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The Effectiveness of Red Ginger Extract (Zinbgiber Officinale Var. Rubrum) on Decreased Blood Glucose Levels in Mice (Mus Musculus)

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ABSTRACT

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia conditions (increased blood glucose) caused by abnormalities in insulin secretion, abnormalities in the action of insulin or perhaps both. Red Ginger (*Zingiber officinale var. rubrum*) contains alkaloids, flavanoids, tannins, saponins, gingerol and shagol which have blood glucose-lowering, anti-inflammatory, anticancer and antitumor effects. This study aims to determine the effectiveness of Red Ginger extract against decreasing blood glucose levels in mice (*Mus musculus).* This research is a type of experimental study conducted to determine the effectiveness of red ginger extract against decreasing blood glucose levels in mice. This study was conducted using alloxane as a diabetes inducer, Na CMC 1% as a negative control, glibenclamide as a positive control, extract dose 2 %, 5 % and 7 % orally for 7 days in 5 groups of test animals. The results of the study obtained 1% Na-CMC results showed a percentage decrease, namely -16.32% and -103.03%. In the group of mice given Red Ginger extract 2% showed a percentage decrease, namely 105.57% and 102.04%. The group of mice given Red Ginger extract 5% showed a percentage decrease of 105.83% and 86.84%. The group of mice given 7% Red Ginger extract showed a percentage decrease, namely 67.34% and 97.45%. The group of mice suspended by glibenclamide showed a percentage decrease of 73.05% and 66.66%. It can be concluded that the administration of Red Ginger extract has been shown to reduce blood glucose levels in aloxane-induced mice at concentrations of 2%,5% and 7% with significant values ($p < 0.05$) indicating a difference and obtained the most effective concentration in lowering blood glucose levels in mice (*Mus musculus*) is a concentration of 7%.

Keywords: decreased glucose levels, mice group, red ginger.

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INTRODUCTION

Diabetes Mellitus is a group of metabolic diseases characterized by hyperglycemia (increased blood glucose) caused by abnormalities in insulin secretion, insulin action or both (Muntafiah et al., 2017). Treatment of diabetes mellitus can be carried out using pharmacological and non-pharmacological treatment, and the action is not an independent nurse's action but an act of collaboration with other medical measures (Yanti, 2021). One of the pharmacological treatments often used is insulin therapy, both in oral form and requiring injections with mild to heavy doses (Suharto et al., 2019). However, many patients experience side effects from drug therapy, such as hypoglycemia, weight gain, and gastrointestinal disorders. These conditions encourage the exploration of natural materials as a source of alternative medicine for treating diabetes Mellitus (Masi & Kallo, 2018) .

Pharmacological therapy with modern drugs in people with diabetes mellitus consists of oral hypoglycemic drugs, insulin injections and other diabetic injections (Zhao et al., 2022). Oral antidiabetic drugs are classified into six groups: 1) sulfonylurea groups, 2) glinide groups, 3) biguanides, 4) thiazolidinediones (TZD), 5) alpha-glucosidase group inhibitors, 6) DPP-IV inhibitors (Roncero-Ramos et al., 2021). Antidiabetic drugs are used by injection of (1) insulin, (2) GLP

analogues, and (3) Amylin analogues (Wardani, 2016). One example of an antidiabetic drug often used by the public is glibenclamide from the sulfonylurea group (Doucet et al., 2023). Glibenclamide treats non-insulin-dependent diabetes mellitus (type 2 DM) hyperglycemia (Padhi et al., 2020). The mechanism of action inhibits ATP-sensitive K+ channels in pancreatic beta cells. This inhibition causes cell membrane depolarization and will open Ca channels. So that Ca channels are formed, Ca++ ions will enter the pancreatic beta cells and stimulate granules containing insulin to secrete insulin (Sharma, 2012). Red Ginger (*Zingiber officinale var. rubrum*) contains active substances, namely flavonoids, gingerols, shogaol and oleoresin (Sulistyoningsih et al., 2018). Gingerol and shogaol are phenol components that have anti-inflammatory, anticancer and antitumor effects (Etika, A, N., Nurrahayu, K, I., & SS, 2017)

Therefore, this study was conducted to determine the effectiveness of red ginger extract (*Zingiber officinale var. rubrum*) in reducing blood glucose levels in mice (*Mus musvulus*).

METHODS

This research is experimental research to determine the effectiveness of ginger extract (*Zingiber officinale var. rubrum*) on reducing blood glucose levels in mice (*Mus musculus*). The population in this study were 15 mice, and the sample used was male mice. The materials used in this study were red ginger taken in Bulukumba Regency, Mice test animals, 96% ethanol, glibenclamide tablets, alloxan, and Na.CMC, glucose, aqua dest, HCL 2 N, drag-drop reagent, Mg powder, concentrated HCL, gelatin solution, 10% NaCl, and 1% FeCl3. The tools used in this study were GlucoDR AGM-2100, Gluco DR strips, oral syringes, analytical balances, coarse scales, stirring rods, porcelain dishes, 100 ml measuring cups, drying cabinets, and rotary evaporators. Data collection was carried out after all mice received treatment, then observed and recorded data, including blood glucose levels measured every 3 days after treatment.

RESULTS AND DISCUSSION

The following results are obtained from the research on how effective Red Ginger Extract (*Zingiber Officinale var. rubrum*) is in reducing blood glucose levels in Mice (*Mus Musculus*).

Yield % Yield

The yield of Red Ginger extract (*Zingiber officinale var. rubrum*) is 22.32 %

Phytochemical Screening

Table 1. Phytochemical Screening

Compound Type	Reagent	Observation	Results	References
Alkaloids	Reagent	precipitate white	(+)	precipitate white
	Mayer	precipitate white yellowish	(+)	
	Dragendroff	precipitate red brick	(+)	
Flavanoids	concentrated HCL	Produce White colour clear	(+)	Solution white clear
tannins	Fecl 1%	Produce Brown yellowish	(+)	Solution chocolate yellowish
Saponins	HCL 2N	nope _ form of foam	(+)	formed froth (Yessi *et al.,2018)*

Results of Decreased Blood Glucose Levels in Mice

Table 2. Results of Decreased Blood Glucose Levels in Mice

Group	Replication	Heavy Mice (g)	Sugar Blood Beginning (mg/dL)	After Induction (mg/dL	Day to 3	Day to 7
Control	1		164	213	219	221
Negative	2	29,1 g	159	192	215	226
Na	Amount	28,8 g	323	405	434	447
CMC 1%	Flat -flat		161.5	202.5	217	223.5
	1		110	487	110	89
Extract 2%	2	32,9 g	117	264	129	114
	Amount	21,6 g	227	751	239	203
	Average		113.5	375.5	119.5	101.5
	1		159	433	274	143
Extract 5%	2	34,4 g	78	192	125	93
	Amount	18.5 g	237	625	399	236
	Average		118.5	312.5	199.5	118
	1		120	365	355	200
Extract 7%	2	29,1 g	106	224	172	109
	Amount	31.4 g	226	589	527	309
	Average		113	294.5	263.5	154.5
	1		149	342	245	201
Negative	2	31.1 g	114	243	200	157
control	Amount	35.1 g	263	585	445	358
	Average		131.5	292.5	222.5	179

The research entitled "Effectiveness of Red Ginger Extract (*Zingiber Officinale var.rubrum*) on Reducing Blood Glucose Levels in Mice (*Mus Musculus*)" was conducted to know the effectiveness of red ginger extract in reducing blood glucose levels in mice. This study used red ginger extract with a concentration of 2% w/v, 5% w/v, and 7% w/v. CMC Na was a positive control, and glibenclamide suspension was a positive control.

The results of the phytochemical tests that have been carried out show that the sample contains alkaloids, flavanoids, tannins and saponins. The positive reaction in the alkaloid test was the formation of a white precipitate in the reagent, a yellowish-white precipitate in Mayer and a red brick precipitate in the drag-drop reagent. Flavanoids are generally more soluble in water or polar solvents because they have bonds with sugar groups. The formation of a translucent white colour indicates a positive flavanoid test result. Tannins are phenolic compounds that tend to be polar. The results of the tannin test showed a positive result for the formation of a brownish-yellow colour. Saponins are generally in the form of glycosides, so they tend to be polar. The saponin test was negative because there was no foam (Prasetyo & Inoriah, 2013).

The results of the study were carried out using alloxan as an inducer of diabetes, 1% Na CMC as a negative control, glibenclamide as a positive control, extract doses of 2%, 5% and 7% orally for 7 days in 5 groups of test animals consisting of 3 mice in 1 group. Observations were made due to changes in blood glucose levels in mice that had been induced with alloxan. The research results obtained were 1% Na-CMC as a negative control showing a decreasing percentage of -16.32% and -103.03% respectively. In the group of mice given 2% Red Ginger extract, the percentage of reduction was 105.57% and 102.04%. The group of mice given 5% Red Ginger extract showed a reduction percentage of 105.83% and 86.84%. The group of mice given 7% Red Ginger extract showed a reduction percentage of 67.34% and 97.45%. The group of mice suspended with glibenclamide as positive control showed a reduction percentage of 73.05% and 66.66%. It can be concluded that the administration of Red Ginger extract (*Zingiber officinale var. rubrum*) is proven to reduce blood glucose levels in alloxan-induced mice at concentrations of 2%, 5% and 7% with significant values ($p < 0.05$), indicating a

difference and the highest concentrations were obtained. effective in reducing blood glucose levels in mice (*Mus musculus*) is a concentration of 7%.

The results showed that the blood sugar value of group 1 had an average value of 223.33. While group 2 has an average value of 101.33. While group 3 has an average value of 118.00. Group 4 has an average value of 154.33 and group 5 has an average value of 179.00. After the research results were analyzed using the normality test, group 1 obtained a significance value (p=0.780), group 2 obtained a significance value (p=0.956), group 3 obtained a significance value (p=1.000), group 4 obtained a significance value (p=0.988) and group 5 has a significant value (p=1.000). So it can be concluded that the data is usually distributed from group 1 to group 5.

After the data were tested for normality, it was then analyzed using the ANOVA test to obtain a mean square value of 7121.100, an F value of 10.654 and a value of p = 0.001, which means that Ho is rejected and Ha is accepted. Thus red ginger extract (*Zingiber officinale var.rubrum*) is effective in reducing blood glucose levels in mice (*Mus musculus*).

Determination of the effect of reducing blood glucose levels was measured with a glucometer (Akcay et al., 2022). The working principle of using this tool is that oxygen, with the help of the enzyme glucose oxidase, catalyzes the oxidation process of glucose into gluconic acid and hydrogen peroxide. Blood is taken through a vein at the end of the tail and then dripped on the glucometer strip. Blood drops containing blood glucose will react with certain substances in the strip (glucose oxidase). Then automatically, within 10 seconds, the blood glucose level will be measured and the results can be read on the glucometer monitor (Fardiyanti, 2018).

Based on research conducted (Wicaksono, 2015) entitled the effect of giving red ginger extract (*zingiber officinale*) on fasting and postprandial blood glucose levels in diabetic rats shows that the phenol content present in the red ginger extract has antioxidant and anti-inflammatory properties that will reduce free radicals. Free and inflammatory processes in the pancreas are caused by alloxan induction. Therefore, red ginger extract has the ability to reduce blood sugar levels in people with diabetes mellitus.

The animals used in this study were male mice in good health and weighing 20-40 grams. Female mice were not used because their hormonal systems were unstable compared to male mice, and they had higher blood sugar levels during pregnancy, which could affect the research results. After treatment, the mice were first starved for 12 hours to minimize blood sugar levels in the blood and to reduce interfering substances such as food intake, which could affect blood sugar levels and to increase the speed of drug absorption and facilitate the administration of oral preparations (Sharma, 2012).

Glibenclamide was used as a positive control, a second-generation oral antidiabetic drug of the sulfonylurea class; glibenclamide has a solid hypoglycemic effect at low doses. Glibenclamide was prepared in a suspension dosage form with 1% w/v Na CMC because it is practically insoluble in water as a positive control. As a positive control (Masi & Kallo, 2018).

Seeing the results of the research above, the results of the research carried out are in line with the theory that the treatment of diabetes mellitus can be carried out using pharmacological and non-pharmacological treatment; the action is not an independent nurse's action but an act of collaboration with other medical measures (Ko et al., 2022). One of the pharmacological treatments often used is insulin therapy, both in oral form and requiring injections with mild to heavy doses (Ye et al., 2017). However, many patients experience side effects from drug therapy, such as hypoglycemia, weight gain, and gastrointestinal disorders. Therefore researchers can conclude that, in theory, the results obtained have a relationship with one another after the research was carried out. The statistical test results showed a positive and significant influence between variables.

CONCLUSION

Based on the research that has been done, it can be concluded that there is an effectiveness of Red Ginger extract (*Zingiber officinale var. rubrum*) in lowering blood glucose levels in mice (*Mus musculus*). Angry Ginger (*Zingiber officinale bar.rubrum*) is proven to reduce blood glucose levels because it contains active substances that can lower blood glucose levels. Angry Ginger Extract (*Zingiber officinale var. rubrum*) with a concentration of 7% w / v is proven to have a lasting effect can reduce blood glucose levels in Mice (*Mus musclus*).

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