Conference Paper

Intake Pericarp of *Garcinia mangostana* L. Extract Inhibited Oxidative Stress on Wistar Rat Hyperglycemic through the Increased of Superoxide Dismutase and Histopathology Pancreatic Activities

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Abstract

Stress oxidative can cause the development of pathological condition such as diabetes mellitus. *Garcinia mangostana* L., locally known as "Manggis" is a tropical fruit rich in polyphenolic compounds that possesses high antioxidant activity. This research aimed to study the effect of intake pericarp *G. mangostana* ethanol extract in inhibiting stress oxidative in hyperglycemic Wistar rats by analyzing superoxide dismutase (SOD) activity and histopathology of pancreatic cell. Extraction of 800 g pericarp *Garcinia mangostana* with ethanol gave 147 g crude ethanol extract. Hyperglycemic on Wistar rats was made by inducing hyperglycemic with alloxan. The experimental was performed on five groups of animals that were Hyperglycemic. The dose of pericarp of *Garcinia* extract given to of rats which assigned P_0 for normal control, P_1 for negative ;control (hyperglycaemic), P_2 for hyperglycemic rats with *Garcinia* extract 50 mg · kg^{-1} body weight; P_3 for hyperglycemia rats treated with 100 mg · kg^{-1} body weight and P_4 treated with 150 mg · kg^{-1} body weight. The result showed that intake of pericarp *Garcinia* extract in all dose given have increased the activity of superoxide dismutase (SOD). The highest SOD activity was obtained in P_4 with given of 150 mg · kg^{-1} body weight and SOD activity increased to 65.71 %. The increased of SOD activity was directly proportional to the histopathology profile of pancreatic found in the hyperglycemic rat.

Keywords: histopathology; hyperglycemic; oxidative stress; pericarp *Garcinia mangostana* L.; SOD.

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1. Introduction

Human body is continuously exposed to different types of agents that result in the production of reactive species called as free radicals and which, by the transfer of their free radical, can cause the oxidation of cellular machinery. In order to encounter the deleterious effect of such species, body has got endogenous antioxidant system

or it can be exogenous of antioxidant from diet that neutralizes such species and keep the homeostatis of body. Stress oxidative condition is produced when radical species and antioxidant are imbalanced. Stress oxidative can cause the development of pathological condition such as diabetes mellitus. In hyperglycemic condition, continuous generation of reactive oxygen species (ROS) occurs and evidence show diabetes induced changes in the activities of antioxidant enzymes in various tissue. Most of the studies show the interference of oxidative stress in diabetes pathogenesis by alteration in enzymatic system, lipid peroxidation, DNA damage. Gluthatione, catalase, and superoxide dismutase are various biomarker of oxidative stress in diabetes mellitus [1, 2].

Antioxidant plays an important role in scavenging the free radicals and protect human from oxidative stress. Therefore, compounds with both antioxidant and antidiabetic properties would useful for treatment of diabetes mellitus [3]. In recent times, many medicinal plants have been reported to have antioxidant and hypoglycemic activities.

Garcinia mangostana L., locally known as "manggis" is a tropical fruit. Recently it has emerged category of novel functional food sometimes called as super fruits presumed to have a combinatory appealing subjective characterize, such as taste, fragrance and visual qualities, nutrient richness, antioxidant strength and potential impact for lowering risk of human diseases [4–6]. It has been reported that the extract from various parts of *Garcinia* including its pericarp contain a variety of secondary metabolites including phenol, polyphenol, flavonoid, triterpenoid and it has been traditionally used to treat a variety of ailment [6]. Phenolic and polyphenolic compounds have known to possess antioxidant due to their capability to scavenge free radicals [2]. The present study was carried out to determine hypoglycemic potential of pericarp *G. mangostana* ethanol extract on diabetic rats induced by alloxan through the measurement of superoxide dismutase activity and histopathology of pancreatic cells.

2. Materials and methods

Garcinia mangostana. pericarps was collected from Denpasar and Gianyar. Other material: ethanol, aquades, wash buffer concentrate, tetramethylbenzidine substrate (TMB substrate), antibody diluents, alkaline phosphate (stop solution), Horseradish Peroxidase (HRP conjugate*),* pellet food standard, egg yolk, porcine oil, standard pellet rats diet, glibenclamid, alloxan.

Animals used in this research were 25 healthy male Wistar rats aged 3 mo weighed 215 g to 240 g collected from UPT Analytical Laboratory, Udayana University. The subjects used in this research were 25 healthy male Wistar rats divided into five group. Instrumentation: UV-Vis Variant DMS 80, injection, centrifuge Clements 2000,

well protein binding plate, water bath Gelman Science, binoculer microscope, Gomori Nuclear fat red with 400x magnificient, analytical scale, centrifuge machine, test tube, syringe, EDTA tube, filter paper, aluminium foils, sonde, gloves and mask, Fresh pericarp of *Garcinia mangostana* L. were determined with maceration process using technical ethanol solvent (72 h), plant material extraction: 1 800 g of pericarp *G. mangostana* was extracted using ethanol and the solvent was evaporated to yield crude ethanol extract. A thick pericarp of *G. mangostana* extract of ethanol was obtained from this process. This is process of extraction that uses a polar ethanol solvent can loosen up the cell's phenolic structure and dissolve the active components

Experimental animals: healthy Wistar rats weighed 215 g to 240 g with aged 3 mo. The rats were randomly assigned to five equal groups. The animals were kept under standard environmental condition and maintained by feeding standard pellet diet and allowed to access water ad libitum. The animals initially were acclimated for 7 d under laboratory condition. The rats were given high glukosa diet for 35 d and then injected with alloxan for 7 d to get hyperglycemia rats. The rats were randomly divided into five groups of six animals each. Group1 (P_0 control normal received only standard pellet diet and water vehicle, group2 (P_1) control negative hyperglycemia rats without given extract. Group3 (P_2), hyperglycemia rats given extract *G. mangostana* 50 mg · kg^{-1} body weight, Grup4 (P_3), hyperglycemia rats given extract *G. mangostana* 100 mg · kg^{-1} body weight, and group 5 (P_4) hyperglycemia rats given extract *G. mangostana* 150 mg · kg^{-1} body weight. The extract was administered orally for 21 d. At 28 d the blood of each rats were collected for SOD activity measurement. After that the rats were sacrified and the pancreatic cell was taken for hystophatological analysis.

Data analysis: data were analysed using ANOVA with Shapiro Wilk test with significance level α = 0.05.There were significant difference in treatment obtained with $p < 0.05$. Then the data were analyzed using post hoc test to measure the difference. Post hoctest result results are summarized in Figure 1.

3. Results and discussion

Extraction of 1 800 g pericap *G. mangostana* L. with ethanol yielded 147 g crude ethanol extract. This ethanol extract was then orally administrerred to hyperglycemia rats with a treatment P_2 of 50 mg · kg^{-1}.BW, treatment P_3 100 mg · kg^{-1} BW, and treatment P_4 150 mg · kg^{-1} BW to analyse the SOD activities and histopatology of the pancreatic cell and result was then compared to the control negative hyperglycemic rats. As is shown in Figure 1, the SOD activity of (P1) control negative hyperglycemic rats decreased compared to control normal. It meant that stress oxidative has occured in control negative (hyperglycemic). While intake of pericarp garcinia mangostana ethanol extract in all dose of 50 mg · kg^{-1} body weight (P_2), 100 mg · kg^{-1} body weight

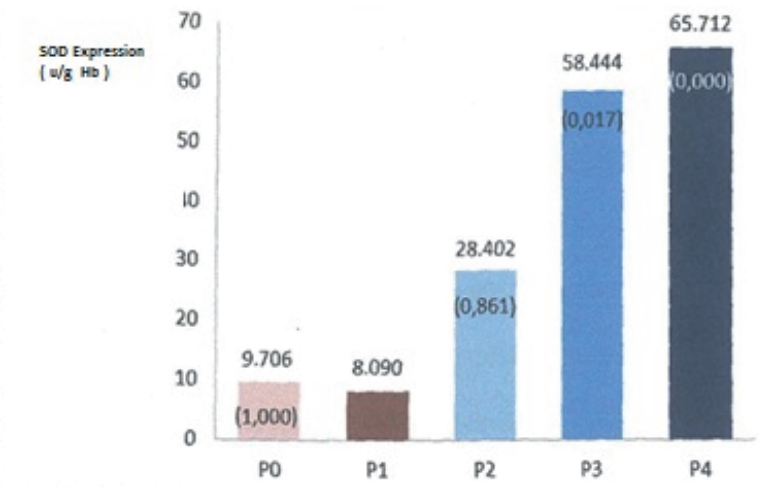

Figure 1: SOD Activity ethanol extract of pericarp *G. mangostana*.

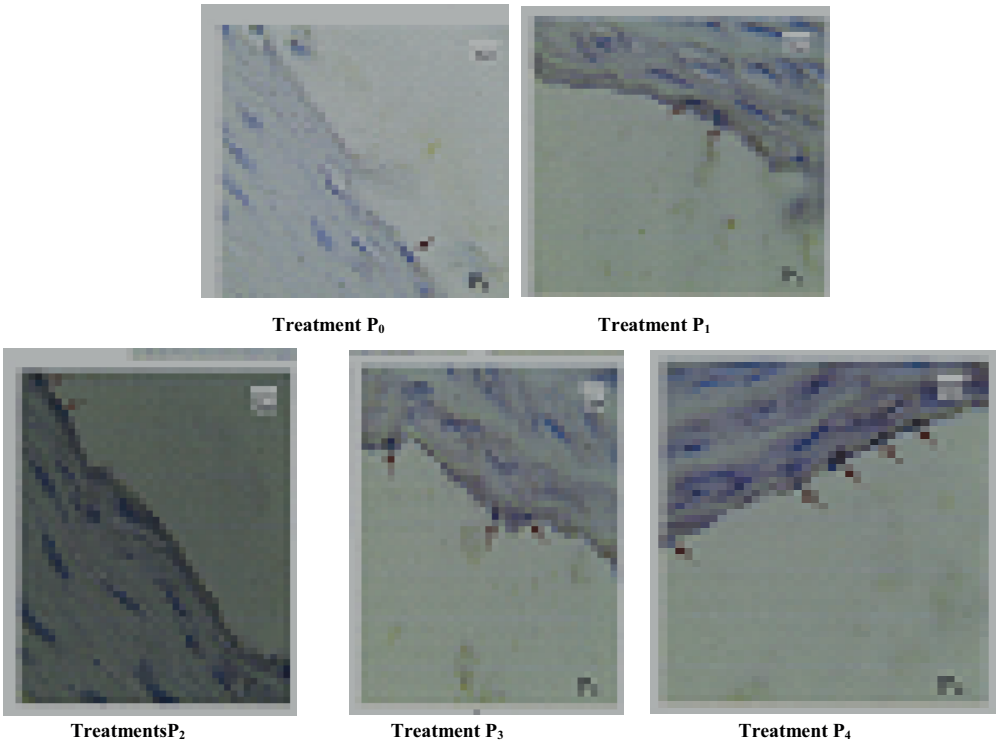

Figure 2: Profile of histopatology cell pancreatic.

(P_3), and 150 mg · kg^{-1} body weight (P_4) to analyse SOD activities and histopathology of pancreatic cells and result was then compared to the control normal and control negative hyperglycemic rats.

As it is shown in Fig. 1, the SOD activity of (P_1) control negative hyperglycemic rats decreased compared to control normal, It means that stress oxidative has occurred in control negative (hyperglycemic). While intake of pericarp *G. mangostana* ethanol extract in all dose 50 mg · kg^{-1} body weight (P_2), 100 mg · kg^{-1} body weight (P_3), and 150 mg · kg^{-1} body weight (P_4) significantly inreased ($p < 0.05$) SOD activity

in hypergycemic rats as compared to control negative. The SOD activity increased by increasing the dose of extracts. The highest SOD activity was obtained by intake pericarp *Garcinia* extract at a dose of 150 mg · kg^{-1} body weight which increased SOD activity by 65.71 %.

The histopathology studies (Figure 2) relealed the normal hystopathology of pancreas (P_o); (P_1) hyperglycemiic rats; (P_2) intake of 50 mg · kg^{-1} body weight ; $P_3$100 mg kg^{-1} body weight; and (P_4) intake of 150 mg · kg^{-1}bodyweight; *G. mangostana* extracts. This study showned that intake of *G mangostana* pericarp ethanol extract to alloxan induced hyperglycemic ratsb improved the antioxidant activity and repaired the organ to normal hystology when compared to the morphologycal disruptinn in the control hyperglycemic rats. The result obtained as shown in Figure 2 revealed the inhibitory and protective effect of intake pericarp *Garcinia* extract nalysis of pancreatic revealed intake of *G. mangostana* pericarp ethanol extract at dose of 150 mg · kg^{-1} body weight (P_4) repaired any damaged in pancreatic cell of hyperglycemic rats to become cell pancreatic as control normal (P_0) (Fig. 2).

Figure 2 revealed the inhibitory and protective effect of plant extract over the organ damage at hyperglycemic rats Therefore intake *G. mangostana* pericarp extract which is rich in polyphenolic compounds as sources of antioxidant protect the body from stress oxidative.

4. Conclusion

Based on the analysis, it can be concluded that intake pericarp of *G. mangostana* L extract increased superoxide dismutase (SOD) activity hyperglycemic Wistar rats in a dose dependent manner. It gave the highest SOD activity at a dose of 150 mg · kg^{-1} body weight. Histopathology analysis found that intake of pericarp *G. mangostana* extract at a dose of 150 mg · kg^{-1} body restored the damage in pancreatic cell tissue to become a normal pancreatic cell.

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