), Figs. (1, 2 and 3). In group B and C the levels of total cholesterol, LDL-c, triglycerides and total lipids were significantly ( $P<0.05$ ) higher than the control. However, group which received 4% *Coriandrum sativum* the levels of total cholesterol,

LDL-c, triglycerides and total lipids were non significantly lower than group B. Meanwhile, the levels of HDL-c in group B and C were significantly ( $P<0.05$ ) lower compared to the control, but group C was higher than group B with no significance. In group D which received 8% *Coriandrum sativum*, the levels of total cholesterol, LDL-c, triglycerides (TG) and total lipids showed a significant ( $P<0.05$ ) reduction than group B and C, but the levels of HDL-c was significantly ( $P<0.05$ ) higher. There were no significant difference in HDL-c, TG and total lipid in group D compared to the control.

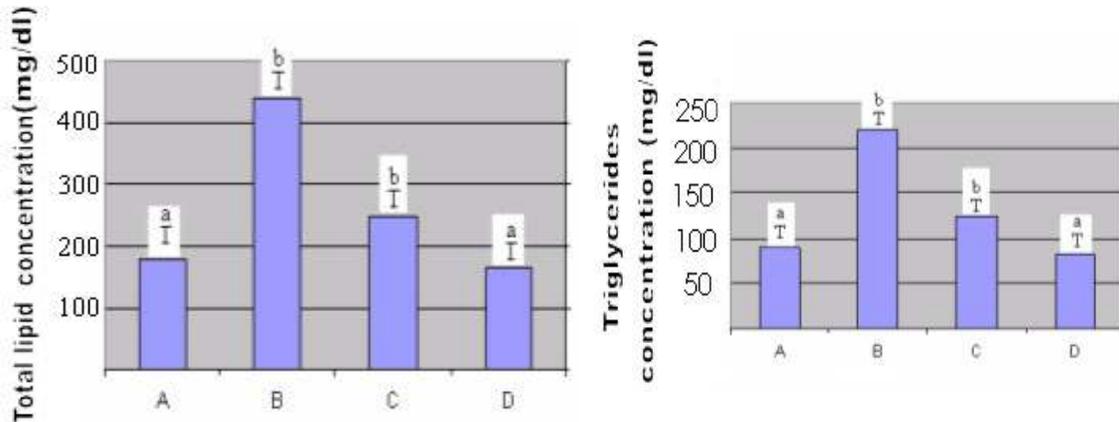
In the present study, the plasma total cholesterol level was decreased significantly ( $P<0.05$ ) following administration of 8% *Coriandrum sativum* fruits powder, but was not affected when 4% *Coriandrum sativum* was added to the diet. This is in agreement with Chithra and Leelamma<sup>[2]</sup>, who reported that feeding of 10% *Coriandrum sativum* fruits powder to rats for 75 days resulted in a significant reduction in the serum total cholesterol level. They attributed this to the high fiber amount that increases degradation of cholesterol to fecal bile acids. Similar results were also obtained by Hwang *et al.*<sup>[11]</sup>, who fed 5% *Coriandrum sativum* whole fruits for 5 weeks to rats in high fat diet. They claimed that the reduction of total cholesterol levels may be due to fibers content that increases the activity of plasma lecithin cholesterol acyl transferase (LCAT), enhances hepatic bile acids synthesis and increases degradation of cholesterol to fecal bile acids and neutral sterols. However, Garcia *et al.*<sup>[4]</sup> stated that addition of soluble fibers to atherosclerotic patients increases cholesterol degradation to fecal bile acids. Sairam<sup>[21]</sup> reported that *Coriandrum sativum* seeds contain high amount of fibers. In contrast to our findings Ertas and Guler<sup>[5]</sup>, stated that feeding of 4% *Coriandrum sativum* fruits to quails for 5 weeks resulted in a significant decrease in total cholesterol level.

Diederchsen<sup>[3]</sup> reported that *Coriandrum sativum* contain 16.6% omega 3 fatty acids and 38.4% soluble fibers which may play a role in decreasing LDL-c level. Robert<sup>[20]</sup> concluded that mixing of 5 and 10% omega 3 fatty acids with atherosclerotic patient's diet reduced LDL-c level significantly, this because omega 3 fatty acids incorporated into atherosclerotic plaques and rupture it. Tsang<sup>[26]</sup> suggested that feeding of 5% flax seeds to rats fed high fat diet increased LDL-c receptors which are due to the high amount of omega 3 fatty acids that enhance LDL-c entry into cells.

In the current study feeding of 8% *Coriandrum sativum* fruits to an induced hypercholesterolemic Wistar albino rats caused a significant increase in HDL-c levels. This is may be due to the decreased production of VLDL. Park *et al.*<sup>[18]</sup> suggested that feeding of 5% fish oil to rats resulted in an increased

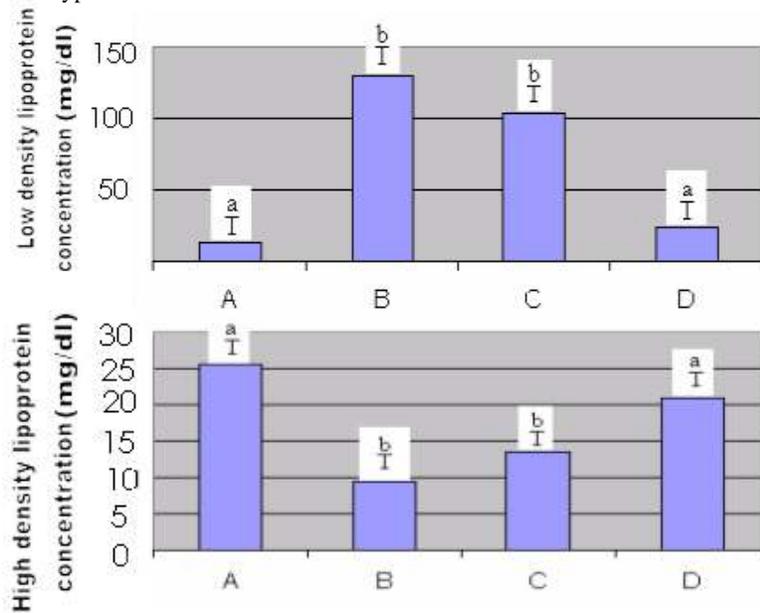
**Table 1:** The effect of feeding *Coriandrum sativum* fruits powder on the levels of total cholesterol, low density lipoprotein, high density lipoprotein, triglycerides and total lipid in an induced hypercholesterolemic Wistar albino rats.

Groups	Total cholesterol (mg/dl)	Low density lipoprotein (mg/dl)	High density lipoprotein (mg/dl)	Triglycerides (mg/dl)	Total lipid (mg/dl)
A	61± 5.37 <sup>a</sup>	13.42± 1.2 <sup>a</sup>	25.52±2.15 <sup>a</sup>	90±6.72 <sup>a</sup>	220±13.38 <sup>a</sup>
B	154.2±3.56 <sup>b</sup>	130.36±9.12 <sup>b</sup>	9.41±2.27 <sup>b</sup>	220±13.36 <sup>b</sup>	533.4±36.52 <sup>b</sup>
C	140.2±11.19 <sup>b</sup>	102.7±7.18 <sup>b</sup>	13.55±3.27 <sup>b</sup>	125±7.59 <sup>b</sup>	467±10.77 <sup>b</sup>
D	117±6.09 <sup>a</sup>	23.61±2.11 <sup>a</sup>	20.97±2.14 <sup>a</sup>	82±3.97 <sup>a</sup>	231.2±12.97 <sup>a</sup>



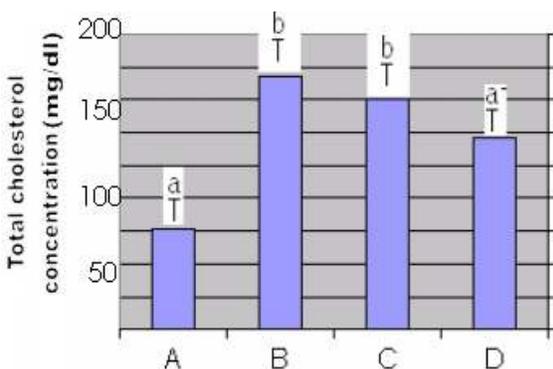
Means (±SE) within the same column having the different & subscript letter(s) are significantly different (P<0.05) based on t-test

**Fig. 1:** The effect of feeding *Coriandrum sativum* fruits powder on the plasma total lipid and triglycerides levels in an induced hypercholesterolemic Wistar albino rats.



(±SE) within the same column having the different superscript letter(s) are significantly different (P<0.05) based on t-test

**Fig. 2:** The effect of feeding *Coriandrum sativum* fruits powder on the plasma LDL-c and HDL-c levels in an induced hypercholesterolemic Wistar albino rats.



Means ( $\pm$ SE) within the same column having the different superscript letter(s) are significantly different ( $P < 0.05$ ) based on t-test

**Fig. 3:** The effect of feeding *Coriandrum sativum* fruits powder on the plasma total cholesterol level in an induced hypercholesterolemic Wistar albino rats.

HDL-c level due to the inhibition of apo D activity which is responsible for the transferring of cholesteryl ester (CE) into VLDL. Murugaiah<sup>[17]</sup> suggested that mixing of 35 and 70 mg of ginger with rats' high fat diet increased HDL-c level significantly.

The results obtained in our study showed that plasma triglycerides decreased significantly in the group treated with 8% *Coriandrum sativum* fruits powder. These results agree with Hwang *et al.*<sup>[11]</sup> and Chithra and Leelamma<sup>[2]</sup>, who reported that administration of *Coriandrum sativum* whole fruits or powder resulted in a significant decrease in the serum triglycerides level.

The plasma total lipids level decreased significantly in the group treated with 8% *Coriandrum sativum* fruits powder. This may be due to the presence of the omega 3 fatty acids and soluble fibers. Sebokova *et al.*<sup>[22]</sup> reported that administration of 30% omega 3 polyunsaturated fatty acids from fish oil mixed with rats' diet for 14 days resulted in a significant reduction in serum total lipids and saturated fatty acids and this is due to the blockage of fatty acids synthesis. Judith and Samuel<sup>[12]</sup> reported that feeding of 1.5g of *Irvingia gabonensis* seeds added to rats' basal diet 3 times a day for one month resulted in decreased serum total cholesterol as well as fatty acids synthesis, which may be due to the high fibers content in the plant. Nevertheless, feeding of 4% *Coriandrum sativum* fruits powder in this experiment showed no effect on reducing total lipid levels.

In conclusion, the results revealed that feeding of *Coriandrum sativum* fruits powder mixed diet significantly reduced plasma lipids profile in Wistar albino rats when given at a dose of 8% for one month.

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