

PHYTOCHEMICAL SCREENING AND ANTIDYSLIPIDEMIC ACTIVITY OF CORIANDER LEAF ETHANOL EXTRACT (*Coriandrum sativum* L.) IN WISTAR MALE RATS

S.M. Sinaga[✉], H. Cintya, M. Batubara, I. Zilena and H.D. Syahputra

Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Universitas Sumatera Utara,
Medan-20155, Indonesia

[✉]Corresponding Author: sitimorin@usu.ac.id

ABSTRACT

Dyslipidemia is an important major issue that accounted for atherosclerosis and coronary heart disease. Therapy with synthetic drugs becomes a daily routine and can lead to multiple side effects. This makes herbal medicine often used as an additional treatment, one of which is coriander leaves (*Coriandrum sativum* L.). The goal of this research is to find out the lipid-lowering activity of coriander leaves ethanolic extract (CLEE) in male rats induced with the intake of a high-fat diet. The resulting data were analyzed by ANOVA (Analysis of Variance) then continued with the Post Hoc Tukey HSD test to see the differences between treatments. The result of this study shows that there were significant differences between the CLEE doses of 100, 200 and 400 mg/kg body weight. Based on the result show that CLEE has an effect in reducing levels of total cholesterol, LDL and triglycerides as well as increasing blood HDL levels of mice induced by a high-fat diet. Shown that of CLEE with affixed dose in 400 mg/kg BB has the best lipid-lowering agent among other treatments.

Keyword: *Coriandrum sativum* L, Total Cholesterol, HDL, LDL, Dan triglyceride

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INTRODUCTION

According to with World Health Organization (WHO) in 2012 shown that heart disease and stroke rank number one and two as the cause of death in the world with and accountable for 14.1 billion deaths. This number is increasing compared to 2000 data. In Indonesia, stroke, along with coronary heart disease, is the leading cause of mortality. The incidence of stroke in Indonesia based on in 2007 is accounted in eight per thousand it's populace. The total number of stroke patients in Indonesia, around 2.5% or 250 thousand people died and the rest had minor or severe disabilities. In 2020 it is estimated that 7.6 million people will die from stroke. Based on RIKERDAS data in 2013, it shows that the prevalence of heart disease increases along with age, which leads highest group is aged 65-74 years.^{1,2}

According to another theory, saponins can create insoluble complex bonds with cholesterol obtained from food, bind to bile acids to form micelles, and enhance cholesterol binding by fiber, preventing cholesterol from being absorbed by the gut. Tannins in the body attach to proteins in the body and coat the gut walls, preventing fat absorption. Flavonoids inhibited the HMG-CoA reductase enzyme in mice in vitro, resulting in a reduction in cholesterol production.³

Coriander (*Coriandrum sativum* L), a member of the Apiaceae family, is one of the herbs used in traditional medicine. Most parts of this plant are edible, although the leaves and seeds are the most often consumed.⁴ Flavonoids, polyphenols, β -carotene, cineol, coumarin, and tannins are among the many chemicals identified from coriander.⁵

Based on the findings, the researchers sought to see if an ethanol extract of coriander leaves might reduce total cholesterol (TC), HDL, LDL, and triglyceride (TG) levels in male rats fed a high-fat diet. In this study, a high-fat meal consisting of quail egg yolk, used cooking oil, and goat fat was given to the test animals to raise their cholesterol levels.⁶⁻⁹

EXPERIMENTAL

Methods

Twenty-four test animals were split into six groups, each with four rats. Group I was treated as a control group and fed with a normal diet, whereas group II-VI was subjected to a high-fat diet. Meal and water were given every day for 15 days as much as 1% BW orally for group II-VI. The group with a high-fat diet was administered daily with oral intake. Day 16 to day 21 each subject was treated with: group II, oral Na-CMC suspension; group III was given an oral suspension of simvastatin 2 mg / kg BW, groups IV, V and VI were given leaf ethanol extract coriander each at a dose of 100 mg / kg BW, 200 mg / kg BW, and 400 mg / kg BW orally. On the test animals on days 0, 14 and 21, total cholesterol, HDL, LDL and TG levels were measured.

Data Analysis

The data obtained in the form of total cholesterol, LDL, HDL, and TG levels were statistically processed with the SPSS program using the One-Way ANOVA method as a comparison towards the effects between treatments can be determined by further analysis, namely the Post Hoc Test.¹⁰

RESULTS AND DISCUSSION

Coriandrin Bioactivity

As seen in Table-1, coriandrin bioactivity as anti-cholesterol as shown towards target receptor with ligand-gated G-Couple Protein, Ion Channel Modulator, Protease Inhibitor, Kinase Inhibitor, Nuclear Receptor Ligand, and Enzyme Inhibitor. Results showed that coriandrin can give potent enzyme activity against HMG CoA reductase. By using *QSAR toolbox* study and the result obtained are as followed:

Table-1: Coriandrin Bioactivity

Compound	GPCR	Kinase	Nuclear receptor	Protease	Ion Channel	Enzyme
Coriandrin	-0.69	-0.80	-0.89	-0.66	-0.24	-0.24

Antidyslipidemic Activity of Coriander Leaf Ethanol Extract

At the beginning of the treatment, the levels of experimental animals were measured to determine their normal levels. After being tested statistically there was no significant difference between groups on the 0th day of data levels. This is because the treatment given to experimental animals is the same, namely the acclimatization for 7 days given standard feed, drinking water, the same conditions and the induction of a high-fat diet.¹¹⁻¹³

The subject was then given a high-fat diet consisting used of cooking oil, goat fat and quail egg yolk to increase total cholesterol, LDL, TG levels and reduce HDL. A high-fat diet is given for 14 days as much as 1% BW. After 14 days, the levels were measured again and analyzed statistically. It was found that there was a significant difference between day 14 levels and day 0 levels, and there was a significant difference between group I and all groups. This could happen because the group I was not given a high-fat diet like the other groups.

Quail eggs consisted of 47.4% egg whites; egg yolk 31.9%; shells and 20.7% shell membranes. The protein content of quail eggs is around 13.1% while the fat content is 11.1%. The cholesterol level of quail egg yolk was 844 mg / dL, while the cholesterol content of chicken egg yolk was only 423 mg / dL. Quail eggs fall into the category of very high cholesterol levels. Quail egg yolk contains 15.7% - 16.6% protein; 31.8% - 35.5% fat; 0.2% - 1.0% carbohydrates and 1.1% ash. High cholesterol levels in the blood can cause diseases such as heart attacks and narrowing of blood vessels.¹⁴

Cooking oil that had been used more than two or three times is categorized as waste because it can cause a number of diseases. It can contain free radicals which are carcinogenic. The heating process can change the physio-chemical properties of oil and accelerate the hydrolysis of triglycerides and increase free fatty acids.⁷ Another ingredient used to increase cholesterol levels in goat fat. This is due to the high cholesterol content in goat fat, which is 3.2 mg / g.¹⁵

On the 15th day, all experimental animals were given therapy according to their respective groups for 7 days. Furthermore, the final measurement for total cholesterol, HDL, LDL and TG levels is carried out to

see if the levels have decreased and increased. Total cholesterol, HDL, LDL and TG levels are shown in Tables-2, 3, 4, and 5 respectively.

Table-2: Average Total Cholesterol Level

Groups	Cholesterol Total Level		
	Day-0	Day-14	Day-21
Normal	107.50±1.73	108.75±1.71	109.75±0.96
Simvastatin	112.75±1.71	167.75±3.86	114.25±4.35
CMC Na 0.5 %	112.25±7.27	172.25±7.09	170.75±4.65
CLEE 100 mg/kgBW	114.75±4.57	178.00±7.70	143.75±4.11
CLEE 200 mg/kgBW	114.00±4.55	171.50±5.97	122.00±2.16
CLEE 400 mg/kgBW	111.25±6.65	178.50±7.19	117.00±2.94

Table-3: Average HDL Level

Groups	HDL Level		
	Day-0	Day-14	Day-21
Normal	53.50±5.80	53.75±5.56	53.00±5.89
Simvastatin	58.75±6.70	29.25±4.72	56.75±4.35
CMC Na 0.5 %	63.25±4.65	29.00±2.16	28.75±0.96
CLEE 100 mg/kgBW	58.75±7.63	29.50±4.43	33.25±3.30
CLEE 200 mg/kgBW	58.50±3.70	28.75±5.74	46.75±3.40
CLEE 400 mg/kgBW	62.25±5.32	26.75±1.71	52.75±7.04

Table-4: Average LDL Level

Groups	LDL Level		
	Day-0	Day-14	Day-21
Normal	42.25 ± 5.50	43.25 ± 6.02	45.50 ± 5.51
Simvastatin	42.50 ± 5.50	115.25± 5.96	43.25 ± 1.50
CMC Na 0.5 %	37.25 ± 2.06	119.25± 6.40	118.25± 2.99
CLEE 100 mg/kgBW	44.00 ± 8.83	124.75± 5.91	93.50 ± 4.36
CLEE 200 mg/kgBW	42.00 ± 6.27	118.75± 9.71	58.75 ± 5.74
CLEE 400 mg/kgBW	35.00 ± 8.04	128.25± 8.26	49.00 ± 7.39

Table-5: Average Triglyceride Level

Groups	Triglyceride Level		
	Day-0	Day-14	Day-21
Normal	69.25 ± 8.54	58.50 ± 2.89	58.25 ± 5.51
Simvastatin	70.00 ± 7.07	117.25 ± 7.54	72.25 ± 2.63
CMC Na 0.5 %	72.25 ± 9.43	120.25 ± 9.00	117.50 ± 8.35
CLEE 100 mg/kgBW	64.50 ± 4.43	178.00 ± 7.70	93.75 ± 3.30
CLEE 200 mg/kgBW	74.75 ± 11.41	171.50 ± 5.97	82.25 ± 2.22
CLEE 400 mg/kgBW	72.25 ± 7.93	178.50 ± 7.19	76.25 ± 3.50

Furthermore, the data were analyzed statistically using the SPSS program with the normality test method, the One Way ANOVA parametric test with a 95% confidence level, then continued with the Post Hoc Tukey HSD test to see significant differences between treatment groups.

The results of the analysis of total cholesterol levels on the 21st day showed that the CLEE dosages of 200 mg / kg and 400 mg / kg of body weight did not have a significant difference with the simvastatin group of 0.9 mg / kg ($p > 0.05$). Meanwhile, CLEE 100 mg / kgBW had a significant difference with simvastatin 0.9 mg / kgBW ($p < 0.05$).

The analysis of the reduction in LDL levels on the 21st day of CLEE at a dose of 400 mg / kgBW found that there was no significant difference with the simvastatin 0.9 mg / kgBW group ($p > 0.05$). Meanwhile, CLEE 100 mg / kg body weight and 200 mg / kg body weight had a significant difference with simvastatin 0.9 mg / kg body weight ($p < 0.05$).

The results of the analysis of the increase in HDL levels from CLEE doses of 200 mg / kg and 400 mg / kgBW showed that there was no significant difference with the simvastatin 0.9 mg / kgBW group ($p > 0.05$). Meanwhile, CLEE 100 mg / kgBW had a significant difference with simvastatin 0.9 mg / kgBW ($p < 0.05$).

The results of the analysis of triglyceride levels from CLEE doses of 200 mg / kg and 400 mg / kgBW showed that there was no significant difference with the simvastatin 0.9 mg / kgBW group ($p > 0.05$). Meanwhile, CLEE 100 mg / kgBW had a significant difference with simvastatin 0.9 mg / kgBW ($p < 0.05$).

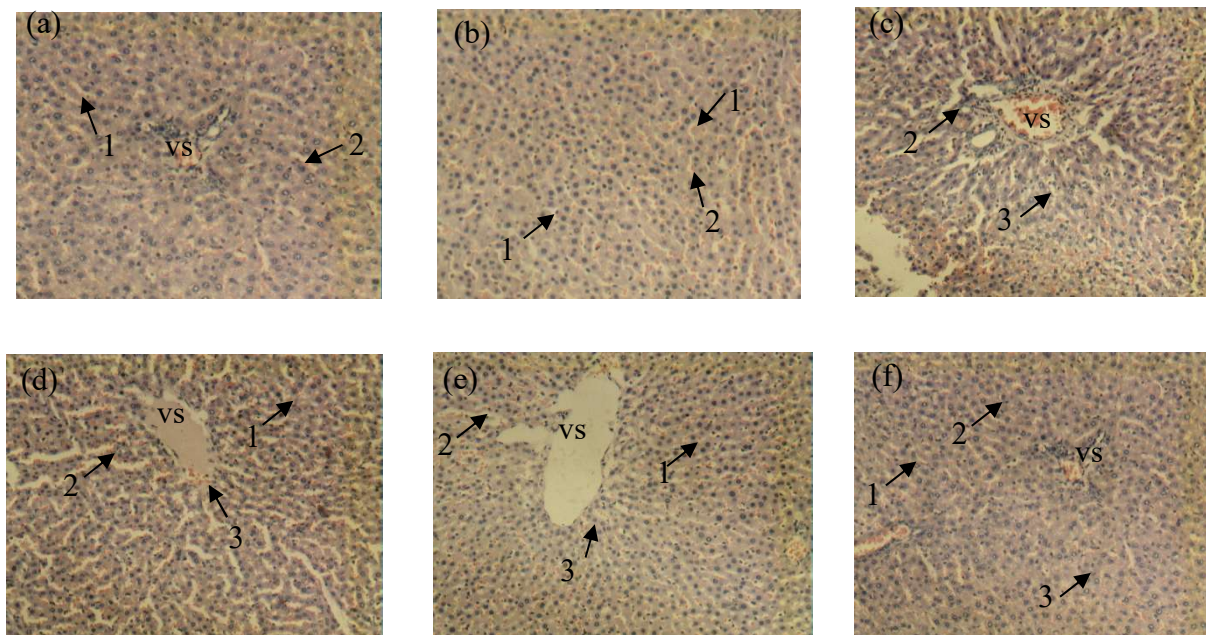


Fig.-1: The liver histopathological features of experimental animals (a) normal, (b) positive control, (c) negative control, (d) CLEE at a dose of 100 mg / kg, (e) CLEE at a dose of 200 mg / kg, (f) CLEE at a dose of 400 mg / kg
1 = normal liver cells, 2 = sinusoids, 3 = fatty liver cells, vs = central vein.

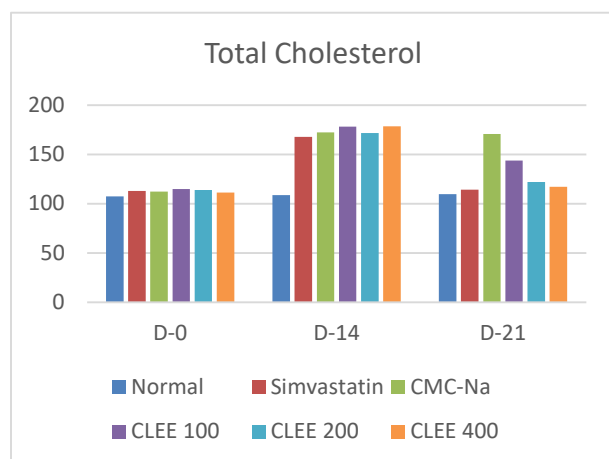


Fig.-1: Total Cholesterol Level Chart

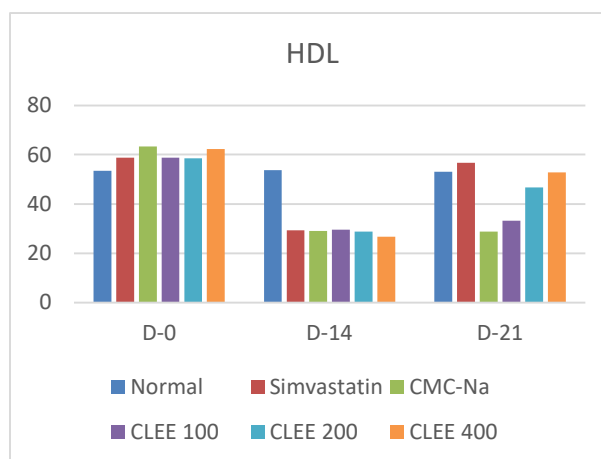


Fig.-2: HDL Level Chart

Histologic review in the picture (c) show a normal histologic liver cell, as can be described through several cells growing closely with venous centralis; can be seen in (b) as positive control which liver cell clearly show a concentrated lipid forming followed with migrated nuclei, since increase volume of lipid forming in a liver cell near venous centralis it would lead unto inconsistency sinusoid pocket.

Histologic review for the group treated with 200 mg/kg CLEE (e) show an improvement recovering factor in repairing liver cell from lipid forming, as for group that administered with 400 mg/kg of CLEE (f)

compared with another group (d), show significant progress in recovery for its sinusoid pocket becomes normal and free of lipid degeneration.

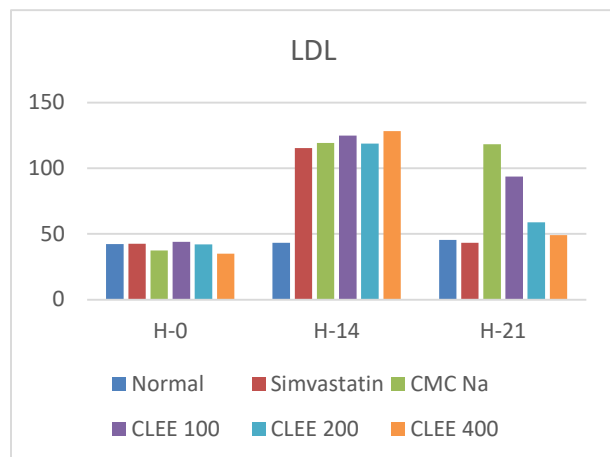


Fig.-3: Total Cholesterol Level Chart

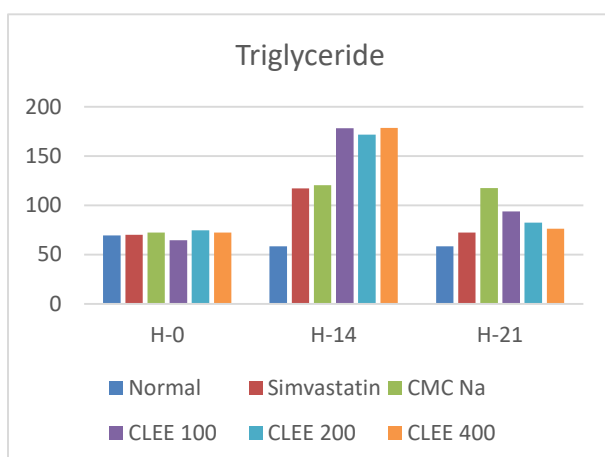


Fig.-4: HDL Level Chart

The activity of reducing total cholesterol levels is due to the content of flavonoids, saponins and tannins. The results of coriander leaf phytochemical screening showed the presence of flavonoids, saponins, and tannins. Based on the previous research¹⁶, flavonoids can affect the process of LDL cholesterol metabolism by increasing the ability of LDL to bind to its receptors. LDL that is bound to the receptor will be metabolized into cholesterol ester in the tissue. HDL will bind to cholesterol esters present in the tissue and then excrete into the small intestine. In addition, according to Fuhrman and Aviram, flavonoids also have an activity to reduce LDL oxidase. By decreasing cellular oxygenase and activating cellular antioxidants, flavonoids can decrease LDL lipid peroxidation and macrophage oxidative stress. Flavonoids are natural antioxidants that can protect arteries and lipoproteins against lipid peroxidation. Foam cell development will be prevented by lowering LDL oxidase, lowering the risk of atherosclerosis.¹⁷⁻²¹

CONCLUSION

Based on the findings, it can be concluded that CLEE has an effect on lowering total cholesterol, LDL, and triglyceride levels, as well as boosting blood HDL levels in mice fed a high fat diet.

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