The potential of plant extracts containing flavonoids as anti-hyperlipidemia: A literature review

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ABSTRACT

One of the risk factors that cause cardiovascular disease is hyperlipidemia. Hyperlipidemia is a condition of increased plasma fat levels consisting of increased cholesterol, triglycerides and LDL levels and decreased HDL levels. The existence of side effects on the body from antihyperlipidemic drug treatment makes herbal medicine one of the alternatives chosen as a treatment for hyperlipidemic patients. Antihyperlipidemic activity testing was carried out on various herbal plants that contain antioxidants. There are 6 types of plant extracts with activity test results that have potential as antihyperlipidemic. The literature study used a search method on the internet related to the keyword “Plants that contain flavonoid compounds and have the potential as antihyperlipidemic” on the Google Scholar page. Primary data is obtained with sources of research results that have been published in national and international journals. The result of our literature review shows that plants that have flavonoids have the potential for antihyperlipidemic. More investigation is required to determine what kind of plants, dose and side effects can improve the herb plants as a substitute for anti-hyperlipidemia treatment.

Keywords: flavonoid; hyperlipidemia; antihyperlipidemic; herb plants.

Cite this Article: Lukas, L.M. 2023. The potential of plant extracts containing flavonoids as anti-hyperlipidemia: A literature review. *IJBS* 17(1): 224-226. DOI: 10.15562/ijbs.v17i1.481

INTRODUCTION

The lifestyle and diet of today’s society trigger the emergence of various diseases. Consumption of fatty foods, fast food, and infrequent exercise is a habit that is not good for the community; so it can cause diseases including hyperlipidemia.

The 2018 Baseline Health Research (Risksesdas) data shows the prevalence of heart disease based on a doctor's diagnosis in Indonesia is 1.5%, with the highest majority in the province of North Kalimantan, 2.2%, DIY 2%, and Gorontalo 2%. The leading cause of death from non-communicable diseases in the world is coronary heart disease (CHD). Every year, there are 74,000 deaths from Coronary Heart Disease (CHD); this shows that 200 people die daily from coronary heart disease.

Hyperlipidemia is a disease or disorder of lipid metabolism characterized by increased levels of total cholesterol, LDL (Low-Density Lipoprotein), triglycerides, and decreased levels of HDL (High-Density Lipoprotein) in blood serum. Hyperlipidemia is one of the risk factors for coronary heart disease caused by atherosclerosis and is the most common cause of death in developed countries, including Indonesia. The existence of side effects on the body from antihyperlipidemic drug treatment makes herbal medicine one of the alternatives chosen as a treatment for hyperlipidemic patients. This review explores the potential of plant extracts containing flavonoids as anti-hyperlipidemia.

METHODS

The search process involved using electronic databases on the Google Scholar page related to the keyword “Plants that contain flavonoid compounds and have the potential as anti hyperlipidemia”. Primary data is obtained with sources of research results that have been published in national and international journals. These journals were then selected to obtain 6 articles used as references.

RESULT

Secondary metabolites in plants provide pharmacological effects, including antioxidant, cytotoxic, antimicrobial and antiviral. One of the important secondary metabolites in plants is the flavonoid, a derivative of 2-phenyl-benzyl-γ-pyrone with biosynthesis using the phenylpropanoid pathway. Flavonoids in plants give color taste to seeds, flowers, fruit, and aroma, protect plants from environmental influences as antimicrobials, and protection from exposure to UV rays. In the health sector, flavonoids act as anti-bacterial, anti-oxidant, anti-inflammatory and anti-diabetic. In its development, until 2011, more than 9000 flavonoids were found and have been used for health supplements. Flavonoids are divided into subgroups based on the carbon substitution at the central aromatic group (C). These subgroups are flavones, flavonols, flavanones, flavanols/ catechins, anthocyanins and chalcones. This review discusses the pharmacological activity of flavonoids.
Phytochemical screening aims to determine the secondary metabolite compounds in extracts related to their efficacy and pharmacological activity. Flavonoids are a polyphenols group classified based on their chemical structure and biosynthesis.

The basic structure of flavonoids consists of two aromatic groups joined by a carbon bridge (C6-C3-C6). Flavonoids are flavones, flavanones, flavonols, catechins, chalcones, and anthocyanins. The division of the flavonoid group is based on differences in structure, especially on the substitution of carbon in the central aromatic group with the various pharmacological activities it generates.

Since ancient times, Indonesian people have started to recognize and use plants that have medicinal properties, which are a form of effort to overcome health problems they face. Herbs as a medicine have been used long before formal health services. Knowledge of medicinal plants is one of the nation's cultural heritage from generation to generation.

Flavonoids inhibit the activity of pancreatic lipase and pancreatic cholesterol esterase enzymes. Inhibition of the pancreatic lipase enzyme can hinder the absorption of triglycerides in digestion. Inhibition of triglycerides in digestion can cause a decrease in triglyceride levels. Inhibition of the pancreatic cholesterol esterase enzyme results in a reduction of cholesterol absorption. Reducing cholesterol absorption causes a decrease in cholesterol levels in the blood.

Six studies are studying how the flavonoids contained in plant extracts affect lipid levels or as antihyperlipidemic, which can reduce lipid levels in the blood (Table 1). An experimental pre-test and post-test control group design study conducted on male white Wistar rats using a combination of Memecylon edule extract and red ginger extract (Zingiber officinale) stated that the extract positively reduced total cholesterol levels.

Another study used a pre-test and post-test control group design study on 18 male white Wistar rats who were given a high-fat diet (MDTL) in the form of 10 mL of quail egg yolk and 1.8 gram/Kg Body weight (BW) of Propylthiouracil (PTU). Duration of a high-fat diet for 30 days and continued with the administration of Notika leaf extract (Archboldiodendron calosericeum Kobuski) after the 15th day of giving a high-fat diet until the 30th. A dose of 300 mg can reduce cholesterol levels by 85.33 mg/dl.

A study by Adawiyah et al. was...
conducted using the ethanol extract of Kalakai leaves (*Stenochlaena palustris* (Burm. F) Bedd) on 30 male white Wistar rats. The analysis results used ANOVA (p <0.05) to see differences in treatment between treatment groups. The percentage changes in cholesterol levels obtained are tested using the Independent t-test to see differences in treatment between test groups. The results show that the group is normally distributed but not homogeneous. As for triglycerides, the results show a normal distribution; the data is homogeneous, so the test is continued with the test. A double comparison using Post Hoc Tukey to see where the differences were in each treatment, where this study could see the percentage reduction in cholesterol and triglyceride levels with a statistically significant difference between the 400 mg/Kg BW extract dose treatment group and the normal group and the negative group.

Another study was conducted on the Batak onion plant (*Allium Chinese L.*), a spice plant that grows a lot in the Batak ethnic area and is widely used by the Batak people as a cooking ingredient. This research was conducted using 5 groups of male Wistar rats. The study found that Batak onion extract reduced total cholesterol at a dose of 8 mg/200 gram BW with an average decrease of 22 mg/dl.

In a study conducted using water extract of okra fruit (*Abelmoschus esculentus* (L.) *Moench*) in male Wistar rats at a dose of 100 mg/Kg BW, it had activity in reducing total cholesterol, triglyceride, and LDL levels to 62.72 ± 16.30; 50.12 ± 5.85; and 26.05±2.02; consecutive.

Meanwhile, in a study conducted on mice (Mus musculus) that were given ethanol extract of the stem of the bamboo plant (*Polygonum polchrum* Blume) at a dose of 4.09 mg/Kg BW, it was effective in reducing total cholesterol, triglycerides and increasing HDL levels.

**CONCLUSION**

A recent study has shown that antioxidant flavonoids can decrease the value of lipids. The result of our literature review shows that plants that have flavonoids have the potential for anti-hyperlipidemic. More investigation is required to determine what kind of plants, dose and side effects can improve the herb plants as a substitute for anti-hyperlipidemia treatment.

**ACKNOWLEDGMENTS**

The authors would like to express gratitude to the Dean of Udayana University, Head and member of the Biomedical Department of Medicine Faculty at Udayana University for their assistance and the opportunity to contribute to this literature.

**CONFLICT OF INTEREST**

We declare that there were no conflicts of interest in this study.

**FUNDING**

The authors are responsible for the study funding without a grant, scholarship, or other resources.

**AUTHOR CONTRIBUTION**

The author contributed fully to the study.

**CONFLICT OF INTEREST**

The authors declare no conflict of interest.

**REFERENCES**