

Activities Formulation of Jackfruit (*Artocarpus Heterophyllus* Lamk) and Moringa (*Moringa Oleifera*) Leaf on Antidiabetic in Vivo

Joko Santoso¹ Atiek Murhayati¹ Irma Erinda Nur Pratiwi¹

¹Kusuma Husada University, Surakarta

Abstract

Indonesia ranks sixth in the world for the highest prevalence of diabetes after China, India, the United States, Brazil, and Mexico. The prevalence of people with diabetes in Indonesia tends to increase, where in 2007 it was 5.7% and in 2013 it was 6.9%. In 2045, the number is estimated to be 16.7 million people with diabetes aged 20-79 years. Jackfruit leaves (*Artocarpus heterophyllus* Lamk) contain phytochemical compounds, active compounds of flavonoids, tannins, saponins, alkaloids, polyphenols, steroids, where these compounds can reduce blood glucose levels. Jackfruit leaves and Moringa leaves contain flavonoids, tannins, alkaloids, triterpenoids, saponins, and reducing sugars showed that flavonoids have a hypoglycemic effect. Objective To evaluate the activity of the jackfruit and moringa leaf formulations against antidiabetic in vivo. Methods The research used experimental methods with a post test design laboratory research approach where this study was divided into 5 experimental groups, each group consisting of 5 test animals. Results: Tests for blood sugar levels in rats were Group I (ENK 200mg/kgBW) of 110.30 mg/dL, Group II (ENK 400mg/kgBW) of 100.50 mg/dL, Group III (ENK 800mg/KgBW) of 95.50 mg/dL, Group IV (Glibenclamide 150mg/KgBW) of 120, 30 mg/dL and Group V (Aquadest) of 190.30 mg/dL. Conclusion: The effective dose and activity as antidiabetic is group III (ENK 800mg) because it can reduce blood sugar levels by 95.50 mg/dL compared to other groups.

Keywords: Jackfruit leaves, Moringa and Antidiabetes

Introduction

Indonesia is ranked sixth in the world for the highest prevalence of diabetes after China, India, the United States, Brazil, and Mexico. The prevalence of people with diabetes in Indonesia tends to increase, where in 2007 it was 5.7% and in 2013 it was 6.9%. In 2045, the number is estimated to be 16.7 million people with diabetes aged 20-79 years. Diabetes mellitus is a chronic disease characterized by high blood glucose levels (hyperglycemia) due to imperfect glucose hemostasis regulation. Diabetes mellitus is divided into 2 types, namely type 1 and type 2 diabetes. Type 1 diabetes or insulin-dependent diabetes mellitus (IDDM) is characterized by the body's immune system destroying pancreatic cells, so that cells are unable to produce the insulin hormone that functions. to lower blood glucose levels. Type 2 diabetes or non-insulin-dependent diabetes mellitus (NIDDM) begins with insulin resistance, which is a decrease in the sensitivity of insulin receptors in the liver, muscle tissue, and adipose tissue so that the insulin hormone is not used properly. Due to the

increased need for insulin, the pancreas tries to produce more insulin (Ridwan. 2012)

Diabetes mellitus can cause excessive production of free radicals or commonly known as Reactive Oxygen Species (ROS). ROS will trigger oxidative stress because there are more free radicals in the body than antioxidants. Free radicals have the ability to diffuse into cell membranes which then react with lipid membranes to produce malondialdehyde (MDA). MDA is one of the end products of cell membrane lipid peroxidation by excess free radicals so that MDA is used as an index for measuring free radical activity in the body. The target of ROS oxidation in addition to lipids is DNA, in the oxidation of DNA guanine nucleotides are prone to ROS oxidation reactions. The compound resulting from the oxidation of guanine is 8-hydroxy-deoxyguanosine (8-OHdG). Oxidation of guanine in DNA strands, resulting in DNA loss of guanine nucleotides. Sustained reactions can cause DNA damage, thereby inhibiting the process of cell division in spermatogenesis and mitochondria and disrupting respiration which can interfere with cell energy

(Tandi J. 2017).

Diabetes mellitus is characterized by high blood glucose levels, due to impaired insulin function or decreased insulin secretion by pancreatic cells. The pancreas is a very long organ located retroperitoneal in the upper abdomen, in front of the I and II lumbar vertebrae (Syaifuddin, H. 2011). One of the plants that is widely used and efficacious as a diabetes drug is jackfruit leaf (*Artocarpus heterophyllus* Lamk) and Moringa leaf (*Moringa oleifera*). these compounds can lower blood glucose levels (Baha MK 2015). Moringa leaves contain flavonoids, tannins, alkaloids, triterpenoids, saponins, and reducing sugars indicating that flavonoids have a hypoglycemic effect.

Table 1. Docking grid box settings

Protein	Center	Dimensions	Target Domain
PBP2a (PDB ID: 3ZfZ)	X:27.4699 Y:39.7027 Z:87.9937	X:20.0Å Y:24.0Å Z:14.0Å	Transpeptidase
PBP4 (PDB ID: 5TW8)	X:22.3153 Y:-48.6732 Z:23.4581	X:22.0Å Y:14.0Å Z:20.0Å	Transpeptidase
PBP3 (PDB ID: 3VSL)	X:20.1072 Y:39.7027 Z:87.9937	X:20.0Å Y:14.0Å Z:22.0Å	Transpeptidase
PBP2 (PDB ID: 2OLV)	X:-18.9370 Y:86.2685 Z:-19.8550	X:22.0Å Y:28.0Å Z:18.0Å	Transglycosylase
PBP1 (PDB ID: 5TRO)	X:27.6481 Y:-24.6340 Z:-28.4674	X:28.0Å Y:28.0Å Z:28.0Å	Transpeptidase

macromolecules and the ligand structures were imported, minimalized, and made as PDBQT format. The grid box was set in accordance with **table 1**. Ligands with the most negative binding energy (BE) were visualized and analyzed using Biovia Discovery Studio Visualizer.

Method

The type of research in this study was experimental with a posttest design laboratory research approach where this study was divided into 5 experimental groups, each group consisting of 5 test animals.

The tools used for extracting were analytical balance, macerator, rotary evaporator, Buchner funnel and vacuum pump, filter paper, aluminum foil, porcelain cup, and water bath. The tools used for handling the test animals were rat scales, oral probe, eppendorf tube, scalpel no.20, vortex, disposable syringe, micropipette, white tip and yellow tip, rat holder, rat cage, drinking rat, centrifugator, beaker glass, gloves and masks.

The plant materials used are jackfruit leaves and Moringa leaves. The jackfruit and moringa leaves are then made into a thick extract. The chemicals used were 96% ethanol, Glucose GOD-PAP (DSi) kit reagent, alloxan monohydrate

(Sigma Aldrich), aquabidest, Glibenclamide (generic), sugar solution. The test animals used were male white rats of the Wistar strain aged 8-12 weeks with a body weight of 150-250 grams.

Making jackfruit and moringa leaf extract

Extracts of jackfruit and Moringa leaves were made by maceration method, namely 600g jackfruit leaf powder and 400g Moringa leaves which had been sieved using sieve no. 40 mesh, weighed 1000 grams and then extracted using 70% ethanol solvent as much as 3 liters for 5 days. The extract was then filtered using filter paper and the filtrate was obtained. Then evaporated or separated the solution using a Rotary Vacuum Evaporator at a temperature of 60°C and continued with thickening which was carried out using a water bath at a temperature of 60°C until a dry extract was obtained.

Glibenclamide suspension manufacture

The dose of Glibenclamide in adult humans is 5 mg per day, if converted to rats weighing 200 g is 0.018 then the dose of Glibenclamide for rats is 0.45 mg/kg BW. Weigh the glibenclamide powder and add Aquadest to 100 ml, shake until homogeneous.

Test Animals
25 male white rats were adapted for two days in the laboratory by being adequately housed at normal ambient temperature and given food and drink. (Tandi J. 2017)

Data analysis

The data obtained in the form of blood glucose levels were analyzed statistically using the one way ANOVA test at a 95% confidence level.

Results and Discussion

Table 1. Extract Yield Results

No	Extract Organoleptic Parameters	Test result
1	Shape	Solid
2	Color	Dark green
3	Smell	aromatic
4	Flavor	Chelate
5	Yield	16 %

The results of this study produced organoleptic extracts, namely solid form, dark green color, distinctive aromatic odor, chelating taste and 16% extract yield.

Table 2. Phytochemical Test Results Extract

Testing	Reagents	Observation	Result
Alkaloids	Dragendorf	Precipitated	+

Flavonoids	Concentrated HCl and Metal Mg	Saffron	+
Saponin	Shake +HCl 2 N	Foam is formed	+

Description :

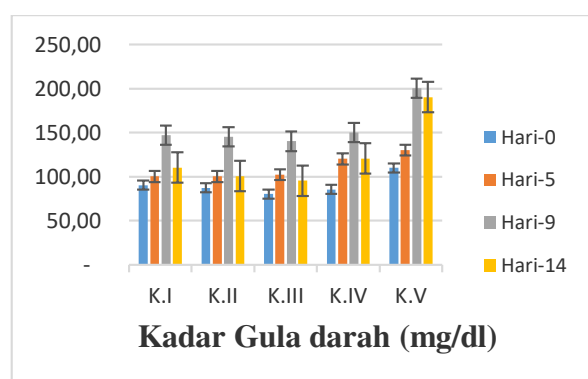
(+) contains the class of compounds being tested

(-) does not contain the class of compounds tested

The results showed that the extract contained chemical compounds such as alkaloids, flavonoids and saponins.

Table 3. Results of Measurement of Glucose Level in blood

Group	Pengukuran Kadar Gula Darah (Hari)			
	0	5	9	14
K.I	90,30±1	100,15±	147,10±	110,30±
K.II	5,20	15,21	20,20	10,20
K.III	87,20±1	100,100	145,20±	100,50±
K.IV	0,25	±09,26	15,20	15,21
K.V	80,10±1	102,20±	140,10±	95,50±1
(+)	6,22	17,27	10,13	5,30
(-)	85,30±1	120,10±	150,05±	120,60±
	8,10	18,11	14,23	20,13
	110,00±	130,20±	200,30±	190,30±
	12,20	10,25	12,10	10,24



Gambar 1. Gambar kadar glukosa dalam darah

This study was used to see the effect of giving a combination of jackfruit leaf extract and Moringa leaves on glucose levels in the blood of rats for 14 days. This study used test animals in the form of 25 male white rats (*Rattus norvegicus*). The use of male white rats as test animals because it can provide more stable research results because it is not affected by the estrus cycle and pregnancy as in female white rats. Male white rats also have a faster drug metabolism rate and more stable biological condition than female rats. (Tandi, J. 2017).

Extract preparations are viscous preparations obtained by extracting the active substance from vegetable simplicia or animal simplicia using a suitable solvent, then using an extraction method by withdrawing the soluble chemical content from a simplicia powder, so that it is separated from the insoluble material (MOH). (RI. 2000). The extract preparation in this study used dry extract so that it could facilitate the development of more modern pharmaceutical preparations because the dose is measurable and can be developed in further research.

Diabetic male rats were treated for 14 days, namely in group I the dose of ENK 200mg/kgBW, Group II the dose of ENK 400mg/kgBW, the dose of ENK 800mg/kgBW,

Group IV as a positive control with a dose of glibenclamide 0.45mg/gBW and Group V as a control. negative with Aquadest. The results of research data from measuring blood glucose levels are that group II has a high effectiveness in reducing blood glucose levels by 95.50 mg/dL compared to other groups and controls. Groups I, II, III and IV can reduce glucose levels in the blood. blood but those who have a high potential to reduce blood glucose levels are group III.

Conclusions

The effective dose and has antidiabetic activity is group III (ENK 800mg) because it can reduce blood sugar levels by 95.50 mg/dL compared to other groups. The plant extracts in this study contained alkaloids, flavonoids and tannins.

Reference

- Andrie, M., wintari T., dan Rizqa A. 2014. Uji Aktivitas Jamu Gendong Kunyit Asam (*Curcuma domestica* Val; *Tamarindus indica* L.) Sebagai Antidiabetes Pada Tikus Yang Diinduksi Streptozotocin. *Asian Pacific Journal of Tropical Biomedicine*. Vol 7 No3 : 1089-1099. Hal.13-14.
- Baha Khorioh Miss. 2015. Pengaruh pemberian ekstrak etanol daun nangka (*Artocarpus heterophyllus*) Terhadap Penurunan Kadar Glukosa Darah Tikus Wistar yang Diinduksi Aloksan. *Jurnal Trop Pharmacy Chemistry*. Vol 19. No 9. Hal 8
- Departemen Kesehatan RI , 2005, *Pharmaceutical Care untuk Penyakit Diabetes Mellitus*, hal 23, Departemen Kesehatan Republik Indonesia
- Leila Mousavi, Rabeta Mohd Salleh, Vikneswaran Murugaiyah, Mohd Zaini Asmawi. 2016. Hypoglycemic and antihyperglycemic study of *Ocimum tenuiflorum* L. leaves extract in normal and streptozotocin-induced diabetic rats. *Asian Pacific Journal of Tropical Biomedicine*. Vol 6. No 12
- Nasdiwaty Daud, Rosidah, M Pandapotan Nasution. 2016. Antidiabetic Activity of *Ipomoea batatas* L. Leaves Extract In Streptozotocin-Induced Diabetic Mice. *International Journal of Pharmtech Research*. Vol 9. No 3.
- Omar,S.H., El-Beshbishy, H.A., Moussa, Z., Taha, K.F., and Singab, A.N.B., 2011, Antioxidant Activity of *Artocarpus heterophyllus* Lam. (Jack Fruit) Leaf Extracts: Remarkable

- Attenuations of Hyperglycemia and Hyperlipidemia in Streptozotocin- Diabetic Rats, *The Scientific World Journal*, 788-800.
- Tandi J, Suryani As'adm., Rosdiana Natzir., Agussalim Bukhari. 2016. Test Of Ethanol Extract Red Gedi Leaves (*Albelmoschus manihot* (L.) Medik) In White Rat (*Rattus norvegicus*) Type 2 Diabetes Melitus. *International Journal Of Sciences. Basic and Applied Research (IJSBAR)*. Volume 3 No, 1. Hal 1-6.
- Tandi J, H.Z Mutiah, Yuliet dan Yusriadi. 2016. Efektivitas Ekstrak Daun Gedi Merah Terhadap Glukosa Darah, Molandialdehid, 8-hdidroksi-deoksiganosin, Insulin Tikus Diabetes. *Jurnal Trop Pharmacy Cemistry* Vol.03 No.04.
- Tandi J, M Rizky, R Mariani. 2017. Uji Efek Ekstrak Etanol Daun Sukun (*Artocarpus artilis* (Parkinson Ex FA Zorn) Terhadap Penurunan Kadar Glukosa Darah Kolesterol. *Jurnal Sains dan Kesehatan*. Vol 1. No 8.
- Tandi J, Ayu Wulandari, Asrifa. 2017. Efek Ekstrak Etanol Daun Gendola Merah (*Basella alba* L.) terhadap Kadar Kreatinin, Ureum dan Deskripsi Histologis Tubulus Ginjal Tikus Putih Jantan (*Rattus norvegicus*) Diabetes yang Diinduksi Streptozotocin. *Galenika Journal Of Pharmacy*. Vol 3. No 2.
- Trilestari Herni. 2016. Hubungan perilaku diet dengan kadar glukosa sewaktu pada penderita diabetes melitus tipe II di ambar ketawang Yogyakarta. *Jurnal Sains dan Kesehatan*. hal.1-2