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THE EFFECT OF RAMBUTAN (*Nephelium lappaceum* L.) PEEL EXTRACT ON LIPID PEROXIDATION IN LIVER OF OBESE RATS

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ABSTRACT

Lipid accumulation is main cause of obesity which then may cause liver damage due to a high oxidative stress. The oxidative stress in cell can cause lipid peroxidation. This process can be prevented by giving the external antioxidants. Previous study reported that rambutan peel extract reduced mice body weight and several adipogenesis parameters in visceral lipid. The objective of this research was to study the effect of rambutan peel extract on lipid peroxidation and accumulation in the liver of obese rats. The research was arranged in a complete randomized design (CRD). The experimental animals used were male Wistar rat aged 13 weeks weighed 310-340 gram which grouped into 5 groups; each group was given 15mg/kgbw, 30mg/kgbw, 60mg/kgbw, distilled water (C+), or nothing (C-). The extract was given per oral once every two days. The observed parameter are MDA levels and PPARγ expression. At week 12th the animals were dissected, the liver were isolated and tested for Malondialdehyde (MDA) level using TBA and PPARã expression using Immunohistochemistry. Data was analyzed using One Way ANOVA. The results showed that rambutan peel extract in 15 and 30mg/kgbw significantly decrease MDA levels and not significantly down regulate the expression of *PPARγ*.

Keywords: rambutan peel extract, lipid peroxidation, Malondialdehyde, *PPARγ*.

INTRODUCTION

Obesity is a health disorder that occurs due to excessive fat deposits in the body (Yussac *et al.*, 2007) caused by the increase of adipose tissue mass as a result of hyperplasia and hypertrophy of fat cells (Ferranti *et al.*, 2008). Lipid accumulation in adipose tissue may cause changes of metabolism lipid which controling the lipid accumulation. An increasing number of triglyceride storage and adipocyte cell will trigger lipid accumulation in other tissues, such as liver. The accumulation will lead to fatty liver (Gavrillova *et al.*, 2003). Liver damage due to fatty liver in obese individuals may occur due to increased expression of transcription factor *Peroxisome Proliferator Activating Receptor γ (PPARγ)* and the free radicals excess in the body (Dambal & Kumari, 2012; Pettinelli *et al.*, 2011).

*PPARγ*is a transcription factor which controls glucose regulation, insulin sensitivity and lipid metabolism in liver. *PPARã* regulates fatty acid binding with the help of *Fatty Acid Transport Protein 2* (*FATP2*) and *Fatty Acid Transport Protein 5* (*FATP5*) (Gavrilova *et al.*, 2003 & Pettinelli *et al.*, 2011). The Increasing activity of these proteins will increase hepatic lipid metabolism which lead to the accumulation of lipid.

Reactive Oxygen Species (ROS) is a type of free radicals commonly present in the body. High ROS production in cells would lead to disruption of cell activity. At the cell membrane, the radical will oxidate membrane lipid. MDA is one of secondary products resulted from polyunsaturated fatty acids (PUFA) peroxidation which is known to be toxic to the cells.

The accumulation of MDA can be used as an indicator of cell or tissue damage due to an increase in lipid peroxidation activity (Utari, 2011).

Naturally, body has antioxidants that can eliminate free radicals as a result of increasing lipid metabolism. In excessive condition of free radicals produced by metabolism external antioxidants become required. Rambutan (*Nephelium lappaceum* L.) peel contains polyphenol well known as antioxidant (Thitilertdecha *et al*., 2010). The phenolic compounds of rambutan peel including flavonoid, i.e: geraniin and corilagin, and tannin, an elagic acid. It had also been reported that rambutan peel extract significantly reduce DPPH free radicals (Wulandari & Lestari, 2012), yet so far it is considered as waste.

MATERIALS AND METHODS

Animals Preparation

Obese male Wistar rats were divided into three experimental groups were treated with high-fat-diet and rambutan peel extract of 15, 30, or 60mg/kgbw, negative control groups were treated with high-fat-diet only and positive control group was treated with high-fat-diet and aquadestilata for twelve weeks. After all treatments the animals were sacrificed by decapitation. Livers for each sample were collected and immediately frozen then kept at -40^{o}C until used.

Measurement of malondialdehyde and PPARã Expression

MDA levels of liver samples were determined by *Thiobarbituric Acid* (TBA) test according to Ohkawa (1978). Absorbance was measured at 532 nm. *PPARã* expression was determined using Imunohistochemistry staining; the number of liver cells expressing *PPARγ* was counted manually.

RESULTS AND DISCUSSION

The research resulted to the fact that rambutan peel extract tend to repress the expression of *PPARγ* according to the dosage as shown in Figure 1. However, the statistical analysis reveal that the decreasing of *PPARγ* expression is not significant, compared to both control.

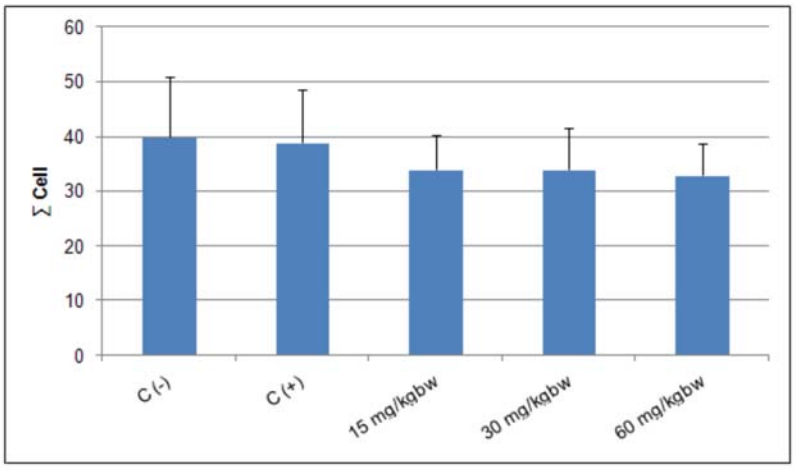

Figure 1. The effect of rambutan peel extract on *PPARγ* expression

Taking a consideration on the report showing that chatechins, a flavonoid family from black tea inhibit the expression of *PPARγ* by binding IGF1-R (Virdausi *et al.*, 2012) it can be suggested that rambutan peel extract flavonoid share this potency to inhibit *PPARγ* expression by competing the binding of IGF1 to its receptor. The repression of *PPARγ* expression by rambutan peel extract is depicted in Figure 2 where we can find the decreasing number of cell expressing *PPARγ* according to the dosage.

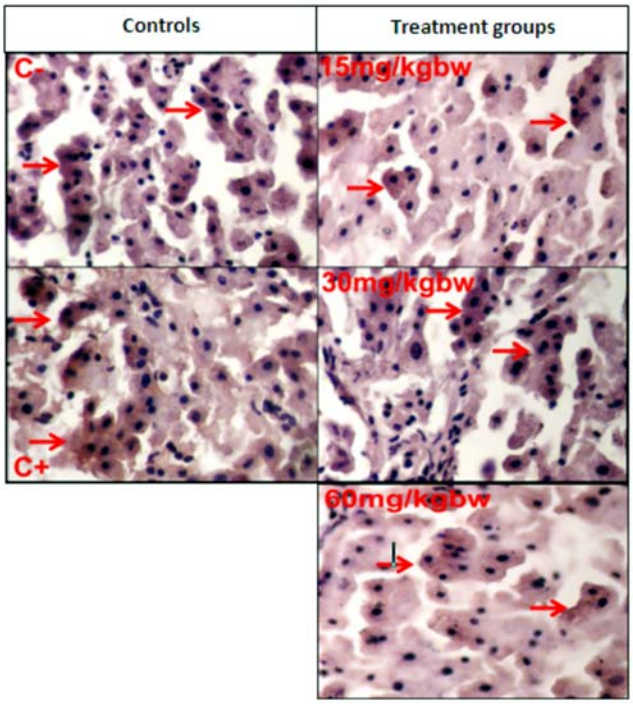

Figure 2. Liver cell expressing *PPARγ.* Red arrows indicate cells which express *PPARγ.*

MDA level is significantly decreased ($p<0.05$) by the administration of rambutan peel extract. Figure 3 showing that the most effective dose is 15mg/kgbw, but the increasing the dosage the lower the effectivity of rambutan peel extract in reducing MDA level. It seems that little amount of rambutan peel extract flavonoid effectively reduce the radical lipid which in turn reduces the production of MDA as a secondary product of lipid peroxidation (Gordon, 1990).

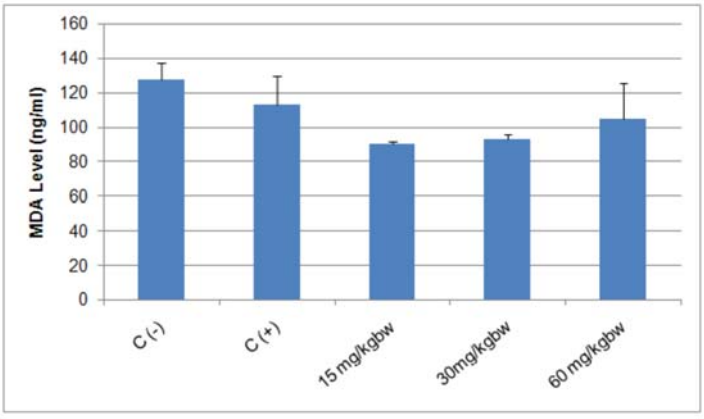

Figure 3. The effect of rambutan peel extract on MDA production

Meanwhile, the higher amount of rambutan peel extract showing the less effectively of repressing the MDA production. It might be that the accumulation of radical flavonoid as a result of its work on reducing radical lipid stimulating the production of MDA. To get a clearer picture a study on this aspect need to be done.

CONCLUSION

This research clears up the potency of rambutan peel extract in reducing the hepatic lipid accumulation in obese rat by means of inhibition of *PPARγ* expression. Moreover, rambutan peel extract may significantly decreasing the tissue damage resulted by the activity of MDA.

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