ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Utilization of Fruit Peel Extracts of Persea americana, Cyphomandra betacea, Mangifera odorata and Archidendron pauciflorum as Antidiabetic in Experimental Rats.

Jenny Ria Sihombing[1], Christian Agus Bona Satria Sidabutar[2], Edy Fachrial[3], Almahdy[4], Zulkarnain Chaidir[5], and Abdi Dharma[5*]

[1]Doctoral Program of Chemistry and Biomolecular Science, Faculty of Mathematics and Natural Science, University of Andalas, Padang, Indonesia.
[2]Faculty of Medicine, University of HKBP Nommensen, Medan, Indonesia.
[3]Laboratory of Molecular Biology, Faculty of Medicine, University of Prima Indonesia, Medan, Indonesia.
[4]Faculty of Pharmacy, University of Andalas, Padang, Indonesia.
[5]Department of Chemistry, Faculty of Mathematics and Natural Science, University of Andalas, Padang, Indonesia.

ABSTRACT

The present study investigated the antidiabetic activity of four medicinal peel methanolic extract namely *Persea americana*, *Mangifera odorata*, *Cyphomandra betacea* and *Archidendron pauciflorum*. The experimental rats which administered with alloxan induced diabetic, then treated with peel methanolic extracts of the medicinal plant above. *A.pauciflorum* peel methanolic extract (AMPE) showed the most significant in decreasing of blood glucose, followed by *C.betacea* peel methanolic extract (CMPE). The antidiabetic activity of AMPE might be due the antioxidant content which inhibiting the lipid peroxidation and prvent the destruction of pancreatic β cells.

Keywords: Antioxidant, antidiabetic, medicinal plants; alloxan

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Diabetes mellitus as one of the five leading causes of death in the world, is a chronic disorder that occurs due to various causes with characteristic of hyperglycemia, accompanied by impaired metabolism of carbohydrate, lipid and proteins, which resulted from abnormal insulin secretion, insulin action or both [1,2].It is estimated that 25% of the world population is affected by this disease. There are 2 types of diabetes, type 1 diabetes and type 2 diabetes. Type 1 diabetes leads to inability to release insulin resulted in low rates of glucose uptake into muscles and adipose tissue. Types 2 diabetes usually occurs in obese individuals and associated with hypertension and dyslipidemia. Thus the treatment aims to reduce insulin resistance and to stimulate secretion of insulin [3]. The increasing prevalence of this disease in the world is as a result of a sedentary life style. The synthetic hypoglycemic drugs that commonly used could cause undesirable side effects so we need to find a new sources for he treatment of diabetes [4].Apart from currently available therapeutic options, many herbal medicine have been recommended for the treatment of diabetes [5].

Persea americana known as avocado is an evergreen tree which originated in Central America but is now found in most tropical and subtropical countries. *Persea americana* possesses analgesic and anti-inflammatory effects [6], prevention of cardiovascular risk factors [7] and antimicrobial [8].*Cyphomandra betacea* is locally known as "terong Belanda" among local people in Indonesia, can grow naturally in the higher humidity and low temperature area. The ripe fruit of *C.betacea* is usually eaten raw by local community. This fruit exhibit the high antioxidant activity and also flavonoid content [9]. *Mangifera odorata* (kweni) belongs to the mango (Anacardiaceae) family and has typical exciting strong flavor. Different from the sweet-type mango, kweni has more fruity, freash and little spicy note [10]. Sihombing [11] reported that *M.odorata* is one of the fruit that have high antioxidant activity. Fruit peel extract of *M.odorata* could scavenging free radical of DPPH as 79,113%. *Archidendron pauciflorum* is a legume tree with a size of 18-25 and have greyish smooth bark. The tree is indigenous to mountainous areas as well as on river banks in Southeast Asian countries. The seeds have an antioxidant effect [12]. The present paper reports result to assess the hypoglycemic activity of peel methanolic extract of *P.americana*, *C.betacea*, *A.pauciflorum* and *M.odorata* in experimental mice.

MATERIAL AND METHODS

Peel methanolic extract of Samples

The peels of *P.americana, C.betacea, M.odorata* and *A.pauciflorum* was air dried for 2 weeks and crushed using crusher into a powder form. The extraction was carried out by pecolation method with methanol as solvent. The concentrated extract then diluted for later administered to experimental mice orally.

Experimental design

Experimental mice obtained from Andalas University, Faculty of Mathematics and Natural Sciences, namely male mice (*Mus musculus*), aged 3 months with 20-40 g of weight as many 25 mice. 25 mice were divided into 5 groups of 5 mice in each group, ie :

Group I : distilled water + normal diet
Group II : 42mg/kg.bw of *P.americana* peel methanolic extract (PPME) + normal diet
Group III: 42 mg/kg.bw of *M.odorata* peel methanolic extract (MPME) + normal diet
Group IV: 42 mg/kg.bw of *C.betacea* peel methanolic extract (CPME) + normal diet
Group V : 42 mg/kg.bw *A.pauciflorum* peel methanolic extract (APME) + normal diet

The blood glucose level of experimental mice were measured before treatment, 3 days after alloxan induction and after treatment.

Statistical analysis

The data were statistically analyzed using Statistical Package for Social Science Program ver. 16 (SPSS ver. 16). The analysis was conducted using analysis of variance (ANOVA).

ISSN: 0975-8585

RESULT AND DISCUSSION

The Decrease of Blood Glucose Level of Experimental Mice

The decrease of blood glucose level of experimental mice before and after induced with Alloxan and after treatment was showed in Table.1

Table 1. The blood glucose level of experimental mice during experiment

Treatment Group	Blood glucose level (mg/dL)			
	initial	After induced with Alloxan	After treatment	Decreased of blood glucose level (mg/dL)
I	80,8	159,2	98,2	61
II	91,4	289,2	288,8	0,4
III	89,4	328	326,8	1,2
IV	101,6	417	251,2	165,8*
V	82,8	433	224	208,8*

***P<0,05 compared to group 1**

Table 1 showed that there are elevated levels of blood glucose levels in all experimental mice after induced with alloxan. Alloxan is a hydrophobic and unstable chemical compound which has similar shape as that of glucose. Similarity in the shape allows alloxan to transports into the cytosol by the glucose transporter (GLUT2) in the plasma membrane of β cell. Another biological effect of allozan has been attributed by the reactivity of thiol group that allows selective inhibition of glucose-induced insulin secretion through inhibition of glucokinase [13]. Skudelski [14] reported that alloxan will establish a redox cycle with the formation of superoxide radicals. The action of reactive oxygen species with a simultaneous massive increase in cytcolic calcium concentration causes rapid destruction of β cells. Table 1 showed that all the group of experimental mice that treated with peel extract showed the decrease of glucose levels. Table 1 shows that the administration of *P.americana* peel extract and *M.odorata peel* extract have no effect in reducing the blood glucose level. The present study demonstrated that APME was the most effective at decreasing blood glucose, followed by CPME . Arya et al [15] reported that antioxidant play a main role in reducing the blood glucose level particularly flavonoid and phenolic content which are known to be involved in the healing process of free radical-mediated disease, including diabetes. The similar result was reported by Sharma et al [16] which investigated the hypoglycemic activity of *Ficus glomerata* in alloxan induced diabetic rats. It was reported that the ethanolic extract of *Ficus glomerata* leaves could reduce the fasting blood glucose of experimental albino rats which induced with alloxan. Mendes and Bogle [17] reported that the antioxidants have been shown to prevent the destruction of pancreatic β cells by inhibiting the peroxidation chain reaction and thus may provide protection against the development of diabetes. Moreover, the fibers of plants may also interfere in the absorption of carbohydrates and thus have an effect on blood glucose. Norafida et al [18] reported that *Archidendron jiringa* (one of binomial names of *A.pauciflorum*) could reduce the MDA level and blood glucose levels of streptozotocin-induced rats, and the antioxidant properties of *A.jiringa* are probably mediated by reducing free radical formation, thus decreasing the lipid peroxidation. In addition , *A.jiringa* seeds contain fibre and alkaloid substance that is claimed to be antidiabetic properties. The similar result also reported by Mary et al [19] which reported the antioxidant, antihyperlipidaemic and antidiabetic activity of *Eugenia floccosa* Bedd leaves in alloxan induced diabetic rats. Administration with ethanol extract of *E.floccosa* leaf exhibited decrease in blood glucose and increase in plasma insulin significantly at a dose of 150 mg/kg and 300 mg/kg body weight. The possible mechanism by which ethanol extract brings about its hyperglycemic action may be induction of pabcreatic insulin secretion from β cells of islets of langerhans or due to enhanced transport of blood glucose to peripheral tissue.

CONCLUSION

It concluded that *A.pauciflorum* peel methanolic extract and *C.betacea* peel methanolic extract could significantly reduced the blood glucose levels of diabetic-alloxan induced experimental rats. Further

investigations in pharmacological and biochemical will needed to clearly elucidate the mechanism of action and will be helpful in projecting this plants as antidiabetic agent.

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