

Effectiveness of Giving a Mixture of Garlic (*Allium sativum*) and Winged Bean (*Psophocarpus tetragonolobus*) against Changes in LDL Cholesterol Levels

Ocky Dwi Suprobowati¹, Sri Sulami Endah Astuti², Ika Rasya³

^{1,2,3} Health Analyst Departement, Health Polytechnic of Surabaya, Indonesia

Abstract: The content of Allicin and unsaturated fats on Garlic (*Allium sativum*) and Winged beans (*Psophocarpus tetragonolobus*) has the ability to reduce cholesterol levels. This study aims to determine whether there is an effect of giving a mixture of garlic and winged beans to reduce LDL cholesterol levels in mice (*Mus musculus*) with a concentration of 100%, 75%, 50%. The study used a type of experimental research to determine the effect of 3 treatment concentrations. A total of 0.25 mL of the juice mixture was given to mice according to the treatment group. Treatment was given using a sonde for 7 days after the mice were given a high cholesterol intake. After treatment, each mouse was examined for LDL cholesterol using Photometer 5010 VS +. The results of the study revealed that administration of a mixture of garlic and winged beans with a concentration of 50%, 75% and 100% can reduce LDL cholesterol levels in mice. The One Way Anova statistical test shows the results of $0,000 < \alpha (0,05)$ which means that there are significant differences from each treatment of total cholesterol levels in mice.

Keywords: Garlic (*Allium sativum*), winged beans (*Psophocarpus tetragonolobus*), LDL cholesterol

1. Introduction

Cholesterol is a yellowish fat shaped like a candle that is produced by the human body, especially in the liver (liver) [1]. Hypercholesterolemia is the elevation of cholesterol levels in the blood. High blood cholesterol levels are a serious problem because they are one of the most important risk factors for coronary heart disease (CHD), in addition to other factors, namely high blood pressure and smoking [2].

According to data from the World Health Organization (WHO), in 2012 around 17.5 million deaths in the world were caused by coronary heart disease and blood vessels or represented 31% of the causes of death worldwide. The estimated mortality rate is 7.4 million caused by CHD and 6.7 million due to stroke [3]. Doctor's diagnosis, the prevalence of coronary heart disease (CHD) in Indonesia in 2013 was 0.5% or estimated at around 883,447 people, while based on doctor's diagnosis or symptoms it was 1.5% or estimated at around 2,650,340 people. Basic Health from the Health Office in 2007 also reported that strokes, hypertension and ischemic heart disease occupy the largest proportion (27.3%) as a cause of death at all ages. That is, cholesterol as a trigger for the disease can attack anyone [4]. Most cases of coronary heart disease (CHD) or Coronary Heart Disease (CHD) and stroke begin with the formation of deposits known as atherosclerosis or also called calcification in arteries. Excess cholesterol levels, especially LDL cholesterol in the long term, will cause accumulation that increases from atherosclerosis. Keep in mind the accumulation or deposition of atherosclerosis which contains cholesterol and the fat has an unstable and fragile nature. If the plaque breaks, an open wound will form on the artery wall of the artery in question. This open wound is easily covered by blood substances, such as platelet and fibrin protein (clotting protein), forming a blood clot, called the

thrombus. These clots can grow larger to close the arterial arteries and stop blood flow to the heart and brain. If the heart arteries are blocked, a heart attack occurs, whereas if the brain vessels are blocked, a stroke occurs [2].

Most people still use chemical medicine as one of the instant efforts in the treatment of hypercholesterolemia. On the other hand, the low level of knowledge and economy of the community so that many still ignore the provisions in medical therapy, for example, forgetting to take drugs or not being able to continue treatment because they are constrained by cost factors [5]. In a survey known as CHPHEUS1 (Centralised Pan-Asian Survey on the Undertreatment of Hypercholesterolemia), Indonesia also included around 800 patients and doctors. As a result, only 31.1% of patients in Indonesia managed to achieve the cholesterol reduction target. Meanwhile, the remaining 68.7% was declared to have failed to reduce cholesterol levels as expected [4].

Alternative compounds in an effort to prevent hypercholesterolemia are very necessary. Garlic (*Allium sativum*) is an alternative natural ingredient that can be used to reduce cholesterol levels [6]. Fresh garlic has two main groups of biologically active substances namely sulfur compounds and sulfur free active substances. Sulfur compounds are flavor compounds such as allicin, alliin, and ajoene which are very important in this group. While sulfur-free active substances are substances such as allistatin, adenosine, saponins, anthocyanins, flavonoids, garlicin antibiotics, and saponins [7].

Allicin is considered to be the main bioactive sulfur compound in raw garlic. Allicin is known to have a number of major biological effects such as antimicrobial, anti-inflammatory, anti-thrombotic, anti-cancer, and anti-atherosclerotic activities in addition to the capacity to reduce

serum lipid levels and blood pressure [7]. Allicin is not found in garlic before the cutting or destruction of garlic occurs, damage during cutting or destruction on the part of garlic activates the enzyme allinase, which metabolizes allin and produces allicin [8].

Alternative compounds from natural ingredients other than garlic (*Allium sativum*) are winged beans (*Psophocarpus tetragonolobus*). Winged plants are found in many tropical countries. These plants are often found in various regions in Indonesia. The most widely used part of the bean plant as a vegetable ingredient is young pods. Winged pods contain 5 to 20 seeds. Compared to other parts, winged beans have the best nutritional composition, but are less widely consumed than young pods. Winged beans (*Psophocarpus tetragonolobus*) contain nutrients such as protein, fat, carbohydrates, vitamins, and minerals which are quite high when compared with young pods, tubers, and leaves. Protein and carbohydrate levels of bean seeds even outperform peanuts and almost as well as with soybeans. Apart from protein, the fat content of winged beans is also relatively high, which is around 15% to 20%. Of these, 71% are unsaturated fatty acids, especially linoleic acid. Linoleic fatty acids are omega-6 unsaturated fatty acids (sourced from seeds). The fat contained in the wing consists of unsaturated fatty acids which are beneficial for the body to reduce total cholesterol levels. [9].

Both of these plants each have the ability to reduce total cholesterol levels so that, with a combination of garlic juice and winged beans, it is expected to be more effective and influential in lowering LDL cholesterol levels better. Based on the background described above, researchers are interested in conducting research on the effect of the mixture of garlic (*Allium sativum*) and winged bean (*Psophocarpus tetragonolobus*) mixture on total cholesterol levels in mice.

2. Research Methods

The material used in this study was garlic, winged beans, serum, aquadest. The procedure of this research are:

- 1) Make a garlic and winged beans extract
- 2) Prepare mice with a weight of 25 grams through oral 0.25 mL.
- 3) Treatment of mice in laboratory which three different treatment concentration (100%, 75%, and 50% as much as 0.25 ml / day / 25 gram body weight of mice and standard feed 10 grams / day / mice and drinking water in ad libitum)
- 4) Each treatment group was treated with a mixture of garlic and winged bean mixture for 7 days with a volume of

0.25ml. On the 21st day the mice were fasted for 8 hours. Then, mice are anesthetized with chloroform and dissected to take blood from mice through the heart. Blood is used as a test material for checking LDL cholesterol using Photometer 5010 VS +.

The data analysis in this study was to compare changes in LDL cholesterol levels with more than two treatment groups, the statistical method used for data normality test analysis, if the data were normally distributed then parametric statistical tests were conducted, namely one way ANOVA test, or using non-parametric statistical tests kruskal wallis if the data is not normally distributed.

3. Result and Discussion

From the results of research that has been done on the effect of giving a mixture of garlic (*Allium sativum*) and winged bean (*Psophocarpus tetragonolobus*) mixture to changes in total cholesterol levels tested in animals, mice that have been given quail egg yolk for 7 days to increase cholesterol levels later, the test material was treated by giving a mixture of garlic (*Allium sativum*) and winged seeds (*Psophocarpus tetragonolobus*) with a difference in concentration of 50%, 75%, and 100% at a dose of 0.25 mL for 7 days. The end of each treatment was performed surgically and taking blood in mice to check cholesterol levels. The results of the examination showed an influence and difference in each concentration treatment.

On the results of the examination of LDL cholesterol the extract mixture results with a negative control average of 25 mg / dl, positive control of 47 mg / dl, while at a concentration of 50% with an average of 27 mg / dL, at a concentration of 75% at 22 mg / dL and at 100% concentration of 33 mg / dL, each concentration has the ability to reduce LDL cholesterol levels when compared to positive control values, namely treatment of high cholesterol diets with an average value of 47 mg / dL (Table 1).

The results are in accordance with the results of the One Way Anova statistical test showing a difference in cholesterol levels that occurred in each concentration of the test material against total cholesterol levels in mice tested animals, then to determine the group that had a difference in cholesterol levels, Post Hoc Test was conducted and the result is that all concentration groups have significant differences, which means that each concentration has the ability to reduce cholesterol levels with different values.

Table 1: Average data on the results of the examination of total cholesterol in mice

No.	Treatment				
	Negative control	Positive control	Treatment Group I (Concentration of 50%)	Treatment Group II (Concentration of 75%)	Treatment Group III (Concentration of 100%)
1	24 mg/dL	44 mg/dL	26 mg/Cl	22mg/Cl	32mg/dL
2	23 mg/dL	44 mg/dL	28 mg/Cl	21 mg/Cl	35 mg/dL
3	25 mg/dL	49 mg/dL	27 mg/Cl	23mg/Cl	33mg/dL
4	28 mg/dL	47 mg/dL	29 mg/Cl	21 mg/Cl	33mg/dL
5	26 mg/dL	49 mg/dL	26 mg/Cl	22mg/Cl	34 mg/dL
Average	25 mg/dL	47 mg/dL	27 mg/Cl	22mg/Cl	33 mg/dL

From the results of the three concentrations, each of them showed quite good results, but the mixture of extracts with a concentration of 75% was considered to have the most optimal results compared to the other two concentrations. At a concentration of 75% can reduce cholesterol levels optimal, this can occur because of differences in metabolism in the body of mice to receive doses or levels of the test material, because not all doses or levels of the test material can be received and processed properly on the body of the mice. Optimal results are results that show the ability of the test material from the mixture of cider can be received and metabolized well in the body of mice so that compounds such as Allicin, vitamin C, Omega 6 and other influential ingredients can inhibit the HGM CoA reduction enzyme formation process to form mevalonate in cholesterol biosynthesis that occurs in blood vessels, so that the production of excess cholesterol can be inhibited. At a concentration of 100% the average yield is 33mg / dL which is the highest value or a decrease that is not optimal compared to other concentrations, these results can occur because at this concentration is a mixture of concentrated juice or without dilution so that the dosage produce also high. Consuming garlic with high or excessive doses can affect blood vessel damage, because garlic has a high anticoagulant or antithrombic effect so that it influences blood dilution [10]. Increased cholesterol levels will affect damage or injury to blood vessels and will cause bleeding in blood vessels. If at the time the condition consumes garlic with a high dose, the bleeding rate will also increase.

So that compounds that are expected to inhibit the formation of HGM-CoA in cholesterol biosynthesis in blood vessels, can not be done optimally because the compound from garlic at high doses / levels has antithrombic side effects which thin the blood in the blood vessels that are injured due to plaque from LDL broken.

4. Conclusion

There is an effect of giving a mixture of garlic extract (*Allium sativum*) and winged beans (*Psophocarpus tetragonolobus*) with a concentration of 50%, 75% and 100% on LDL cholesterol levels in mice.

The most optimal results were obtained in a mixture of extracts of garlic (*Allium sativum*) and winged beans (*Psophocarpus tetragonolobus*) with a concentration of 75% at 22 mg / dL.

References

- [1] Nilawati, S., Krisnatut, D., Mahendra, B., Djing O.G. 2008. *Care Yourself, Cholesterol*. Jakarta: Spreader Plus
- [2] Anies. 2015. *Cholesterol & Coronary Heart Disease*. Jogjakarta: Ar-Ruzz Media
- [3] Munasika, G. 2016. *Giving Banana (Musa paradisiaca) to Total Cholesterol At Mecit (Mus musculus)*
- [4] Mumpuni, Y., Wulandari, A. 2011. *The Right Way to Overcome Cholesterol*. Jogjakarta: CV Andi Offset
- [5] Wignjosoesastro, A. 2014. *Effect of Garlic (Allium Sativum) on Prevention of Hypercholesterolemia in Mice*
- [6] Alamuoye O.F., Aye P.A. 2016. Effect of Garlic Powder (*Allium sativum*) Supplement on Blood Chemistry of West African Dwarf Rams. *Scholars Journal of Agriculture and Veterinary Sciences*
- [7] Koca and B. Tasci. 2016. *Garlic as a Functional Food*.
- [8] Londhe V.P., Gavasane A.T., Nipate S.S., Bandawane D.D., Chaudhari P.D. 2011. Role of Garlic (*Allium Sativum*) In Various Diseases: An Overview, *Journal of Pharmaceutical Research and Opinion*.
- [9] Astawan, M. 2009. *Healthy with Peanuts & Grains*. Jakarta: Spreading Self-Help
- [10] Dermadi., Rusli, R.H. 2012. *The Role of Garlic (Allium sativum) Against Hypertension*