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International Conference of Indonesia Forestry Researchers

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"Strengthening Forest Science and Technology for Better Forestry Development"





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PREFACE

"Society is the ultimate beneficiary of research". This statement means that all the result of research activities should be equally distributed to all users and stakeholders. There are many tools to disseminate research findings, and one of them is through a scientific conference. Its role as a media for researchers and users includes policy-makers to cooperate closely to understand specific needs, ensure relevance of topics, and improve communication, dissemination and implementation of the research recommendations makes scientific conference essential to any research agency.

The International Conference of Indonesia Forestry Researchers (INAFOR) was an endeavour of Forestry Research and Development Agency (FORDA), the Ministry of Forestry to actively improve the quality of Indonesian forestry research and publications as well as establish a robust scientific forum for Indonesia forestry professionals from research and development entities including government agencies, private sectors and universities. Its first event was conducted in 5-7 December 2011 in Bogor under the theme of **"Strengthening Forest Science and Technology for Better Forestry Development".**

This conference aimed to provide international experience for Indonesia forestry researchers, and develop forestry research and development activities in Indonesia. In regards to international forestry research forum, the International Union of Forest Research Organizations (IUFRO) involved numerous Indonesian participants. Unfortunately, this impressive complicity has failed to be redeemed by numbers of accepted papers. This mainly due to lack of experience in international conference mechanism and less technical knowledge in preparing the drafts.

This proceeding is a documentation and publication of papers and posters presented in the conference. It consist of 110 succesfully presented oral presentations, when 77 papers out of them have been selected to be sent to IUFRO forum. I expect this publication could be distributed to all participants, users, partners and other stakeholders throughout Indonesia.

In addition, I would like to acknowledge all the authors of papers and posters contributed in this proceeding. The comments and review from the editors towards the publishing of the proceeding are also greatly appreciated. I am also grateful for the participants who had actively involved in the conference. Finally, I wish this proceeding and the conference could contribute endless benefits to the society toward strengthening forest science and technology for better forestry development.

Jakarta, November 2012

Director General of FORDA

Dr. R. Iman Santoso

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The Potency of Mahogany (*Swietenia macrophylla*) Bark as a Hypercholesterolemia-preventing Agent in Sprague-Dawley Rats

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ABSTRACT

Bark is a major by-product from the wood processing industries. However, the bark has not been intensively utilized. In this study, mahogany bark was investigated the potency as hypercholesterolemia-preventing agent in white rats. The thirty five male rats were divided into five groups with seven rats in each group. Rats in normal group were fed with standard rat feed. Hypercholesterolemic rats (negative control group) were fed with cholesterol feed (0.86%) and propyl tiouracyl at a dose of 0.5 mg/kg body weight. Lovastatin, a commercial drug, was administered to positive control rats at a dose of 0.286 mg/kg body weight together with cholesterol feed. Mahogany bark hot water extract were administered to the other rats groups at doses of 4.2 mg/kg and 21 mg/kg body weight as well as cholesterol feed. The experiment was carried out for eight consecutive weeks. The total blood cholesterol concentrations were analyzed every two weeks by enzymatic cholesteroloxidase phenol amino phenazone method (CHOD-PAP) and spectrophotometer at 500 nm of wave length. The results showed that administration of cholesterol feed and propyl tiouracyl in hypercholesterolemic group has increased the total cholesterol concentration to reach 52.7%. While the mahogany bark extract at the dose of 21 mg/kg body weight could successfully reduce the increasing of total cholesterol level by 35.8% compared to lovastatin which reduced the increasing of total cholesterol level by 33.8%. Therefore, the mahogany bark has a potential of a hypercholesterolemia-preventing agent.

Keywords: Mahogany bark, hypercholesterolemia-preventing agent, lovastatin, total blood cholesterol

1. INTRODUCTION

Cardiovascular disease is a leading cause of death in the worldwide. One of the disease risk factor is the level of cholesterol concentration in the blood above normal level which called hypercholesterolemia. Foods that contain saturated fats and high cholesterol may increase blood cholesterol concentrations when consumed in excess. Another factor that is a genetic condition, obesity, age and the presence of estrogen in women (Grundy, 1991).

More widespread cases of cardiovascular disease among the general population lead to the increasing need of a cheap and effective drug. Medication of cardiovascular disease with herbal therapies has been developed as an alternatives to synthetic drugs. Therapy with herb has been developed in addition because it is cheaper, efficacious, and side effects can be avoided, as well as raw materials available in nature. In order to develop herbal medicines, high potentially mahogany bark was investigated its effectiveness as a supplement in the treatment of coronary heart disease.

Previous study of mahogany bark showed three chemical compounds has been isolated and identified from the bark i.e. swietemacrophyllanin, catechin, and epicatechin (Falah *et al.*, 2008). Those compounds have a high antioxidant activity and potentially prevent the oxidation of low-density lipoproteins (LDL) in the blood vessel. Therefore, it will inhibit the development of

atherosclerosis, that is responsible for coronary heart disease. In this study, mahogany bark extract was investigated the potency as an antihypercholesterolemia-preventing agent in white rats. The activity was compared to that of lovastatin as a reference.

2. EXPERIMENTAL METHODS.

2.1 Extract Preparation

Mahogany bark were collected from Sumedang, Indonesia. A dried bark powder of Mahogany (500 g) were boiled in two liters of water for four hours in hot water extraction method. The extract was then filtered and evaporated with a rotary evaporator at 60°C, and the crude extract was used in biological assay.

2.2 Animals

Male Sprague-Dawley rats of 3 weeks old were obtained from The National Agency of Drug and Food Control of Indonesia. They were fed with a standard laboratory diet and allowed food and water ad libitum for an acclimatization periods of 10 weeks prior to experiments. The animals were divided into five groups of seven each and housed individually during the experimental period.

2.3 Experimental Design

All the rats (*Sprague dawley* albino male rats) were randomly divided into the five groups.

Group A: Normal (N) rats administered NaCl 0.9% by intraperitoneal and orally aquades 1 ml daily.

Group B: Hypercholesterolemia (HK) negative control rats were fed with cholesterol feed (0.86%) and propyl tiouracyl at a dose of 0.5 mg/kg body weight.

Group C: Lovastatin (Lovas) positive control rats administered standard drug lovastatin (0.286 mg/kg, orally) daily together with cholesterol feed and propyl tiouracyl.

Group D: Hypercholesterolemia rats (E1) administered hot water extract (4.2 mg/kg, orally) daily together with cholesterol feed and propyl tiouracyl.

Group E: Hypercholesterolemia rats (E2) administered hot water extract (21 mg/kg, orally) daily together with cholesterol feed and propyl tiouracyl.

The experiment was carried out for eight consecutive weeks. Cholesterol feed was prepared from mixture of egg yolk, goat fat, vegetable oil, and standard feed.

2.4 Measurement of Total Blood Cholesterol Level

Blood samples were obtained from the tail vein in fasting rats for 18 h and blood cholesterol levels were measured using an enzymatic method of cholesteroloxidase phenol amino phenazone (CHOD-PAP) with a commercial diagnostic kit (Randox). A 10 µL of blood serum was mixed with 1 mL of kit reagent. The solution was then shaken and kept stand for 10 min at room temperature to afford pink solution. Standard was measured as like the same way at different concentration levels (25, 50, 100, 200 and 250 mg/dL). Absorbance's of the samples were measured with spectrophotometer at 500 nm. In this study, analysis of blood cholesterol using blood serum was done over 5 times with each blood sampling at weeks-0, 2, 4, 6 and 8 of the experimental periods.

2.5 Statistical Analysis

All the values of body weight and fasting blood sugar were expressed as mean ± standard error of mean (S.E.M) and analyzed for ANOVA and Duncan's *t*-test. Differences between groups were considered significant at $p<0.05$.

3. RESULTS AND DISCUSSION

3.1 Body Weight

Body weight of the rats increased significantly during the experimental periods in each groups (Figure 1). However, the body weight is not statistically difference at the end of the periods. Normal rats group have a lowest body weight than that of another groups because of unfeeding the cholesterol feed. Consumption of cholesterol feed can lead to increase the body weight of rats.

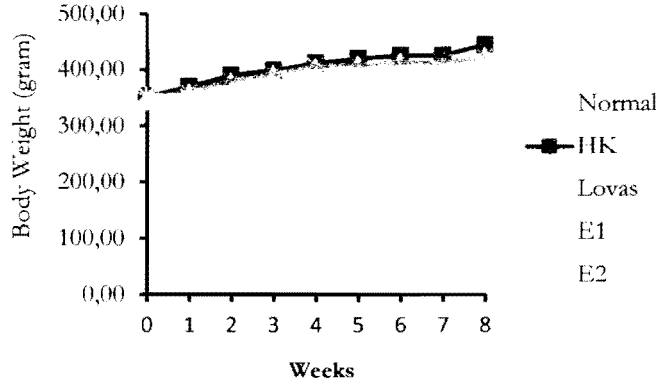

Figure 1: Body weight of the rats during the experimental periods

3.2 Blood Cholesterol Level

Administration of cholesterol-rich feed can also enhance the total of blood cholesterol level. Consumption of foods rich in cholesterol and fatty acids will suppress the formation of LDL receptors, thus will increase cholesterol in the blood. Administration of PTU also can exhibit the increasing of blood cholesterol level. It caused the PTU as an antithyroid agent will inhibit the formation of thyroid hormone, but did not inhibit the secretion. Thyroid hormone deficiency may suppress the formation of LDL receptors in the liver to trigger hypercholesterolemia. Administration of cholesterol feed and propyl tiouracyl in hypercholesterolemia group has increased the total cholesterol concentration to reach 52.7%

Statistically, blood cholesterol level of each the rats groups is not difference significantly at the beginning of experimental periods. Profile of the blood cholesterol levels of the rats shown on Table 1.

Table 1: Blood cholesterol profile of the rats groups for 8 weeks of experimental period [mg/dL]

Groups	Weeks				
	0	2	4	6	8
N	63,77 ± 6,76	47,93 ± 11,03	57,43 ± 14,53	76,64 ± 12,27	76,49 ± 8,23
HK	63,26 ± 7,33	55,18 ± 11,42	76,34 ± 10,96	80,57 ± 8,74	95,34 ± 15,24
Lovas	69,83 ± 15,21	67,47 ± 11,73	82,94 ± 19,36	84,96 ± 14,00	90,67 ± 9,56
E1	64,03 ± 11,61	59,50 ± 15,06	79,90 ± 15,25	108,71 ± 10,43	102,59 ± 13,54
E2	64,41 ± 3,30	60,48 ± 13,50	72,56 ± 12,66	79,86 ± 16,87	86,23 ± 11,43

The lovastatin rats group had an average concentration of blood cholesterol is lower than that of hypercholesterolemia rats at the end of experimental period. It was suggested that statin compound can stop biosynthesis endogen cholesterol via the inhibition of HMG-CoA reductase mechanism in liver.

Mahogany extract at a dose of 21 mg/kg body weight has a tendency to prevent the increasing of the blood cholesterol at 33.75% (Figure 2). According to those data, the dose has an effect to prevent the increasing the blood cholesterol as equal to 34.81% of lovastatin. Statistically, the effectiveness of extract at dose 21 mg/kg and lovastatin is no difference significantly ($P > 0,05$).

The capability of the extract at dose of 21 mg/kg to prevent enhancing of cholesterol level more than of hypercholesterolemia group is caused the presence of tannin and saponin, phytochemical components of mahogany extract (Falah *et al.*, 2010). Tannin in our body has an existing deposit the mucous of protein in the small intestine, so that it can reduce the effectiveness of the absorption of cholesterol and fat. In addition, tannin is also led to inhibit the fat absorption that it was stored at adipose. It was proved by the lowest body weight than that of the others. Saponin also can reduce the cholesterol concentration by the inhibition of cholesterol absorption in the alimentary track.

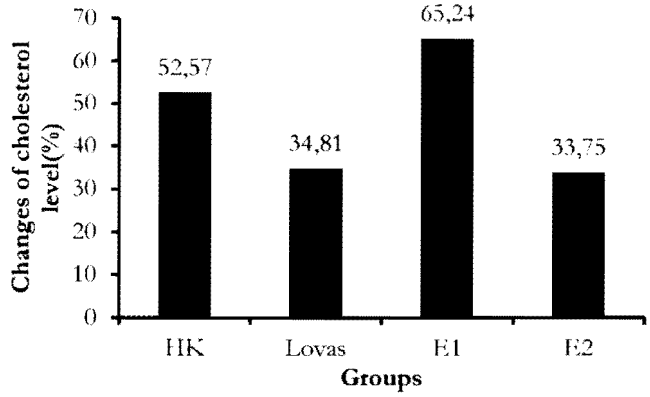

Figure 2: Changes of blood cholesterol level on the rats

4. CONCLUSION

Administration of cholesterol feed and of propyl tiouracyl can enhance the blood cholesterol level of the rats. Administration of mahogany bark extract at a dose of 21 mg/kg body weight has potentially a hypercholesterolemia-preventing agent when compared to that of lovastatin, a commercial drug.

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