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Effects of Ethanol Extract of Aloes (Aquilaria malaccesensis) Leaves in Lowering Blood Sugar Levels of Mice after Maltose Loading

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Abstract
Introduction: *Diabetes mellitus is a significant health problem, in 2015 mentioned that around 415 million adults had a history of diabetes. Aloes leaves (Aquilaria malaccensis) contain flavonoid compounds which are phenolic compounds as antioxidants and are often used as antidiabetic. Efficacy of agarwood leaves as antidiabetic is related to secondary metabolite content from phytochemical screening, ethanol extract of fresh agarwood leaves and ethanol simplex extract obtained, there are active compounds such as flavonoids, glycosides, tannins, and steroids/triterpenoids.*
Objective: *To determine the effect of agarwood leaf ethanol extract (Aquillaria malaccencis) in reducing blood sugar levels of mice after maltose loading. This study uses a randomized controlled design method with pre and post test control group design patterns. A total of 30 male mice (Mus musculus. L) aged 3-4 months weighing 20-35 grams were randomly selected and divided into 5 groups consisting of: Negative control group, positive control group, 2.5% EEDG (250 mg/kgBB), 5% EEDG (500 mg/kgBB), and 10% EEDG (1000 mg/kgBB). The extract was given first then after 10 minutes the whole group was burdened with maltose, measurements of blood sugar levels were carried out by measuring fasting KGD and KGD after loading of maltose at intervals of 30, 60 and 120 minutes.*
Methods: *To see the differences between the control groups with the treatment carried out post-hoc test then performed LSD test, and calculate the value of the area under the curve (AUC) to see differences between groups. All data analyzes were performed using SPSS 17 software. In this study 95% confidence level was taken ($p<0.05$).*
Results: *The study showed that the treatment group (EEDG dose 250 mg/kgBB, EEDG dose 500 mg/kgBB, and EEDG dose 1000 mg/kgBB) had an effect in lowering blood sugar levels marked by significant differences with negative control group. EEDG dose of 500 mg/kgBB obtained a significant value of $p>0.05$ ie $p = 0.986$ there was no significant difference with the positive control group. The under the curve (AUC) area shows the AUC value respectively produced by the negative control group (276.2 ± 8.980), the positive control group (217.9 ± 10.700), EEDG 250 mg/kgBB (187.4 ± 33.862), EEDG 500 mg/kgBB (217.6 ± 25.062), and EEDG 1000 mg/kgBB (323.4 ± 40.482).*
Conclusion: *From the entire treatment group the optimal dose was EEDG with a dose of 250 mg/kgBB and it was able to significantly reduce the blood sugar levels of mice, but further research was needed for further active components of agarwood leaves that play a role in lowering blood sugar levels.*
Keywords: Aquillaria Malaccencis Leaf, Blood Sugar Level, Diabetes Mellitus, Maltose

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I. Introduction

Diabetes mellitus (DM) is a collection of symptoms that arise in patients due to increased blood sugar (glucose) levels caused by insulin deficiency both in absolute and relative terms, so that regulation of blood sugar levels becomes chaotic. Although blood sugar levels are already high, the breakdown of fat and protein into glucose (gluconeogenesis) in the liver cannot be inhibited so that blood sugar levels increase (Soegondo, et al., 2005).

Symptoms that often appear in people with DM are thirsty, easily hungry, frequent urination, and weight loss. Complications arising from DM include disruption of large blood vessels that can cause damage to the heart, brain and feet, as well as small blood vessels that can cause kidney, eye, and nerve damage (Utami, 2004).

A-glucosidase inhibitors work to inhibit the α-glucosidase enzyme in the small intestinal wall. The α-glucosidase enzymes (maltase, isomaltase, glucomaltase and sucrase) function to hydrolyze oligosaccharides and disaccharides in the small intestinal wall. Inhibition of the work of this enzyme can effectively reduce the

digestion of complex carbohydrates and their absorption, so as to reduce the increase in postprandial glucose levels in diabetics (Shinde, et al., 2008).

Agarwood leaves also contain flavonoid compounds which are phenolic compounds as antioxidants. Flavonoids are also known to regenerate pancreatic β cells, stimulate and increase insulin secretion from undamaged pancreatic cells, and increase insulin sensitivity. The content of flavonoids on agarwood leaves is a type of flavon. Flavone is one type of active flavonoid compound that has an effect as an α-glucosidase inhibitor (Hasibuan, 2011).

The use of agarwood leaves is still limited to some groups of people who use agarwood leaves by boiling as many as seven sheets of aloes to be used as an anti-hyperglycemia drug supported by Yunus et al. (2015) which proves that agarwood leaves can also be used as antidiabetic drugs because they contain compounds of metabolites, and according to Silaban's research (2013) the efficacy of agarwood leaves as antidiabetic is related to secondary metabolite content from phytochemical screening on simplisia powder, ethanol extract of fresh agarwood leaves and ethanol simplisia extract obtained the presence of flavonoid compounds, glycosides, tannins, and steroids/triterpenoids. Based on the description above, researchers are interested to find out more about the effects of ethanol extract of agarwood leaves (Aquillaria malaccencis) in reducing blood sugar levels in mice after maltose loading.

II. Material and Methods

This research is a type of laboratory experimental analytic research, which is to study a phenomenon in causal correlation, by giving a treatment to the research subject then seeing and studying the effects of the treatment (Notoatmodjo, 2012). This study uses a randomized controlled design method with pre and post test control group design patterns. A total of 30 male mice (Mus musculus. L) aged 3-4 months with a weight of 20-35 grams were randomly selected and divided into 5 groups.

The location of sampling and maintenance of experimental animals was carried out at the Pharmacology and Toxicology Laboratory of Pharmacy, Faculty of Pharmacy, Universitas Sumatera Utara. Identification of agarwood leaf ethanol extract (EEDG) was carried out at the Laboratory of Pharmaceutical Biology, Faculty of Pharmacy, Universitas Sumatera Utara, and obtained ethical clearence with No. 0772/KEPH-FMIPA/2019 from the Faculty of Mathematics and Natural Sciences, Universitas Sumatera Utara.

The population in this study were all male mice (Mus musculus. L) weighing 20-35 grams and aged 3-4 months obtained from the Pharmacy Pharmacology and Toxicology Laboratory, Faculty of Pharmacy, Universitas Sumatera Utara. The sample in this study were 30 male mice (Mus musculus. L) from an affordable population that met the inclusion criteria.

The research tools used consisted of, refrigerators, electric balance (mettler toledo), mortars, spatulas, measuring cups, pumpkins, beaker cups, AND electronic scales, to weigh the weight of mice, glucometers and glucotest strips (Easy Touch®GCU), 1 cc syringe, hands scoon, stopwatch, alcohol cotton, scissors, and oral sonde.

The research materials used in this study were 96% ethanol extract of agarwood (Aquilaria malaccensis) leaves obtained from the Lab. Pharmaceutical Biology, Faculty of Pharmacy, Universitas Sumatera Utara, which was dissolved with aquadest solution, 100 mg carcinoma (PT Dexa Medica), aquadest (Brataco), and maltose powder (technical).

After the data is collected computerized data processing is done using SPSS. To see the effect of ethanol extract of agarwood leaves (Aquillaria malaccensis) in reducing blood sugar levels of mice after maltose loading using SPSS 17 software for windows. Before determining the type of test, the normality and homogeneity of the data are tested using the Shapiro-Wilk test. Data that is normally distributed is when the value of p (significance)<0.05. If the test results are normally distributed then a one-way annova test with a confidence level of 95%, if p<0.05, it can be concluded that there are significant differences in the post-hoc test and the least significant defense test (LSD) to see differences between groups each treatment and if the data are not normally distributed then (p<0.005) and continued with the kallkall-wallis test then continued with the mann-whitney test to see comparisons between treatment groups.

III. Result and Discussion

The Result of Calculation of Area Under the Curve (AUC0-120) Value for Each Treatment Calculated Using Formula

Area under the curve (AUC) was used as a description of the hypoglycemic effect of a combination of agarwood leaf ethanol extract (EEDG) after maltose loading. The average KGD value is used to calculate the formula and see the value of the area under the curve (AUC) in each treatment group.

The value of the area under the curve (AUC) where KGD 0 ', KGD 30', KGD 60 ', KGD 120' represent KGD at minute 0, KGD at minute 30, KGD at minute 60, and KGD at the 120th minute is calculated using the calculation formula (Sakaguchi et al., 2016):

$$\text{AUC (Minute.mg/dL)} = \frac{\text{KGD (0)} + \text{KGD (30)} \times 2 + \text{KGD (60)} \times 3 + \text{KGD (120)} \times 2}{4}$$

The AUC value obtained was then analyzed with one-way annova or one-way annova and continued with the least significant difference (LSD) test using a 95% confidence level. The value of blood sugar levels (KGD) is used to calculate the area under the curve area under the curve (AUC) of each treatment group to the time of observation, which shows the amount of change in blood sugar levels, due to the effect of treatment in each group. The average value of AUC with standard deviation calculations using the formula Sakaguchi et al. (2016) which shows that the highest AUC value is the 10% EEDG treatment group and the lowest AUC value is the 2.5% EEDG treatment group.

Table 1. Regions Under the Curve (AUC) Blood Sugar Levels of Minutes Against Observation Times from 0-120 Minutes

Minutes to	Aquadest	Akarbosa	E EEDG 2.5%	EEDG 5%	EEDG 10%
1	26.5	234.75	148.25	242.25	2937.5
2	277.75	210	174.5	206	307.5
3	280.5	222.75	165.5	191	292.5
4	265.75	210.5	180.5	251.25	306
5	283.25	222.75	217.75	194.25	344
6	285.5	206.75	238.25	221.25	396.75
Mean	**276.208**	**217.917**	**187.458**	**217.667**	**323.417**
SD	**8.980**	**10.700**	**33.862**	**25.062**	**40.482**

Shapiro Wilk Statistical Test Area Under the Curve (AUC) Fluctuation Value in Each Comparison of Treatment Group

The shapiro-wilk statistical test was carried out after the AUC value was obtained to determine the normality test of the research data distribution, the significance value was obtained p<0.005 and the results of the AUC0-120 normality test were p=0,000 meaning that the AUC0-120 data were normally distributed. If the data is normally distributed, one-way anova parametric model statistical analysis is chosen, to see the differences in all treatment groups. Based on the analysis of variance, there were significant differences between groups (p<0.005). After obtaining normal and homgenous data, the anova one way test is continued, namely the least significant difference (LSD) test using a 95% confidence level to find out which differences between treatment groups are significantly different. The AUC LSD test results in Table 2 show the group data and can be seen in the following Table:

Table 2. LSD-AUC Test Result AUC_{0-120} in Each Comparison of Treatment Group with a 95% confidence level

	Akarbosa	EEDG 2,5%	EEDG 5%	EEDG 10%
Aquadest	p=0,000*	p=0,000*	p=0,000*	p=0,003*
Akarbosa		p=0,045*	p=0,986	p=0,000*
EEDG 2,5%			p=0,047*	p=0,000*
EEDG 5%				p=0,000*

Information*: Significant

Based on the least significant difference (LSD) test results of AUC0-120 in Table 2 shows that of the three treatment dosage groups the whole group has a significant difference with a p value<0.005, it can be concluded that the entire treatment group is significant and can be concluded that the treatment group with the value p<0.005 has the effect to reduce blood sugar levels, except in the comparison between the roots of the root with EEDG 5%, the significance value p>0.005 is obtained, p=0.986, which means there is no significant difference between the positive control group and the 5% EEDG group.

IV. Conclusion

Based on observations in this study it can be concluded as follows:

1.From the comparison of the three extract test doses, a significant value is obtained and the results are obtained that the extract of agarwood leaves (Aquilaria malaccensis) has effectiveness in reducing blood sugar levels.

2.The results of research that have been done show that the ethanol extract of aloes (Aquilaria malaccensis) leaves is the most optimal dose at a dose of 250 mg/kgBB.

3.From comparison data between treatment groups by calculating the average value of the under the curve area (AUC) has the potential to reduce blood sugar levels (KGD) and can be used as an antihyperglycemic agent.

References

[1]. Hasibuan, Yusridah. (2011). *Isolasi dan Identifikasi Senyawa Inhibitor A-Glukosidase dari Ekstrak Daun Tekokak (Solanum Torvum)*. Bogor: Institut Pertanian Bogor.

[2]. Notoadmojo, Soekidjo. (2012). *Promosi Kesehatan dan Perilaku Kesehatan*. Jakarta. Rineka Cipta.

[3]. Sakaguchi, Kazuhiko., Takeda, Kazuo., Maeda, Mitsuo., Ogawa, Wataru., Sato, Toshiyuki., Okada, Seiki., Ohnishi, Yasuhito., Nakajima, Hirumo., & Kashiwagi, Atsunori. (2016). *Glucose Area Under the Curve during Oral Glucose Tolerance Test as an Index of Glucose in Tolerance*. Diabetol Int, 7, 53-58.

[4]. Shinde, J., Taldone, T., Barletta, M., Kunaparaju, N., Bo, H., Kumar, S., et al. (2008). *Alpha Glukosidase Inhibitory Activity of Syggium Cumini (Linn.) Skeels Seed Kemel in Vitro Goto-Kakizaki (GK) Rats*. Carbohydrate Reseaech, 243, 1278-1281.

[5]. Silaban, S. (2013). *Skrining Fitokimia dan Uji Aktivitas Antioksidan Ekstrak Etanol Daun Gaharu (Aquilaria malaccensis Lamk)*. Skripsi. Medan: USU Press.

[6]. Soegondo, S., Soewondo, P., & Subekti, I. (2005). *Diabetes Mellitus Penatalaksanaan Terpadu*. Jakarta: Fakultas Kedokteran, Universitas Indonesia.

[7]. Utami, P. (2004). *Tanaman Obat Untuk Mengatasi DM.*. Jakarta: Agromedia Pustaka.

[8]. Yunus, S.,N. A.M Zaki, & K.H. K. Hamid. (2015). *Microwave Drying Characteristic and Antidiabetic of Aquilaria Subintegra and Aquilaria Malaccensis Leaves*. Advanced Material Research, 113, 352-357.