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ARTIKEL PENELITIAN

Gambir Catechins (*Uncaria gambir* Roxb) Prevent Oxidative Stress in Wistar Male Rats Fed a High-Fat Diet

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Abstract

Objective*: This study aimed to examine how gambir catechins (Uncaria gambir Roxb) affect serum malondialdehyde (MDA) levels and catalase activity in Wistar white male rats fed a high-fat diet.* ***Methods:*** *This is a true experimental study with a post-test-only control group design. The experiment used 30 rats divided into five groups: a negative control group, a positive control group induced by a high-fat diet, and three treatment groups caused by a high-fat diet and given gambir catechins at doses of 10 mg/kg BW/day, 20 mg/kg BW/day, and 40 mg/kg BW/day for 14 days. The TBARs method measures MDA levels, while the colorimetry method measures catalase activity. One-way ANOVA and Post Hoc Tukey HSD are used to analyze the data.* ***Results:*** *The gambir catechin reduced serum MDA and increased catalase activity in male Wistar strain white rats fed a considerably high-fat diet ($p<0.05$).* ***Conclusion:*** *In mice fed a high-fat diet, catechin gambir was capable of dealing with oxidative damage.*

Keywords: *gambir catechin; malondialdehyde; catalase activity; high-fat diet*

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INTRODUCTION

Lifestyle changes in recent years tend to consume foods high in atherogenic fats (polyunsaturated fatty acids).[1] High-fat diets exceeding 25% of energy requirements (approximately 47 grams/day) are known to produce increased levels of fat absorbed from the gastrointestinal tract. Increased serum total cholesterol, triglycerides, low-density lipoprotein cholesterol, or a lower serum high-density lipoprotein cholesterol concentration are all symptoms of dyslipidemia.[2]

High levels of Low-Density Lipoprotein (LDL) will facilitate the occurrence of oxidative stress.[3] Hyperlipidemia is often associated with obesity.[4] Obesity is a chronic disease that occurs due to the interaction of genetic and environmental factors.[5,6] Obesity is a risk factor for increased mortality, hypertension, type 2 diabetes mellitus, hyperlipidemia, hyperglycemia, and other endocrine dysfunctions.[7]

Hyperlipidemia, one of the causes of atherosclerosis and other vascular disorders, is triggered by a high fat diet.[8,9] Increased fat metabolism will result in an increase in the production of reactive oxygen species (ROS) in both circulation and adipose cells. Long-term hyperlipidemia is linked to an increase in lipid peroxidation, which leads to oxidative stress.[10]

Naturally, antioxidants in the body can slow down, prevent, and eliminate oxidation damage in molecules known as endogenous antioxidants. Some known endogenous antioxidants are superoxide dismutase (SOD), catalytic enzymes, and glutathione peroxidase (GSH-Px).[11] In addition to endogenous antioxidants, there are also exogenous antioxidants obtained from outside the body and are natural, one example of gambir catechins. Catechins are the main active substances in gambir that have high antioxidant activity. The primary phenolic components found in the leaves of the plant Uncaria gambir Roxb are catechins.[12] The main producing area of Gambier in Indonesia are West and South Sumatra Regency.[13] Catechins have been shown to reduce triglyceride levels in a diet-induced high-fat diet in previous studies.[14] In rats fed a high-fat diet, gambir catechins were found to reduce alanine aminotransferase (ALT) and serum aspartate aminotransferase (AST).[15] Since a high-fat diet is closely related to oxidative stress, it is essential to understand the role of catechin gambir in preventing oxidative stress. This study aims to analyze the role of catechins in coping with oxidative stress in high-fat diet-induced animals.

METHODE

This is an experimental study with a posttest-only control group. The Pharmacology Laboratory of the Faculty of Pharmacy, Universitas Andalas, provided 30 males white Wistar rat strains weighing 200-250 grams for this investigation. The Ethics Commission of the Faculty of Medicine, Andalas University, approved this study, with the number 77 / UN.16.2 / KEP- FK / 2020.

Before treatment, rats were acclimatized for a week. Rats are kept in a clean place by keeping a light and dark cycle each for 12 hours. Rats are divided into five groups; negative control that is not induced high-fat diet, positive control group (high-fat diet), and treatment group was given a diet high in fat and catechin gambir with three different doses. A high-fat diet is given as much as 5 gr/100 gr BW/day and added margarine as much as

1.7 grams/day for five weeks. Margarine is first heated at 45°C and administered orally.[15] After five weeks, gambir catechins were administered with a dose of 10, 20, and 40 mg/kg BW. Gambir catechins were obtained from Andalas Sitawa Fitolab with Certificate of Analyses No.01/PE-FP/2017 with a percentage (+)-Catechin of 91.8%. On the last day of the study, blood was taken and examined serum malondialdehyde levels by the TBARS method and catalase activity by colorimetry method duplo.[16]

RESULTS AND DISCUSSIONS

Catechins gambir reduce malondialdehyde serum levels in rats fed a high-fat diet

Malondialdehyde levels in the negative control group (NC) were 1.66±0.251 nmol/ml (Fig.1). In the positive control group (PC), serum malondialdehyde levels reached the highest levels compared to the other group (4,435±0,251 nmol/ml). Administration of catechins gambir able to lower levels of malondialdehyde in the treatment group 1, 2 and 3 (T1, T2, and T3) respectively (3,792±0.125; 3,075±0.237; 2,732±0.314 nmol/ml), *p-value < 0.05

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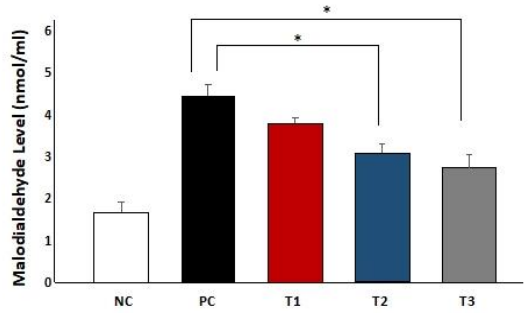

Figure 1. The administration of gambir catechins in rats given a high-fat diet was able to lower serum malondialdehyde levels

Based on statistical analyses by Anova, there is a difference in serum Malondialdehyde levels between groups ($p<0.05$). Post Hoc Test by Tukey HSD in each MDA group showed significant differences in negative control groups with the positive control, positive control groups with treatment groups 2 and 3, and treatment groups 1 with 3. ($p<0.05$).

Catechins gambir increased catalase activity in rats given a high-fat diet

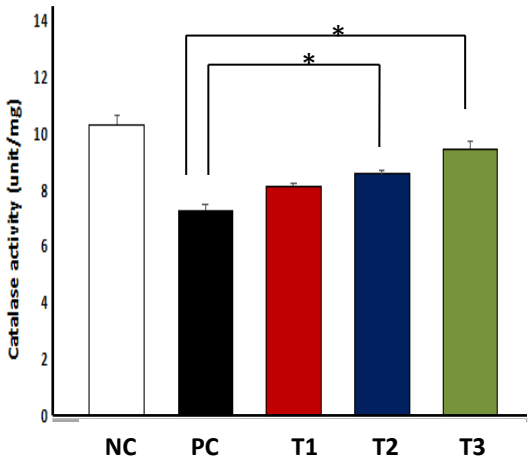

Figure 2. Increased catalase activity after administration of catechins in rats given a high-fat diet

In the negative control group (NC), the average catalase activity was 10.35±0.29 units/mg (Fig.2) A high-fat diet decreased catalase activity in the positive control group (PC) with a value of 7.34±0.16 units/mg. Catechins increased catalase activity in the treatment group in a row (T1, T2, and T3), with values 8.16±0.09; 8.58±0.12; 9.48±0.26 nmol/ml, *p-value < 0.05

According to Anova's statistical analyses, there is an average difference in serum catalase activity between groups (p<0.05). Post Hoc Test by Tukey HSD in each study of catalase group showed significant differences in the negative control group with the positive control, positive control group with treatment groups 2 and 3, treatment group 1 with 3, also treatment group 2 with treatment group 3 (p<0.05).

In this study, there was an increase in serum rats' Malondialdehyde (MDA) levels after being given high-fat diet induction (Figure 1). Oxidative stress occurs due to the imbalance between ROS production and available antioxidants.[17] High oxidative stress can be seen from the low antioxidant status.[18,19] Lipid peroxidation results in increased levels of MDA in the blood and an imbalance of MDA (free radical) levels and antioxidants of catalase enzymes. To neutralize MDA, it is necessary to supplement exogenous antioxidants.[12]

Administration of gambir catechins as exogenous antioxidants led to a meaningful decrease in serum MDA levels in mice who got a high-fat diet (p<0.05). This decrease in MDA levels was shown in all treatment groups depending on dosage, and there was a significant decrease in treatment group 2 and treatment 3. This suggests that a dose of gambir catechins of 20 mg/kg BB and 40 mg/kg of BB could significantly lower malondialdehyde levels. The decrease in MDA levels is due to the content of gambir catechins, which are polyphenols compounds that have the potential as antioxidants. The activity of antioxidant catechins reduces oxidants (ROS) and prevents an increase in lipid peroxidation resulting in a decrease in MDA in rat serum.[12] Catechins have water-soluble properties that can prevent free radicals from entering the lipid membrane of the bilayer. Catechins can enter the lipid bilayer, improve membrane stability, decrease free radicals, and improve antioxidant performance in cells.[20]

The antioxidant activity of catalase enzymes is boosted after gambir catechins are administered, according to an examination of endogenous antioxidant activity in the body. The doses of gambir catechins of 20 mg/kg BB and 40 mg/kg BB were observed to increase catalase activity. Catechins have an antioxidant action that can be both direct and indirect. Reactive Species Oxygen (ROS) can be directly countered by catechin. Catechins feature phenolic hydroxyl groups in their chemical structure that can stabilize free radicals. Catechins can act as anti-free radicals. Catechins inhibit prooxidant (oxidant) while inducing the work of antioxidant enzymes in an indirect manner of action. Catechins are reported to have anti-inflammatory properties.[21]

CONCLUSION

Catechins were found to reduce malondialdehyde levels and enhance catalytic activity in mice fed a high-fat diet. MDA levels were dramatically reduced and catalase activity was significantly increased at doses of 20 mg/kg BW and 40 mg/kg BW of gambir catechins. As a result, gambir catechins have the ability to protect

against oxidative stress in high-fat diets.

DUKUNGAN FINANSIAL

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UCAPAN TERIMA KASIH

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KONFLIK KEPENTINGAN

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