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IDENTIFICATION OF DURIAN ROOT COMPOSITION AS A COMPOUND THAT CAN REDUCE BLOOD SUGAR LEVELS

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ABSTRACT
Durian is a fruit that can be used in the health sector. From the results of phytochemical tests, it was found that durian roots contain alkaloids, flavonoids, tannins, triterpenoids and saponins, each of which has functions as body metabolism, anti-oxidant, anti-bacterial, anti-diabetic, anti-microbial, hypocyclemia and glycogenesis. Some diabetes mellitus patients use durian root decoction regularly to lower blood sugar levels. Where diabetes mellitus (DM) is a chronic disease that occurs due to the pancreas not producing enough insulin or the body being unable to use the insulin produced effectively. The objective study to identify the composition of durian root as a compound that can lower blood sugar. This research uses a descriptive design. The research method involves conducting laboratory tests with graded solvent polarities according to the level of maceration extraction. The population and samples are durian roots that have been dried in the wind for 7 days. The research time will be September – November 2022 in the chemistry laboratory of the chemistry department, faculty of mathematics and natural sciences, University of Papua. The results of the phytochemical test for compounds contained in durian roots are alkaloids, flavonoids, tannins, triterpenoids and saponins. The compounds contained in durian roots are alkaloids, flavonoids, tannins, triterpenoids and saponins. Phytochemical test results of n-Hexane, Ethyl Acetate, Acetone, Ethanol and Aquades Extracts on Durian Roots; alkaloid test, flavonoid test, tannin test, triterpenoid test, saponin test, each of which has an influence on reducing blood sugar.

Keywords: blood sugar; diabetes militus; durian root composition

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INTRODUCTION

Durian root is one of the local ingredients that can be used in the health sector. The results of phytochemical tests showed that durian roots contain alkaloids, flavonoids, tannins, triterpenoids and saponins, each of which has functions as body metabolism, anti-oxidant, anti-bacterial, anti-diabetic, anti-microbial, hypocyclemia and glycogenesis (Budiyanto, 2015). The results of health research (Aditya, 2012), found that ethanol extract from durian roots, Klika and durian leaves has potential as part of diabetes mellitus or antihyperglycemia therapy. Previous research results show that ethanol extract of durian roots acts as an inhibitor of the glucosidase enzyme which can reduce blood glucose levels.

The research results (Wahyudin, E., Agustina, R., Evary, Y.M., dan Rahim, 2016), showed that 2.2 diphenyl-1-picrylhydrazyl (DPPH) could be inhibited by the a-glucosidase enzyme with an IC50 of 2.66 ppm contained in durian roots. Another research from (Evary & Nur, 2018), that the ethanol extract of durian roots has an IC50 value of 3.38 ppm in inhibiting the alphaglucosidase enzyme. Meanwhile, (Kemenkes R.I, 2005), explains that inhibiting the

alphaglucosidase enzyme can slow down the absorption of glucose in the small intestine, thereby having the effect of lowering blood glucose levels after eating. So if there is a compound content in one part of the plant then other parts of the plant are also thought to have the same content. Another study from (Zhan et al., 2021), explains that Modern pharmacological studies show that durian peel has many pharmacological activities, such as antioxidant, anti-inflammatory, regulation of glucose and lipid metabolism. Durian skin is part of the durian plant, as are durian roots.

In Manokwari, durian trees are a choice of terrace plants in food plots which are used as strengthening plants, preventing erosion and greening the area to reduce carbon emissions. Apart from that, the results of durian trees can provide economic results for the community (Litimi, 2023). Information from P2M officers at the Pasir Putih Manokwari Health Center stated that there were 22 cases of diabetes mellitus (DM) from January to July. In this DM case, the problem faced by the Community Health Center is that patients rarely check their blood sugar and are directly involved in the elderly posyandu. Some patients said that they were bored of taking medication, choosing to drink a decoction of durian root which did not contain medicinal ingredients. In accordance with (Leonita & Muliani, 2015), that in general Indonesian people consume medicine from traditional ingredients as one way to reduce diabetes mellitus. From these data, researchers are interested in identifying the composition of durian root as a compound that can reduce blood sugar levels in diabetes mellitus patients. From these data, researchers aim to identify the composition of durian root as a compound that can reduce blood sugar levels in diabetes mellitus patients.

METHOD

This research uses a descriptive design (Nursalam, 2011). This research has received ethical approval from the Sorong Ministry of Health Polytechnic with number: DM.02.03/6/066/2021. The research carried out experimental phytochemical tests in the laboratory with graded solvent polarities according to the level of maceration extraction. The population and samples are durian roots that have been dried in the wind for 7 days. The research time will be September – November 2022 in the chemistry laboratory of the chemistry department, faculty of mathematics and natural sciences, University of Papua. Data were analyzed descriptively according to the results of laboratory examinations.

RESULTS

Durian roots that had been air-dried for 7 days were subjected to phytochemical testing. Phytochemical analysis is a preliminary test to determine specific chemical compounds such as alkaloids, tannins, saponins, steroid flavonoids and triterpenoids. This test is very useful in that it can provide information about the chemical compounds contained in a plant. This analysis is the initial stage in the isolation of further natural compound compounds.

Table 1.
Phytochemical Analysis Results

Uji fitokimia	Hasil Pengamatan				
	Ekstrak n-Heksana	Etil Asetat	Aseton	Etanol 96%	Aquades
Alkaloid	++	++	+++	+++	+
Flavonoid	+	+	++	+++	+++
Tanin	-	++	-	-	+
Triterpenoid	-	+	++	++	+
Saponin	+	+	+	+	++

Information:

- : Negative	++ : Medium positive
+ : Weak Positive	+++ : Strong positive

DISCUSSION

Maceration extraction is carried out to extract active substances or compounds contained in the sample. The maceration process is carried out without heating to prevent damage or loss of active compounds contained in the sample. The principle of maceration extraction is to separate a compound contained in a sample using a solvent (Rohmah, Rini, & Wulandari, 2019). The solvents used in the maceration process of durian root extract are distilled water, 96% ethanol, acetone, ethyl acetate and n-hexane with a sample weight of 100 grams and 600 mL of solvent. The aim of using solvents with different variations is to determine the level of cytotoxicity in each extract according to its solubility so that it can be used as information to determine the highest potential bioactivity of a compound. In different solvents the potential bioactivity and active compounds contained therein are different (Ahmad, Katja, & Suryanto, 2018).

The use of durian root pieces in the maceration process aims to make it easier for the solvent to penetrate the cell walls and enter the cell cavities which contain active compounds. The active substances contained in the durian root sample will dissolve due to differences in concentration or pressure outside and inside the cells. The maceration process is carried out for 3 x 24 hours. After the soaking process, it is continued with filtering the sample from the solvent so that a filtrate is obtained from each solvent which is then evaporated in a ratatory evaporator using the temperature of the boiling point of each solvent, so that a thick extract is obtained from each solvent.

The yield results from each solvent, namely for distilled water extract had a yield of 8.32%, for ethanol extract 3.69%, acetone extract had a yield of 2.93%, ethyl acetate extract had a yield of 0.53% and n extract -hexane has a yield of 0.3%. The extraction results showed that the largest percentage of extract yield was distilled water extract. This shows that the compounds contained in durian roots tend to dissolve in distilled water. The difference in yield values is likely caused by the nature of the solvent in dissolving different secondary metabolite compounds (Rohmah, 2019). The extract obtained was then tested for phytochemistry so that we could find out what secondary metabolites were contained in the durian root extract.

The results of the alkaloid test are characterized by the presence of precipitates in the three reagents given, namely Wagner's reagent, Meyer's reagent and Dragendroff's reagent. Meyer's solution consists of KI and HgCL2, Dragendroff's reagent consists of a mixture of bismuth subnitrate, glacial acetic acid and KI and Wagner's reagent is a mixture of KI and iodine. The alkaloid test with Dragendroff's reagent produces potassium-alkaloid compounds which are indicated by the presence of a precipitate formed. The alkaloid test with Wagner's reagent gave positive results, this was indicated by the presence of a precipitate formed. Naturally alkaloids are stored in seeds, fruit, leaves, stems and roots. Alkaloids are organic compounds with small molecules and contain nitrogen and have pharmacological effects on animals and humans. Many alkaloids are poisonous, but alkaloids are also often found in medicine. Alkaloids also have antibacterial, anti-diabetic and anti-microbial properties.

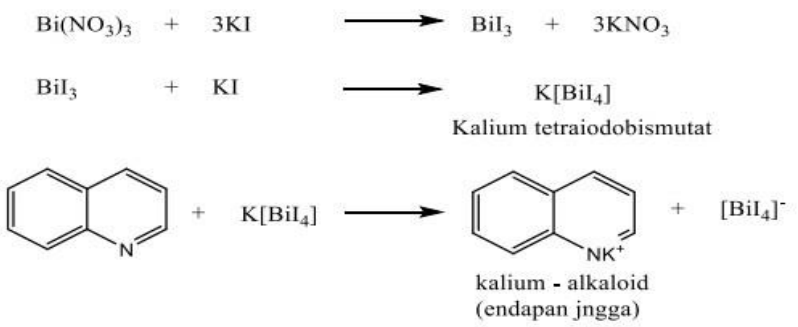

Figure 1. Mechanism of alkaloid formation with Dragondorff reagent (Tandi *et al*.2020).

In the flavonoid test the solvents distilled water and ethanol showed strong positive, for the solvent acetone it showed moderate positive and for the solvent ethyl acetate and n-hexane it showed weak positive. The flavonoid test was carried out by adding concentrated HCL and Mg powder. Positive results were indicated by a change in the color of the extract to specific colors, namely brick red, orange and yellow. Concentrated HCL and Mg powder function to reduce the benzepiron core found in the flavonoid structure and form flavilium salts which are orange or red in color.

The main principle of flavonoids in the human body is as antioxidants, antibacterial and anti-inflammatory. Flavonoids can act as antioxidants and function to neutralize free radicals. Thus minimizing the effects of damage to body cells and tissues. In the mechanism of healing diabetes mellitus, flavonoids are assumed to have a significant role in increasing the activity of antioxidant enzymes and being able to regenerate damaged pancreatic beta cells so that insulin deficiency can be overcome. Flavonoids, especially quercetin, have been reported to have antidiabetic activity. Quercetin works by inhibiting α-glucosidase by inhibiting glucose and fructose transport in the GLUT 2 transporter. Inhibition of GLUT 2 causes a reduction in glucose absorption in the lumen of the small intestine, thereby reducing blood glucose levels (Tandi, Melinda, Purwantari, & Widodo, 2020).

The flavonoid test process involves 2 ml of each extract being put into four test tubes. The first test tube (1) is used as a blank, the second test tube (2) is added with 2-4 drops of concentrated HCL solution and Mg powder. The third test tube (3) was added with 2-4 drops of 10% NaOH solution and the fourth test tube (4) was added with 2-4 drops of concentrated H2SO4 solution. A sample is positive if there is a striking color change (Rahayu, Kurniasih, & Amalia, 2015). Similar research from (Muhtadi, Haryoto, Sujono, & Suhendi, 2016), explains that the ability of durian ethanol extract to reduce blood glucose levels is thought to be due to the flavonoid content. It is suspected that regeneration and stimulation of insulin release by pancreatic ß cells are the result of the mechanism of action of flavonoids.

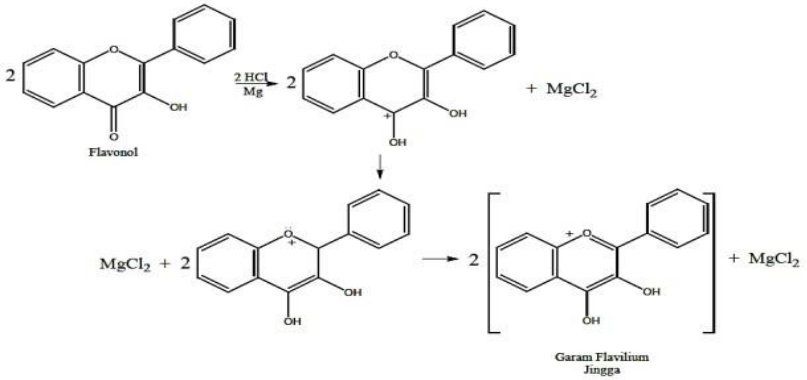

Figure 2. Mechanism of Flavonols with concentrated HCL and Mg powder (Tandi *et al*.2020).

Another discovery from (Prasetya, 2023), was about flavonoids from purple golden leaves, which is one of the compounds that can be used as an antidiabetic. This compound is an inhibitor of the α-amylase enzyme which can reduce blood sugar levels. This enzyme can convert disaccharides into glucose. Apart from that, flavonoids can also inhibit glucose absorption in the small intestine so that they can function as antidiabetics

In the tannin test, the ethanol solvent showed a strong positive, the acetone and ethyl acetate solvents showed a moderate positive, the distilled water solvent gave a weak positive, while the n-hexane solvent showed a negative, namely there was no tannin. The tannin test was carried out by adding 1% FeCL3 to the extract, the results were positive with the formation of a dark blackish green color in the extract. This happens because there are phenol compounds in tannin which form complex compounds with Fe3 ions. Tannins are known to stimulate glucose and fat metabolism so that sources of calorie accumulation in the blood can be avoided.

Tannins also have antioxidant activity which can inhibit tumor growth. Tannins have hypoglycemic activity, namely they can increase glycogenesis, apart from that, tannins also function as an astringent or chelator which can shrink the epithelial membrane of the small intestine, thereby reducing the absorption of food essence and as a result inhibiting sugar intake and the rate of increase in blood sugar is not too high. (Tandi et al., 2020)

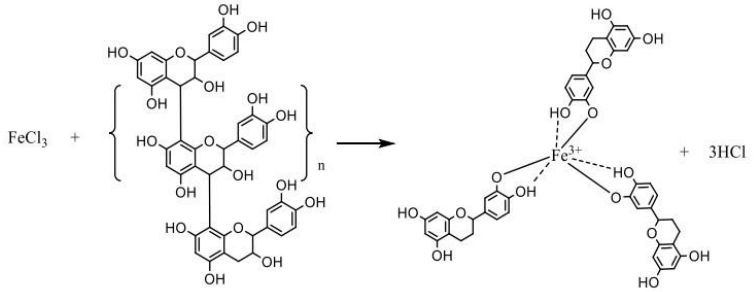

Figure 3. Reaction between tannin and FeCL3 (Tandi *et al*.2020).

The results of other research from (Fitriana Shofia Monisa, Maria Bintang, 2016) regarding tannin content, it was found that in vitro α-glucosidase inhibitory activity was found in extracts of surian leaves and stem bark, and the type of tannin influenced α-glucosidase inhibitory activity. This enzyme inhibits the absorption of carbohydrates from the small intestine, and competitively inhibits enzymes that convert non-absorbable complex carbohydrates into absorbable simple carbohydrates.

In the triterpenoid test, the solvents ethanol and acetone gave a strong positive test, the solvents distilled water and ethyl acetate gave moderate positive results and for n-hexane the triterpenoid test gave negative results. The triterpenoid test is said to be positive because when added galsial acetic acid and concentrated sulfuric acid, orange and purple colors are formed. According to the research results of (Fitri, Rudiyansyah, & Alimuddin, 2018), data was obtained Isolation of terpenoid compounds from the ethyl acetate fraction of red durian root wood (D. dulcis Becc) was identified using the thin layer chromatology method with 10% H2SO4 spray reagent showing terpenoid group compounds.

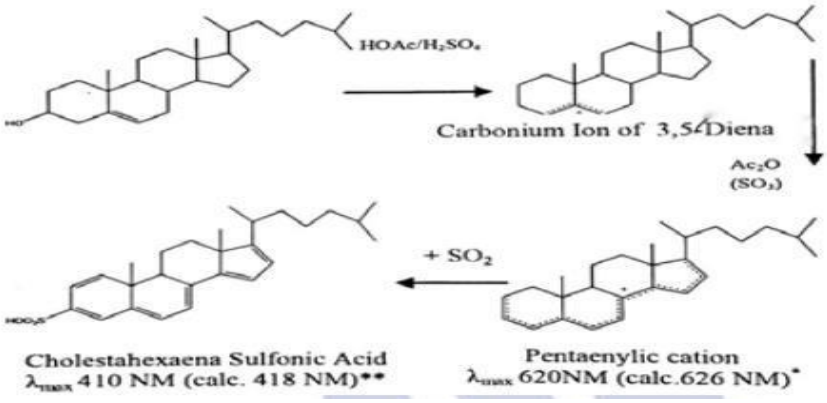

Figure 4. Reaction between Triterpenoids and Concentrated H2SO4 + CH3COOH (Setiabudi & Tukiran, 2017)

In the saponin test, the ethanol solvent gave a strong positive test result, in distilled water it gave a moderate positive test, acetone gave a weak positive test and for ethyl acetate and n-hexane it gave a negative result in the saponin test. The saponin test was carried out by adding distilled water and then heating it for2-3 minutes later cooled and shaken vigorously. Positive results if a lot of foam forms. The appearance of foam in the saponin test is caused because saponin contains compounds that dissolve in non-polar or hydrophobic solvents and dissolve in polar or hydrophilic solvents which are surface active in forming foam. Saponin can dissolve in water because it has a hydrophilic group (OH) which can produce hydrogen bonds with water molecules (Iskandar, 2020).

Saponin is a chemical component that plays an active role in treating diabetes, namely as an antidiabetic agent, because it has the ability to inhibit glucose absorption so that it can prevent the increase in glucose in the blood, and can reduce glucose levels in the blood. Saponins from various marine plants and animals have hypoglycemic activity. The antioxidant activity in saponins regulates blood glucose levels and prevents diabetes complications (Barky & Hussein, 2017). The working principle of saponin is by inhibiting the increase in vascular permeability, thus preventing inflammation in kidney cells. Saponin can also inhibit superperoxide through the formation of hydroperoxide intermediates, thereby preventing damage to biomolecules by free radicals. Saponins can improve kidney function by reducing urea and creatinine levels by increasing the excretion of urea and creatinine in the urine. The mechanism of action of saponins can reduce blood glucose levels by inhibiting glucose transport in the gastrointestinal tract and stimulating insulin secretion in pancreatic beta cells. (Tandi et al., 2020).

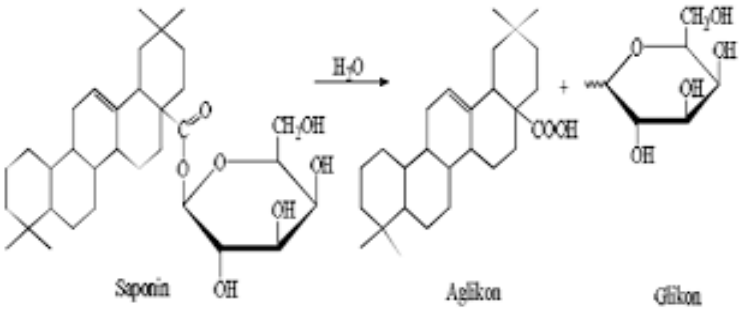

Figure 5. Saponin hydrolysis reaction in water (Minarno, 2015)

CONCLUSION

The results of phytochemical tests with five solvents on durian roots showed the presence of secondary metabolite compounds. The compounds contained in durian roots are alkaloids, flavonoids, tannins, triterpenoids and saponins. Phytochemical test results of n-Hexane, Ethyl Acetate, Acetone, Ethanol and Aquades Extracts on Durian Roots; alkaloid test, flavonoid test, tannin test, triterpenoid test, saponin test, each of which has an influence on reducing blood sugar.

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