

Potential Anticholesterol Infusion of Malaca Leaf (*Phyllanthus Emblica*) in Hypercholesterolemic Mice (*Mus Musculus*)

Potensi Antikolesterol Infusa Daun Malaka (*Phyllanthus emblica*) pada mencit (*Mus musculus*) Hiperkolesterolemia

Sartika Silvana¹, Nuzul Asmilia^{2*}, T. Armansyah TR³, Rasmaidar³, M. Isa⁴

¹Study Program of Veterinary Medicine, Faculty of Veterinary Medicine, Syiah Kuala University, Banda Aceh,

²Laboratory of Clinic, Faculty of Veterinary Medicine, Syiah Kuala University, Banda Aceh, Indonesia Indonesia

³Laboratory of Pharmacology, Faculty of Veterinary Medicine, Syiah Kuala University, Banda Aceh, Indonesia

⁴Laboratory of Chemistry, Faculty of Veterinary Medicine, Syiah Kuala University, Banda Aceh, Indonesia

*Corresponding author: Email: nuzulasmilia@usk.ac.id

Article submitted: July 13, 2023, revised: September 27, 2024, accepted: July 16, 2025

Abstrak

Penelitian ini bertujuan mengetahui uji infusa daun malaka (*Phyllanthus emblica*) terhadap kadar kolesterol darah mencit (*Mus musculus*) yang hiperkolesterolemia. Penelitian ini menggunakan 20 ekor mencit jantan berumur 3-4 bulan yang secara klinis dinyatakan sehat. Secara acak seluruh mencit dibagi menjadi 4 perlakuan, masing-masing terdiri atas 5 ekor mencit. Perlakuan K1 kelompok kontrol negatif. Perlakuan K2 kelompok kontrol positif yang diinduksikan pakan hiperkolesterolemia. Perlakuan K3 dan K4 kelompok yang diberi pakan hiperkolesterolemia dan infusa daun malaka dengan dosis 0,04 dan 0,08 mg. Data dianalisis dengan analisis varian dan dilanjutkan dengan uji Duncan. Hasil analisis statistik menunjukkan bahwa pemberian infusa daun malaka berpengaruh sangat nyata ($P<0,01$) terhadap penurunan kadar kolesterol mencit jantan yang diinduksikan pakan hiperkolesterolemia. Uji lanjut menunjukkan bahwa perlakuan K1 berbeda sangat nyata ($P<0,01$) dengan K2 dan K3. Perlakuan K2 sangat berbeda nyata ($P<0,01$) dengan K1, K3, dan K4. Perlakuan K3 tidak berbeda nyata dengan K4 ($P<0,05$). Dapat disimpulkan bahwa pemberian infusa daun malaka dosis 0,04 dan 0,08 mg dapat menurunkan kadar kolesterol.

Kata kunci: anti kolesterol; daun malaka; infusa

Abstract

The aim of this research was to study the effect of malaka leaves (*Phyllanthus emblica*) infusion to mice (*Mus musculus*) blood cholesterol level which given hypercholdiet. Twenty male mice with the age of 3 month and clinically healthy were used in this research. All mice were randomly divided into 4 treatment groups, 5 mice each. K1 was negative control group. K2 was positif control group, fed with hypercholesterolemic diet. K3 and K4 group were fed with hypercholesterolemic diet and infusion of malaka leaves with the doses of 0,04 and 0,08 mg body weight respectively. The result of statistic analysis showed that infusion of malaka leaves significantly effect ($P<0,01$) on the decrease of cholesterol level of male mice induced by hypercholesterolemic diet. The treatment of infusion of malaka leaves 0,04 mg and 0,08 mg was able to decrease the cholesterol level of mice induced by hypercholesterolemic diet. The advance test showed that the treatment K1 significantly effect ($P<0,01$) compare to K2, K3 and K4. The K2 treatment significantly different ($P<0,01$) with K1, K3, and

K4. The K3 treatment showed no significant effect compared to K4 ($P < 0,05$). In conclusion, the administration of infusion of malacca leaves with the dose of 0,04 and 0,08 mg reduce cholesterol level.

Keywords: anticholesterol; infusion; malacca leaf

Introduction

Hypercholesterolemia is a condition of the body experiencing metabolic disorders caused by cholesterol levels in the blood past normal limits (Murray *et al.*, 2003) this condition is very dangerous because it causes obstruction of blood vessels, narrowing of blood vessels, and rupture of blood vessels. The condition can trigger several diseases such as migraine, vertigo, cardiovascular arteriosclerosis, *Xanthomas*, *stroke*, acute myocardial infarction, and so on (Saryono, 2010).

Cholesterol is not only a health problem faced by developing countries but in developed countries cholesterol becomes its own problem as a trigger for certain diseases (Ariantari *et al.*, 2010). Attention to cholesterol begins with an opinion about the relationship between consumption of cholesterol foods and the incidence of coronary heart disease (Muharrami, 2011).

According to (Helmizar *et al.*, 2010) the relationship of cardiovascular disease with a diet that contains a lot of saturated fat and cholesterol. Increased consumption of saturated fat in some groups of people resulted in high cholesterol in the blood and death from coronary heart disease. High cholesterol in the blood is also caused by smoking habits, low physical activity, family descent, and so on.

The impact of hypercholesterolemia leads to the need for ways to lower it, namely with treatment or therapy. Treatment with synthetic drugs has been widely used by the public to lower cholesterol even for its complications. However, the high price of drugs and the magnitude of side effects caused make people more selective to choose drugs (Idris *et al.*, 2011). Therefore, people prefer cheap and safe alternative medicine, such as using ingredients of natural origin, which is often called traditional medicine (Dalimartha, 2008).

Traditional medicine derived from plants has side effects that are lower in danger than synthetic drugs, besides that traditional medicine

is easier to obtain and cheaper (Fauziah, 2007). Supported by the rich biodiversity of Indonesia which is hereditarily used in everyday medicine. One of the most widely scattered plants is the genus *Phyllanthus*. According to Zhang *et al.* (2004), the genus *Phyllanthus* is spread in tropical and subtropical countries with diverse species.

Phyllanthus genus that grows in Indonesia is *Phyllanthus emblica*, this plant is widely used as an anti-inflammatory and antipyretic by the community. The results of the malacca leaf phytochemical test contain antioxidant compounds (tannins, vitamin C, flavonoids, and others) that are efficacious not only for anti-inflammatory and antipyretic, but can also be used for various types of diseases (Zhang *et al.*, 2004).

The number of diseases caused by cholesterol levels in the blood and high public interest in natural medicines, it is necessary to do research on the infusion of malacca leaves to the level of blood cholesterol (*Mus musculus*) hypercholesterolemia.

The purpose of this study is to find out the effect of giving malacca leaf infusion on mice with hypercholesterolemia.

Materials and Methods

This study is an experimental study using a complete random design. In this experiment used 20 male mice with a body weight of 20-30 g and aged 2 months who were randomly divided into four groups.

Experimental Animals

The experimental animals used in this study were 20 male mice with a body weight ranging from 20-30 g and aged 2-3 months.

Making malacca leaf infusion

Malacca leaf infusion is by crushing the malacca leaves, put in an infusion pot plus 100 ml of distilled water and 10 g of malacca leaves, then heated for 15 minutes starting to

be counted when the temperature reaches 90° C while occasionally stirring. Infusa is filtered while hot with a flannel cloth. To meet the lack of water, water can be added through its pulp. The manufacture of this infusion follows previous research conducted by Ariyanti *et al.* (2007).

Preparation of hypercholesterolemia

Is obtained by dissolving 90 g of sugar into water 100 ml of warm water and stirring until homogeneous. Then mix the yolk as much as 3 g into a solution of sugar and water and then homogenize.

Giving treatment

Before carrying out treatment all mice are acclimatized for 7 days with normal feeding and drinking ad libitum. Then on days 8 to day 14, except for K1 given standard feed, all K2, K3, and K4 treatments are given high cholesterol diet. Furthermore, on the 15th to the 21st day, for the K1 treatment is still given standard feed and the K2 treatment is still given hypercholesterolemia feed. Furthermore, the K3 and K4 treatments were given infusa therapy at doses of 0.04 mg and 0.08 mg with the administration of 2 times / day.

Cholesterol data collection is carried out on the 22nd day after doing all treatments. Blood is drawn by stabbing the tail. *Nesco multichex* cholesterol model: N-01 code 9799.

Data Analysis

Research data processing was analyzed with variant analysis (ANOVA) based on a complete random design and *Duncan's Multiple Range Test* (DMRT) test (Holme et al., 1998)

Results and Discussions

Based on the results of research that has been done obtained the average cholesterol level after treatment on K1, K2, K3, and K4 in the form of a graph that can be seen in Figure 1.

The results of statistical analysis showed that the treatment of malacca leaf infusion therapy (*Phyllanthus emblica*) had a significant ($P < 0.01$) on the levels of mice-induced blood cholesterol level of K1 was significantly lower than K2, K3 and K4 ($P < 0.01$). Meanwhile, Blood cholesterol level of K2 was significantly

higher than K1, K3 and K4 ($P < 0.01$). However, there was no significant different among K3 and K4 ($P > 0.05$)

Infusion of malacca leaves at a dose of 0.04 mg and 0.08 mg at intervals of 2 times a day for 7 days can lower the level of mice cholesterol. The infusion dose of malacca leaves 0.08 mg gives better results in lowering cholesterol levels than 0.04 mg. However, there is not much difference between K3 and K4.

Hypercholesterolemia treatment without malacca leaf infusion therapy (K2) has very high cholesterol levels when compared to negative control (K1). This condition indicates that the hypercholesterolemia feed in this study can increase cholesterol levels above the normal limit of 26-82.4 mg / dl (Diah, 2004). This increase occurs due to the oxidation of LDL caused by the provision of high-fat feed to increase blood triglycerides and lipid peroxides in mice (Wilson and Adam, 2007).

In this study there was a decrease in mice cholesterol levels due to infusion. This is thought to be due to the content of flavonoids and vitamin C contained in the infusion of malacca leaves. According to research Jawi and Budiasa (2011) antioxidants in the form of flavonoids can lower cholesterol levels by inhibiting the absorption of cholesterol in the digestive tract and inhibiting the formation of cholesterol in the liver. While vitamin C as an antioxidant that works to repair damage to biological membranes and inhibit the production of LDL receptors (Idris et al., 2011).

The active substance contained in the infusion of malacca leaves works by suppressing oxidation of LDL so that there is no blockage and facilitates the excretion of fine diusus cholesterol. The content of vitamin C also helps the body produce collagen to repair lesions caused by cholesterol deposits. Cholesterol reduction occurs when there is an inhibitor of its production in the liver, by inhibiting the enzymes hydroxylase and reductase necessary for the change of *Methyl Glutarin Hydro* (HMG-Coenzyme A) to mevalonate (Robbins and Kumar, 1995).

HMG-KoA reductase inhibitors inhibit cholesterol anabolism in the liver, thereby lowering plasma LDL levels. Cholesterol suppresses the transcripts of 3 genes that regulate

HMG-KoA anabolism, HMG-KoA reductase, and LDL receptors. Decreased cholesterol anabolism by HMG-KoA reductase inhibitors removes the inhibition of excretion of these 3 types of genes. Cholesterol anabolism increases compensators by increasing the number of LDL receptors, allowing cholesterol catabolism to increase and resulting in a decrease in cholesterol synthesis by HMG-KoA reductase inhibitors (Suyatna and Handoko, 2004).

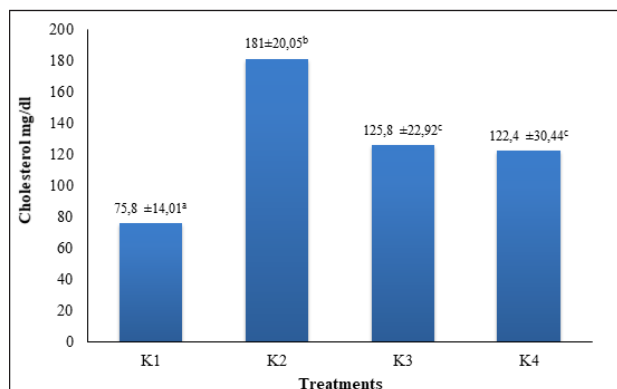


Figure 1. Blood cholesterol level (mean ± SD) of K1, K2, K3, K4

Superscripts with different letters (a and b) in the bar chart show a very noticeable difference in ($P < 0.01$)

K1 = Negative control (-)

K2 = Positive control (+)

K3 = Induction of hypercholesterolemic diet + infusion of malacca leaves 0.04

K4 = Induction of hypercholesterolemic diet + infusion of malacca leaves 0.08

Conclusions

The results showed that infusion of malacca leaves with two dose variants can lower the levels of diarrheal cholesterol that is hypercholesterolemia.

Acknowledgment

Authors would like to give special thanks to Dean and staff in Faculty of Veterinary Medicine Syiah Kuala University.

Reference

Aisha. 2010. Effect of The Use of Leech Oil After Absorption With Sugarcane Pulp Against Total Cholesterol and Triglyceride Levels in The Blood Of Mice. *Thesis*. Faculty of Mathematics and Natural Sciences. Andalas University. Field.

Anila, L., and N.R. Vijayalakshmi. 2003. Antioxidant action of flavonoids from *Magnifera indica* and *Emblca officinalis* in hypercholesterolemic rats. *Food. Chem.* 83:569-574.

Ariyanti, R., N. Wahyuningtyas, and A.S. Wahyuni. 2007. Effect of infusion of bay leaves (*Eugenia polyantha wight*) on the decrease in blood uric acid levels of male white mice induced with potassium oxsonate. *Pharmacon.* 8(2):56-63.

Arora, A., I. Kumar, R. Sen and J. Singh. 2011. *Emblca officinalis* (amla): physico-chemical and fatty acid analysis from arid zone of Rajasthan. *International Journal Of Basic And Applied Chemical Sciences.* 1(1):89-92.

Budiyo, W and A. Candra. 2013. Differences in total cholesterol and triglyceride levels before and after administration of green cincau leaves (*Premna oblongifolia Merr*) in Dyslipidemia mice. *Journal of Nutrition College.* 2(1): 118-125.

Cross, A. 2008. *70 Delicious Soup Recipes*. PT. Gramedia Pustaka Utama, Jakarta.

Dhale, D.A. and U.P. Mogle. 2011. Phytochemical screening and antibacterial activity of *Phyllanthus emblic*. *Science Research Reporter.* 1(3): 138 -142.

Diah, K. 2004. *Friendly with Try Animals*. Gajah Mada University Press, Yogyakarta.

Dyah, T. 2014. The effect of Infusa Daun Tempuyung (*Sonchus arvenis*) on The Decrease in Blood Cholesterol Levels of Mencit (*Mus musculus*) Male Strain DDY. *Thesis*. Sanata Dharma University. Surabaya.

Dalimartha. 2008. *Plant Recipes For Gout*. Self-Help Spreader, Bogor.

Fauziah. 2007. *Family Medicinal Plants (Toga)*. Self-Help Spreader, Jakarta.

Gani, N., L. I. Momuat, and M.M. Pitoi. 2013. Plasma Lipid Profile of Wistar Rats that Hypercholesterolemia in Red Gedi Administration (*Abelmoschus manihot L.*). *Journal of Mipa Unsrat Online.* 2 (1): 44-49.

- Halliwell, B and Gutteridge, J.M.C. 1999. *Free Radicals In Biology And Medicine*. Oxford Clarendon Press, New York.
- Harjana, T. 2011. Study of the potential of natural ingredients to lower blood cholesterol levels. *Proceedings of the National Research Seminar*. Yogyakarta State University.
- Helmizar, F. Jalal, and I. Liputo. 2010. Relationship of Antioxidant Consumption Levels with Blood Lipid Profiles of Minangkabau Ethnic Adults in Padang City. *Indonesian Medical Magazine*. 60(8).
- Hanson, G.K. 2005. Inflammation, atherosclerosis and coronary artery disease. *National English Journal Medical*. 352: 1685-1695.
- Herwiyarirasanta and B.A. Eduardus. 2010. Effect Of Black Soybean Extract Supplementtation In Low Density Lipoprotein Level Of Rats (*Rattus norvegicus*) With High Diet. *Science Article*. Airlangga University, Surabaya.
- Heslet. 2004. *Cholesterol You Need to Know*. (Translated By: Adwiyoto). Kesaint Blanc, Jakarta.
- Holme, S., G. Moroff , and S. Murphy. 1998. A multi-laboratory evaluation of in vitro platelet assays: the tests for extent of shape change and response to hypotonic shock. *Journal Article*. 38(1):31-40.
- Idris, W.I., Usmar, and B. Taebe. 2011. Test for hypocholesterolemic effects of dutch eggplant juice (*Cyphomandra betacea sendt.*) in white rats (*Rattus norvegicus*). *Pharmaceutical and Pharmacological Magazine*. 15(2):105–110.
- Ismawati, E. Asmi, and M. Y. Hamidy. 2012. Effect of Onion Bulb Squeeze Water (*Allium Ascalonicuml*) On Malondialdehyde (MDA) Hypercholesterolemia Induced Mice Plasma. *Journal of Nature Indonesia*. 14(2): 150-154
- Jawi, I.M. and K. Budiasa. 2011. Purple sweet potato bulb water extract lowers total cholesterol as well as increases the total antioxidant blood of rabbits. *Veterinary Journal*. 12(2). 120-125.
- Jeyasankar, A., Premalatha, and K. Elumalai. 2012. Larvicidal activity of *Phyllanthus emblica linn.* (euphorbiaceae) leaf extracts against important human vector mosquitoes (diptera: culicidae). *Asian Pacific Journal of Tropical Disease*. 5(8): 399-403.
- Khan, K.H. 2009. Roles of *emblica officinalis* in medicine - a review. *Botany Research International*. 2 (4): 218-228, 2009.
- Krishnaveni, m., and s. Mirunalini. 2011. Amla – The role of ayurvedic therapeutic herb in cancer. *Asian Journal Of Pharmaceutical And Clinical Research*. 4(3). 13-17.
- Malar, H. L. Vidhya and S. Mertilda Bai. 2009. Hepato-Protective Activity of Phyllanthus emblica Against Paracetamol Induced Hepatic Damage in Wister Albino Rats. *African Journal of Basic & Applied Sciences*. 1(1-2): 21-25.
- Monahapriya, M. and R.Lalitha. 2012. Amla- The Wonder of Ayurvedic Medicine. *International Journal of Ayurvedic and Herbal Medicine*. 2(5): 828-834.
- Morrell, J. 2007. *Cholesterol*. Erlangga, Jakarta.
- Muharrami, L.K. 2011. *Determination of Cholesterol Levels By Gas Chromatography Method*. Kamal, Bangkalan.
- Murray.R.K., D.K. Granner, P.A. Mayes, and V.W. Rodwell. 2003. *Harper Biochemistry*. (Translated by: Andry Hartono). EGC Medical Book, Jakarta.
- Murwani, S., M. Ali, K. Muliarta. 2006. Atherogenic diet in white rats (*Rattus Novergicus*) as an animal model of atherosclerosis. *Journal of Medicine Brawijaya*. Vol.22(1):6-110.
- Octifani, S. 2012. Effect of margarine administration on the LDL/HDL cholesterol ratio of mice *Sprague Dawley*. *Thesis*. Faculty of Medicine. Diponegoro University. Semarang.
- Riansari, A. 2008. The effect of giving bay leaf extract (*Eugenia polyantha*) on the cholesterol levels of male mice strain wistar hyperlipidemia. *Scientific Writing*. Faculty of Medicine, Diponegoro University: Semarang.

- Robbins, S.L. and Kumar.V.1995. *Pathology Teaching Book II*. Issue 4. EGC, Jakarta.
- Rubenstein, D., D. Wayne, and J. Bradley. 2007. *Lecture Notes: Clinical Medicine*. Ed:6. Publisher Erlangga, Jakarta.
- Sargowo, D. 2001. The role of triglyceride and lippoprotein levels as risk factors for coronary heart disease (Preliminary Study). *Journal of Saintika*. 13(2):3-6.
- Saryono. 2010. Decreased total cholesterol levels in hypertensive patients who received cupping therapy at an-nahl purwokerto clinic. *Soedirman Nursing Journal*. 5(2):3-4.
- Please, J. 2006. *Functional Food*. Kanisius, Yogyakarta.
- Singh, E., S. Sharma, A. Pareek, J. Dwivedi, S. Yadav, and S. Sharma. 2011. Phytochemistry traditional uses and cancer chemopreventive activity of amla (*Phyllanthus Emblica*): The Sustainer. *Journal of Applied Pharmaceutical Science*. 02 (01):176-183.
- Siswono.2006. *Dangers of High Cholesterol*. <http://www.gizi.net/cgibin/news/fullnews.cgi?newsid997059568,35248>. Retrieved May 25, 2015.
- Soebroto, L. 2010. Relationship Between LDL Cholesterol Levels in Stroke Patients At Dr. Moewardi Surakarta Hospital. *Thesis*. Faculty of medicine. Eleven March University. Solo.
- Srivasuki, K.P. 2012. Nutritional and health care benefits of amla. *Journal of Pharmacognosy*. 3(2). 147-151.
- Surialaga, S., D. Dhianawaty, A.Martiana, and Andreanus U.S.2011. Antihyperkolesterol effect of star fruit juice wuluh (*Averhoa bilimbi L.*) on the strain of swiss strain webster hypercholesterolemia. *Journal*. Faculty of Medicine. Padjadjaran University. Bandung.
- Suriyavathana, M., and P. Subha. 2011. Proximate analysis on biochemical study of *Phyllanthus acidus*, *Phyllanthus emblica* and citrus limon. *International Journal of Pharmacy and Life Science (IJPLS)*. 801-804.
- Suyatna, F.D., and T. Handoko. 2003. *Hypolipidemic.: Pharmacology and Therapy*. Issue 4. 365-369. Ui Pharmacological Printing, Jakarta.
- Summanen, J.O. 1999. A Chemical and Ethnopharmacological Study on *Phyllanthus emblica* (Euphorbiaceae). Division of Pharmacognosy: University of Helsinki, Finland.
- Suwarto, A. 2010. *9 Fruits and Vegetables Sakti Tangkal Disease*. Liberplus Publisher, Yogyakarta.
- Zhang, Y.J., T. Abe, T. Tanaka. C.R. Yang, and I. Kouno. 2002. Two new acylated flavanone glycosides from the leaves and branches of *Phyllanthus emblica*. *Chem. Pharm. Bull.* 50(6) 841–843.
- Zhang, Y.J., T. Nagao, T. Tanaka. C.R. Yang, H. Okabe, and I. Kouno. 2004. Antiproliferative activity of the main constituents from *Phyllanthus emblica*. *Biol. Pharm. Bull.* 27(2). 251-255.
- Zhong ,Z. G., D. P Wu, J. L. Huang, H. Liang, Z. H. Pan, W. Y. Zhang, and H.M Lu. 2009. Progallin A isolated from the acetic ether part of the leaves of *Phyllanthus emblica L.* induces apoptosis of human hepatocellular carcinoma BEL-7404 cells by up-regulation of Bax expression and down-regulation of Bcl-2 expression. *Journal of Ethnopharmacology*. 13(3): 765–772.