

## THE EFFECTIVENESS OF TEMPUYUNG LEAF (*SONCHUS ARVENSIS*) DECOCTION IN LOWERING TOTAL CHOLESTEROL OF MALE RATS (*RATTUS NOVERGICUS*)

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### Abstract

Cholesterol levels in the blood can have varied suggestions. If the LDL levels in the body are high, it will harm our body, especially the cholesterol blockage of blood vessels. The compilation of the WHO Global status report on non-communicable diseases in 2008 showed that the prevalence of risk factors of hypercholesterolemia in Indonesia women was higher at 37.2% compared to men's, which was only 32.8%. There are many ways to minimize the danger of cholesterol, one of them is by eating vegetables, herbs or wild plants that are efficacious in lowering cholesterol levels in the body. One of the wild plants, which have the potential to lower cholesterol level, is tempuyung leaves (*Sonchus arvensis*). Based on the studies that had been conducted before, tempuyung leaves had the benefit to lower uric acid levels in rats, dissolve calcium oxalate. Tempuyung leaves contain flavonoid amounted to 0.1044% that can act to reduce LDL in the body. This study was an experimental study (true experimental research), which aimed to determine whether tempuyung leaf (*Sonchus arvensis*) decoction is effective in lowering the total cholesterol levels in male rats. The samples used were four white rats (*Rattus novergicus*), rat as the negative control treatment has absorbance value of 0.058 with total cholesterol level of 59.183 mg/100g. Rat as the positive control treatment has absorbance value of 0.090 with total cholesterol level of 91.836 mg/100g. The decoction of tempuyung leaves concentration of 20% has absorbance value of 0.122 with total cholesterol of 183.163 mg /100 g. The decoction tempuyung concentration of 40% has absorbance value of 0.225 with total cholesterol level of 340.414 mg /100 g. The results of this study led to a conclusion that the provision of various concentrations of decoction of tempuyung leaves could not lower the cholesterol level in rats.

**Keywords:** *Sonchus arvensis*, Decoction, *Rattus novergicus*, Cholesterol

### Presenting Author Biography



My name is zulyamin kimo, I was born on 1st March 1995. Now, I am a student at Muhammadiyah University of Malang. I have worked in biology laboratory as an assistant for three years. I also worked as a tutor in tutoring agencies in Malang.

## INTRODUCTION

Cholesterol serves as an important substance in the body and it is necessary for the formation of bile salts and the production of some hormones in the appropriate amount. Hypercholesterolemia will trigger the emergence of various degenerative diseases such as coronary heart disease, hypertension, and so on. Cholesterol level is affected by the intake of fats, carbohydrates, and protein [1]. Fiber and cholesterol intake from food and physical activity also affect cholesterol levels in blood [2].

Based on WHO report on the global status of non-communicable disease in 2008, it showed that in Indonesia, the prevalence of risk factors of hypercholesterolemia for women was higher at 37.2% compared to only 32.8% of men [3]. Indonesia already published new RISKESDAS data in 2007, which stated that cardiovascular disease was the leading cause of death in Indonesia [4]. As the high risk posed, it was necessary for conducting studies and research on the preventive measures to lower cholesterol levels in the blood.

Traditional medicine is a form of real utilization of the potential flora diversity in Indonesia. There had been many studies that used variety of potential plants for healing; one of the potential plants is tempuyung leaves (*Sonchus arvensis*). The results of the research conducted that infusing tempuyung roots with a concentration of 40% was effective in lowering uric acid levels in rats [5]. In addition, the study found that the concentration of dried tea made from tempuyung leaves (*Sonchus arvensis*) optimum was 2 g / 500 mL to dissolve calcium oxalate ( $\text{CaC}_2\text{O}_5$ ) [6].

The number of plant utilization of tempuyung leaves cannot be separated from the compound owned. One compound that plays as an important role in decreasing cholesterol levels are flavonoid compounds, which are secondary metabolites. The research conducted by Sriningsih *et al.*, (2009) found that these types of flavonoids in the leaves tempuyung was 7-4'-dihydroxy flavone [7]. In the body, flavonoids have much of a role as an antioxidant. Flavonoids act as a reducing LDL in the body. In order to reduce LDL, flavonoids also increase the density of LDL receptors in the liver and binds apolipoprotein B. In addition, flavonoids work to reduce levels of cholesterol from the blood by blocking the action of the enzyme 3-hydroxy 3-methylglutaryl coenzyme A reductase (HMG Co-A reductase) [8]. This study aimed to test the effectiveness of the decoction of tempuyung leaves in lowering total cholesterol levels in the blood of white rats (*Rattus norvegicus*).

## RESEARCH METHODS

This research was conducted at the Laboratory of Chemistry, University of Muhammadiyah Malang for one month from May 11 to June 8, 2015. This study used true experimental research with posttest control group design method, which consisted of negative group (no treatment group) and positive group (with treatment group), and then the treatment effect was analyzed with different test. The sampling technique was simple random sampling, in which each individual or unit member of the population has an equal opportunity to be selected as the sample [9].

This study used 4 male rats (*Rattus norvegicus*) who were healthy and had normal activity, 2-3 months old, weighing for about 70-80 grams. Each rat would be accorded with the treatment of tempuyung leaves decoction (*Sonchus arvensis*) with different concentrations to determine whether there was a decrease in the total cholesterol levels in the blood of rats.

## Data Collection Method

The method used in this research was experimental observation method. Observation was made after providing the decoction of tempuyung leaves (*Sonchus arvensis*) with various concentrations for two weeks. They were taken the blood samples for about 3 ml in each rat and measured its absorbance by using a spectrometer. The absorbance values obtained were used to determine the total cholesterol level on male rats (*Rattus novergicus*) after the provision of various concentrations of tempuyung leaves (*Sonchus arvensis*) decoction.

## Tools and Materials

The tools used in this study were cage, mortar, gloves, drinking water and animal fodder, Erlenmeyer, analytical balance, spet, hot plate, bath water, filter paper, spectrometers. The materials used in this study were tempuyung leaves, male rats, distilled water, fat-rich seed and standard feed.

## Fat-Rich Feed

For conditioning the animal to become hypercholesterolemia, they were made to eat feed rich in fat and high protein with a composition of 1.5% cholesterol, 10% lard, 1% cooking oil was then added to standard feed up to 100%.

## Decoction of Tempuyung Leaves

Decoction is made by weighing 100 g of tempuyung leaves (*Sonchus arvensis*) freshly picked and then washed with running water. Tempuyung leaves were crushed by mortar. After that, the crushed leaves were moved transferred to a glass beaker and then distilled water was added with comparisons 2:1 and then it was heated in a hotplate or electric stove with a temperature for about 80°C. It was then filtered to obtain the decoction of tempuyung leaves. The researchers then made a concentration of 20% with 20 ml of tempuyung decoction and 80 ml of distilled water. Make a concentration of 40% with a composition of 40 ml tempuyung decoction and 80 ml of distilled water.

## Induction of Tempuyung Leaves Decoction

Animal testing consisted of four male rats that weigh 70-80 grams were divided into 4 treatment, namely;

- a. Treatment I as the negative control group was only given distilled water and regular feed.
- b. Treatment II as the positive control group was given feed rich in cholesterol without giving decoction.
- c. Treatment III by providing tempuyung leaves decoction with concentration of 20%
- d. Treatment IV by providing tempuyung leaves decoction with concentration of 40%.

The provision of standard feed and feed rich in fat was conducted over two weeks to all treatments. The provision of fat-rich feed was stopped on the 15<sup>th</sup> day, followed by giving standard feed. The measurement of cholesterol levels after the induction of tempuyung leave decoction for 7 days was done by taking blood from the heart for about 3 ml using spet then it was moved to a cuvette and centrifuged, it was allowed to stand for 24 hours in the

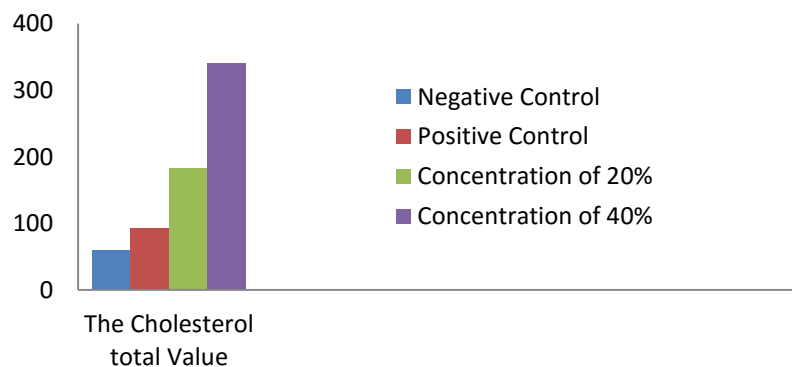
refrigerator. The researchers then took a serum and mixed the blood with a solution and then waited for its absorbance.

## RESULTS AND DISCUSSION

The data measured for each group consisting of the negative control, positive control, the concentration of 20%, and a concentration of 40% treatment were presented in Tab. 1.

**Table 1.** Results of measurements the total cholesterol in male rats after treatment

Sample	Blood Volume (dL)	Absorbance Value	Cholesterol total in blood (mg/100g)
Negative Control	20	0.058	59.183
Positive Control	20	0.090	91.836
20% decoction of tempuyung leaf	20	0.122	183.163
40% decoction of tempuyung leaf	20	0.225	340.415



**Figure 1.** Diagram of the percentage change in total blood cholesterol levels after treatment

The results of measurements of total cholesterol levels in the blood of white rats after the provision of tempuyung leaf decoction showed an increase in the total cholesterol levels. Rats as the negative control treatment had absorbance value of 0.058 with total cholesterol level of 59.183 mg/100g. Rats as the positive control treatment had absorbance value of 0.090 with total cholesterol level of 91.836 mg/100g. The absorbance values in rat treated with the decoction of tempuyung leaves with 20% concentration was 0.122 with total cholesterol level of 183.163 mg /100 g. The decoction of tempuyung leaves with 40% of concentration had absorbance value of 0.225 with total cholesterol level of 340.414 mg /100 g.

The negative control treatment which was given only standard feed had lower total cholesterol levels than rats that were fed with a fat-rich feed. This showed the feeding fats increased the total cholesterol levels in rats. In the treatment by giving tempuyung leaf decoction, all rats have elevated levels of cholesterol. Decoction of leaves tempuyung concentration of 40% has the highest total cholesterol compared to all treatments. This showed that the provision of tempuyung leaves decoction could not lower the total cholesterol levels in rats even though the leaves contained flavonoid.

The total flavonoid compound found in the tempuyung leaves was amounted to 0.1044% and 0.5% on tempuyung roots [7]. The least number of flavonoid found in the tempuyung leaves in the form of decoction, in which the leaves were only crushed and heated at a certain temperature would allow not only the reaction of flavonoid compounds but also another compound. In addition, by putting decoction in the refrigerator will disable the existing compounds in the research. The research conducted by Ranti, G.B *et al.*, found that by isolating the flavonoid compounds in plants and extract flavonoids gedi showed hypolipidemic effects by lowering cholesterol by 86.45% [8]. Therefore, the isolation of flavonoid compounds in the tempuyung leaves was required because the decoction of tempuyung leaves was not effective in lowering cholesterol levels in rats.

## CONCLUSION

In conclusion, the decoction of tempuyung leaves (*Sonchus arvensis*) on various concentrations could not lower the total cholesterol levels in the blood of male rats (*Rattus novergicus*). Some suggestions for further research include the concentration of decoction of tempuyung leaves needs to be added to 100%, the preparation has not been placed in the refrigerator to nutrients or compounds remain active and be required for isolation of flavonoid compounds in the tempuyung leaves.

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