EXPLORING THE ANTIDIABETIC POTENTIAL OF LANGSAT (*Lansium Domesticum* L.): A COMBINED EXTRACT APPROACH IN VIVO

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ABSTRACT

Diabetes Mellitus is a chronic condition caused by increased blood glucose levels due to the body no longer being able to produce enough insulin hormone or use insulin effectively. Traditional medicine has long used Langsat, a native plant of Indonesia. Langsat is widely used by the community in treating various diseases, including as a worm medicine, fever medicine, diarrhoea medicine, and cancer medicine. This study aims to find out how well a mix of antidiabetics works with EKDL (Lansium domesticum L) in lowering blood sugar levels in male white mice (Mus musculus) and to figure out the best dose of EKDL for reducing blood sugar in the mice. Experimental research method using 35 white male mice divided into 7 groups, each group containing 5 mice, namely negative control, positive control, EK, ED, EKKDL 1:1, EKKDL 2:1, and EKKDL 1:2. The results of the ANOVA test of the EKKDL dose 1:2 (200 mg / 240 mg / kgBW) were effective in reducing blood sugar levels in mice. Analysis of blood sugar level data of mice using paired T-tests and post hoc. The results of the paired t-test showed a significant difference in blood sugar levels after treatment ($p < 0.005$) and the results of the post hoc test showed that there was a significant difference ($p < 0.005$) and there was no significant difference ($p > 0.005$) between all EKKDL in reducing blood sugar levels in mice. The combination of langsat skin and leaf extract (Lansium domesticum L.) has effectiveness in reducing blood sugar levels in experimental animals.

Keywords: *DM, Glucose, Lansium domesticum, Langsat, Extract*

INTRODUCTION

Diabetes Mellitus (DM) is a chronic condition caused by increased blood glucose levels. Lack of insulin or the inability of cells to respond to it causes high blood glucose levels, or hyperglycemia, which is a characteristic of diabetes (Antar et al., 2023). Natural treatments using medicinal plants can also treat Diabetes Mellitus. You can easily obtain medicinal plants, pick them directly for fresh use, or dry them. Therefore, traditional medicine with medicinal plants is an alternative step for treatment purposes (Yedjou et al., 2023).

Traditional medicine has long used Langsat, a native Indonesian plant. Langsat has many uses because of the content of efficacious compounds in it. In addition to its properties that have been used by the community for generations, this plant is cheaper and easier to obtain, but further research is needed because many plants have unknown toxicity levels (Vaou et al., 2021). Some parts of langsat are widely used by the community to treat various diseases, including worm medicine, fever medicine, diarrhoea medicine, and anti-cancer medicine.

Previous studies have shown that langsat leaves and langsat skin contain flavonoid compounds. Langsat leaf extract with a dose of 30 mg/30 g BB, 60 mg/30 g BB, and 120 mg/30 g BB showed that a dose of 120 mg/30 g BB obtained a concentration of 13.84%, 35.46%, 43.59%, 52.94%, and 61.24%, which have the potential to act as antidiabetics (Indriyani & Mustarichie, 2020). However, for langsat skin, there has been no research on the potential of the skin as an antidiabetic. Based on the description above, as a researcher, I intend to test the antidiabetic effectiveness of a combination of langsat skin and leaf extract (*Lansium domesticum* L.) in vivo.

METHODE

Tools

The equipment includes a glucometer (*Gluco Dr*), a glucose test strip (*GlucoDR*), a stirring rod, a porcelain cup, a 100 ml Erlenmeyer flask (*Pyrex, Iwaki*), a 100 ml measuring cup (*Pyrex Iwaki*), an oral needle, a beaker, a stopwatch, a pipette, a 1 ml syringe, an analytical balance (*Aicis*), a coarse balance

(*Ohaus*), and a mouse cage filled with food and drink.

Materials

Distilled water, langsat leaf skin (*Lansium domesticum* L.), 20% glucose, male white mice (*Mus muscullus*), 500 mg metformin (*Hexpharm Jaya*), aluminum foil and parchment paper, 2% Na-CMC, 96% ethanol, 2N HCl, concentrated HCl, FeCl, ethyl acetate, concentrated sulfuric acid, anhydrous acetic acid, meyer reagent, dragendorf reagent, wagner reagent.

The skin and leaves of langsat (*Lansium domesticum* L.) are dried without exposure to sunlight; the dried leaves are then powdered until smooth. a) A total of 300 grams of simplicia are put into a maceration container, then 3 litres of 96% ethanol solvent are added and macerated for 24 hours. The extraction results are calculated for their yield, and phytochemical screening is carried out, namely alkaloids, saponins, flavonoids, and tannins. The test animals used were 35 adult and healthy male mice (*Mus musculus*) aged 2-3 months with an average weight of 20-30 g.

All test animals were kept with the same treatment conditions, including food, drink, cages, and bedding. Before being used in the experiment, all test animals were first adapted to the same conditions for 2 weeks. Experimental Animal Treatment Process: Prepare a sample of 35 mice. Test animals were fasted for 8 hours before being treated. Their body weight was weighed and their blood glucose levels were measured as fasting glucose levels.

After administering 20 grammes of glucose solution orally, we collected blood from the marginal vein 60 minutes later to establish the initial blood glucose level. We measured blood glucose levels for 5 hours, taking measurements at 1-hour intervals. We took blood from the vein at the tip of the tail to make the measurements. The blood samples obtained were inserted into a strip attached to the glucometer. Mice were divided into 7 groups:

a. Then group 1 of 5 mice were given Na CMC 2% b/v as a negative control.

b. Group II: Positive control by administering metformin suspension solution at a dose of 65 mg/20 g BW orally.

c. Group III: Langsat leaf extract at a dose of 120 mg/kg BW

d. Group IV: Langsat skin extract at a dose of 200 mg/kg BW

e. Group V: Given treatment with 96% ethanol extract of a combination of langsat skin and leaves with 1:1 (langsat skin extract 200 mg/kgBW: langsat leaf extract 120 mg/kgBW)

f. Group VI: Given treatment with 96% ethanol extract of a combination of langsat skin and leaves with 2:1 (langsat skin extract 400 mg: langsat leaf extract 120 mg)

g. Group VII: Given treatment with 96% ethanol extract of a combination of langsat skin and leaves with 1:2 (langsat skin extract 200 mg: langsat leaf extract 240 mg).

RESULTS AND DISCUSSION

This study looks at how well different amounts of a mixture of langsat bark and leaf extract (*Lansium domesticum* L.) can lower blood sugar levels in mice. The amounts tested were 120 mg/kgBW, 200 mg/kgBW, a mix of bark and leaves (1:1) at 200 mg/120 mg, a mix of bark and leaves (2:1) at 400 mg/120 mg, and a mix of bark and leaves (1:2) at 200 mg/240 mg. The results showed that the thick extract made from 150 g of plant material produced 18.61 g of thick langsat leaf extract, which was dark black in colour, resulting in a yield of 12.40%. The results of the thick extract obtained with 150 g of simplicia produced a thick extract of langsat leaves (*Lansium domesticum* L.) as much as 18.61 g, which had a dark black colour, and the yield obtained was 12.40%. Then the results of the thick extract obtained with 300 g of simplicia produced a thick extract of langsat skin (*Lansium domesticum* L.) of 39.37 g, which had a yellowish-brown colour, and the yield obtained was 13.12%. Based on the results of the percentage yield of the thick extract obtained, it showed that the thick extract met the requirements for a good yield percentage. The requirement for the yield of thick extract is that its value is not less than 10%.

Table 1. Phytochemical Screening

Compound	Result		Indicator
	Bark	Leaf	
Flavonoids	+	+	A yellow solution is formed
Saponins	+	+	There is foam that lasts for 30 minutes
Alkaloids	+	+	Orange precipitate is formed (Dragendorff's reagent). Yellow precipitate is formed (Mayer's reagent).
Tannins	+	+	Greenish black formed

The obtained langsat skin and leaf extracts were subjected to phytochemical screening for alkaloids, flavonoids, saponins, tannins, and terpenoids. Based on table 1, the results of phytochemical screening show that the langsat skin and leaf extracts contain alkaloids, flavonoids, saponins, tannins, and terpenoids. The highest content of secondary metabolite compounds in langsat skin and leaves is flavonoids. Flavonoids act as antibacterials, antioxidants, anti-inflammatory and antidiabetics. Flavonoids can lower blood glucose levels with their ability as antioxidants. Flavonoids are protective against damage to ß cells as producers (Ardi et al., 2016).

Table 2. Average Results of Blood Sugar Level Measurements

Group	Mean Blood Sugar Levels of Mice (Mean at 5th hour ± SD)	Average % Value of Blood Sugar Levels in Mice
Negative control	104,4 ± 20,154	4,334
Positive Control	68,5 ± 27,779	5,372
ED	77,2 ± 8,544	5,076
EK	92,4 ± 9,179	4,87
Combination 1:1	69,4 ± 21,140	6,136
Combination 2:1	70,6 ± 39,204	4,898
Combination 1:2	64,4 ± 9,796	6,494

Table 3. Results of Analysis of Differences in Blood Glucose Levels Between Groups After Treatment

	K1	K2	ED	EK	EKKD (1:1)	EKKD (2:1)	EKKD (1:2)
K1		0,372*	0,788*	0,317*	0,006*	0,193*	0,000
K2	0,372*		0,529*	0,912*	0,042*	0,670*	0,002
ED	0,788*	0,529*		0,460*	0,011*	0,296*	0,000
EK	0,312*	0,912*	0,460*		0,053*	0,752*	0,002
EK KD (1:1)	0,006*	0,042*	0,011*	0,053*		0,099*	0,160*
EK KD (2:1)	0,913*	0,670*	0,296*	0,752*	0,099*		0,004
EK KD (1:2)	0,000	0,002	0,000	0,002	0,160*	0,004	

*Uji Post Hoc (p>0,005)

The study found a notable drop in blood sugar levels 2 hours after eating in the treatment group that received glucose and a mix of langsat skin and leaf extract at 3 different doses ($p < 0.005$). In the negative control group that received 2% Na-CMC, blood sugar levels went up 2 hours after eating, but this change was not significant after treatment ($p > 0.005$). In the negative control group given 2% Na-CMC, there was an increase in blood sugar levels 2 hours postprandial which was not significant after being given treatment ($p>0.005$).

CONCLUSION

Based on the research conducted, it has been concluded that extract of langsat skin and leaves (*Lansium domesticum* L.) can reduce blood sugar levels in mice. Measurement of blood sugar levels using Gluco DR glucose showed that the concentration of dose 7 of EKKD 1:2 (200 mg/kgBW and 240 mg/kgBW) provided higher effectiveness in reducing blood sugar levels in mice.

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