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RESEARCH ARTICLE

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The Effects of The Infusion Cortex of Langsat (*Lansium domesticum* L.) to Decrease Blood Glucose Levels on The Diabetic Rats Induced with Alloxan

Lukman La Bassy^{1(CA)}, Risman Tunny²Aulia Deby Pelu³^{1(CA)}Institute of Health Science "Maluku Husada", Indonesia; apt.lukmanlabasy@yahoo.com (Corresponding Author)²Institute of Health Science "Maluku Husada", Indonesia³Institute of Health Science "Maluku Husada", Indonesia

ABSTRACT

Background Blood glucose levels are a critical factor for maintaining the bodywork. Diabetes mellitus is a metabolic disorder characterized by elevated blood glucose levels due to abnormalities of insulin secretion and insulin work or both. One of Indonesia's native plants that are suspected of potentially as an antidiabetic is Langsat (*Lansium domesticum* L.). Empirically, this plant has been used by Maluku community as an antimalarial drug, but there was no scientific report on the utilization of this plant extract as an antihyperglycemia drug. Objective This research was conducted to determine the effect of the infusion cortex of langsat (*Lansium domesticum* L.) to decrease blood glucose in diabetic rat models. Method Twenty five of Wistar malerats aged 6-8 weeks, weighing 180-200 grams were used in this study. Subjects were induced with Alloxan 110 mg/kgbw. Subjects were grouped into five groups, namely; 1) 10 g/kgbw of the infusion cortex of langsat group, 2) 20 g/kgbw of the infusion cortex of langsat group, and 3) 30 g/kgbw of the infusion cortex of langsat group 4) diabetes group, and 5) control group. The Infusion was given for $\pm$ 21 days and blood glucose examination was conducted before and after this treatment. Results There was a significant decrease in blood glucose levels in the 10 g/kgbw, 20 g/kgbw, 30 g/kgbw of the infusion cortex of langsat groups ($p < 0.05$). Best effects offered by 30g/kgbw dose. Conclusion: Infusion cortex of langsat (*Lansium domesticum* L.) to decrease blood glucose levels in hyperglycemic conditions rats induced by Alloxan. The most effective dose to lower blood glucose levels was 30 g/kgbw.

Keywords: Diabetic, Blood glucose, Cortex of langsat (*Lansium domesticum* L.)

INTRODUCTION

Changes in lifestyle and socio-economic is due to urbanization and modernization, especially the people in big cities in Indonesia, are the cause of the increasing prevalence of degenerative diseases and allegedly the main cause of death in Indonesia. One thing to watch out for is diabetes mellitus⁽¹⁾. Therefore, it is necessary to study further about diabetes mellitus, symptoms, risk factors, prevention and appropriate therapy to reduce the prevalence of diabetes mellitus which continues to increase⁽¹⁾.

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia (increased blood sugar levels) that occur because of abnormalities in insulin secretion, insulin action or both^(2,3). Blood glucose levels are a very important factor for smooth work of the body. Because of the influence of various factors and insulin hormones produced by the pancreas gland, the liver can regulate the level of glucose in the blood. If the level of glucose in the blood increases as a result of the increase in the digestive process and absorption of carbohydrates, then certain enzymes of glucose are converted into glycogen. This process only occurs in the liver and is known as glycogenesis. Conversely, if glucose levels decrease, glycogen is broken down into glucose. This process is known as glycogenolysis, which then undergoes a process of catabolism to produce energy (in the form of chemical energy, ATP)^(2,3).

There is an increase in the number of people with diabetes mellitus every year and expensive medical costs, especially if accompanied by clinical complications encourage people to try traditional medicines that can be used as an alternative treatment. Therefore more and more therapies are developed using traditional medicinal plants to treat diabetes mellitus⁽⁴⁾.

Plant diversity in Indonesia strongly supports most of the supply of raw materials for traditional medicine and helps researchers in isolating the active compounds contained in them. Indonesia in the use of plants for the treatment of a disease is based on empirical experience that has long been used by past people and passed down from generation to generation^(5,6).

One of Indonesia's native plants suspected of having antidiabetic potential is Langsat (*Lansium domesticum* L.). Langsat plants contain alkaloids, saponins, flavonoids, and polyphenols. Empirically this plant has been used by the Maluku community as an antimalarial drug. The seeds of this plant have traditionally been used to treat parasitological diseases of malaria. But there has been no scientific report on the use of extracts of this part of the plant as an antihyperglycemia drug. The presence of alkaloids, flavonoids and other polyphenols in Langsat plants is thought to be potentially antihyperglycemic. So the researchers suspect or hypothesize that the content of secondary metabolites from the Langsat stem bark (*Lansium domesticum* L.) can be efficacious as an antihyperglycemia and can control blood sugar levels tested in diabetic rats.

The objective of this study is to determine the infusion effect of Langsat stem bark (*Lansium domesticum* L.) in reducing blood sugar levels in diabetic rats which were alloxan induced.

METHODS

1. Infusa making of *Langsat* stem bark (*Lansium domesticum* L.)
 - a. The sample was smoothed with a certain degree of smoothness weighed (10 g), (20 g) and (30 g) afterwards it was inserted into the over panic which 100 cc of water was then heated for 15 minutes at 90°C while stirring occasionally. Each was made with a concentration of g / v
 - b. Diabetic rats were alloxan induced rats so that rats become hyperglycemia peritonally. Alloxan dose given was 110 mg / kg body weight of rats, calculated based on the weight of each mouse.
2. How to check and treat
 - a. Rats are divided into 5 treatment groups, each with 5 heads;
 - 1) K1 (diabetic mouse and infusion of 10 g Langsat stem bark)
 - 2) K2 (diabetic mouse and infusion of 20 g Langsat stem bark)
 - 3) K3 (diabetic mouse and infusion of 30 g Langsat stem bark)
 - 4) K4 (diabetic tanta mouse given infusion)
 - 5) K5 (normal / untreated mouse)
 - b. The infusion of Langsat stem bark was daily for 21 days and examination of blood sugar levels on day 1, 7, 14 and 21. Treatment was for 21 days.

RESULTS

Infusion examination was conducted four times, namely on day-1, day-7, day- 14 and day- 21. This research was a type of experimental research, quasy experimental design with control group design. Management of research data using Anova test to see differences of blood sugar levels in each treatment group.

Table.1. Results of statistical test of mean glucose level (mg / dL) of treatment groups

Groups	Mean ± standard deviation			
	P1 (day 1)	P2 (7 th day)	P3 (14 th day)	P4 (21 st day)
K1	74.26 ± 1.48	2.23 ± 7.70	1.90 ± 7.62	1.65 ± 2.49
K2	74.97 ± 1.20	2.25 ± 3.02	1.74 ± 2.51	1.26 ± 3.64
K3	75.32 ± 1.42	2.31 ± 4.77	1.55 ± 1.53	1.12± 1.89
K4	74.89 ± 2.02	2.30 ± 1.81	2.31 ± 1.77	2.32 ± 1.72
K5	76.50 ± 2.71	76.69 ± 2.76	77.70 ± 1.89	77.29 ± 3.02

Examination of glucose levels in P1 (day 1) before alloxan induction was carried out and before giving the infusion treatment of *Langsat* stem skin (*Lansium domesticum L.*) with an average value at:

- K1 (74.26 ± 1.48 mg / dL)
- K2 (74.97 ± 1.20 mg / dL)
- K3 (75.32 ± 1.42 mg / dL)
- K4 (74.89 ± 2.02 mg / dL)
- K5 (76.50 ± 2.71 mg / dL)

Note: All the treatment groups were not in hyperglycemia (table 1).

Examination of P2 glucose levels (day 7) with mean:

- K1 (2.23 ± 7.70 mg / dL)
- K2 (2.25 ± 3.02 mg / dL)
- K3 (2.31 ± 4.77 mg / dL)
- K4 (2.30 ± 1.81 mg / dL)
- K5 (76.69 ± 2.76 mg / dL).

Anova test on P2 examination shows differences that occur because of the comparison with K5 that is not alloxan induced which does not increase glucose levels while K1, K2, K3, and K4, which are alloxan-induced there is an increase in blood glucose levels because of the effects of alloxan which can increase levels glucose (hyperglycemia).

Examination of P3 glucose levels (day 14) with a mean:

- K1 (1.90 ± 7.62 mg / dL)
- K2 (1.74 ± 2.51 mg / dL)
- K3 (1.55 ± 1.53 mg / dL)
- K4 (2.31 ± 1.77 mg / dL)
- K5 (77.70 ± 1.89 mg / dL).

Examination of P4 glucose levels (day 21) with a mean:

- K1 (1.65 ± 2.49 mg /dL)
- K2 (1.26 ± 3.64 mg / dL)
- K3 (1.12 ± 1.89 mg / dL)
- K4 (2.32 ± 1.72 mg / dL)
- K5 (77.29 ± 3.02 mg / dL)

Anova test P3 and P4 also show differences in the amount of p value <0.05 .

There was a decrease in blood glucose levels in each group which is significant with p-value <0.05 in the treatment group in example group K1, K2 and K3 in the examination (P2 to P3) and (P3 to P4). The decrease in glucose levels in this group was due to the infusion effect of *Langsat* stem skin (*Lansium domesticum L.*).

In K4 there was no decrease which occurred in the examination of P2, P3 and P4 and still in hyperglycemic condition while K5 was still in normal condition also there was no significant difference between P1, P2, P3 and P4 with p value > 0.05 .

DISCUSSION

Diabetes mellitus is one of the degenerative diseases that continue to increase every year and its mortality and morbidity are caused mainly due to lifestyle. Diabetes mellitus generally occurs because of the process of

pathogenesis along with autoimmune damage in pancreatic β cells which can cause reduced insulin production (resistance to insulin action).

In this study there is an increase of blood sugar levels after alloxan induction and after 21 days of giving Infusa Langsung stem skin (*Lansium domesticum L.*) There is a significant decrease in blood glucose levels in the treatment groups K1, K2 and K3 (at different doses). Seen in the K3 group with a dose of 30 mg / kgBB is more significant in decreasing blood glucose levels. The decrease of blood glucose levels in K3 group almost reaches the K5 group (control group).

This study uses Infusa Langsung stem skin (*Lansium domesticum L.*) which is given orally for 21 days, referring to research conducted by the researcher himself in 2012 and Kalaivanan and Pugalendi (2011)⁽⁷⁾ and also by Debasis on mahogany plants⁽⁸⁾.

Langsat stem bark (*Lansium domesticum L.*) can improve the condition of hyperglycemia through antioxidant enzymes which reduce the quantity of free radical products. Another possibility is the presence of other types of antioxidants contained in the extract. Antioxidants also protect enzyme metabolism in cells, so they can reach a state of homeostasis.

Diabetes mellitus causes inadequate insulin work, therefore controlling secretion from insulin plays a role in regulating the concentration of glucose in the blood during food absorption and regulation of the pancreatic β cells to produce and secrete insulin.

Body condition in controlling blood glucose levels is very important, regulating diet regular exercise and lifestyle are also proven to control blood sugar levels and increase insulin resistance.

CONCLUSION

From the results of research on the effect of giving Infusa Langsung stem bark (*Lansium domesticum L.*) in diabetic rats induced by alloxan, the following conclusions can be drawn:

- Infusion of Langsung stem bark (*Lansium domesticum L.*) can reduce blood sugar levels in hyperglycemic conditions in rats induced by alloxan
- A dose of 30 g / kgBB is effective in decreasing blood sugar levels in diabetic rats after giving infusion of Langsung stem bark (*Lansium domesticum L.*)

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