IDENTIFICATION OF CHEMICAL COMPOUNDS FROM THE SIMPLISIA OF JACKFRUIT LEAVES (*Artocarpus Heterophyllus*) USING REAGENTS

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ABSTRACT

The utilization of biodiversity is very large, about 80% of people, especially in developing countries still rely on plants as medicinal ingredients to maintain their health. Jackfruit plants have been known empirically efficacy both on the leaves, fruit, fruit seeds, sap, and wood. Jackfruit leaves can be used as a launching of breast milk, ulcers (external medicine) and wounds, the leaves of this plant are also recommended by Ayurvedic medicine as an antidiabetic remedy. This study aims to identify secondary metabolite compounds in jackfruit leaf simplisia *(Aheterophyllus rtocarpus).* The group of compounds was tested using reagents to determine the chemical content in the simplisia of jackfruit leaves in the form of lignin, flavonoids and saponin tests.

The method of research conducted in this study is the method of experimentation. An experiment is an experiment to prove a particular question or hypothesis. Experiments can be at laboratorium or outside the laboratory, experimental work contains the meaning of learning to do, because it can be incorporated into the learning method.

The purpose of the experimental method is that students are able to design, prepare, implement and report experiments.

The results showed that in simplisia jackfruit leaves positively contain lignin by using floroglusin LP reagents in addition to jackfruit leaf lignin also positively contains flavonoids using HCL reagents.

Keywords: Simplisia jackfruit leaves (*Artocarpus Heterophyllus*), lignin, saponins, flavonoids

INTRODUCTION

Indonesia is the country with the third largest tropical forest in the world (after Brazil and Zaire). Biodiversity is the basis of various treatments and discoveries of the pharmaceutical industry in the future. The number of medicinal plants in Indonesia is estimated to be about 1,260 species of plants. Plants produce sekunde metabolites that have the potential to be medicinal. There are 150,000 secondary metabolites already identified and there are 4000 "new" secondary metabolites each year. Indonesia is also a tropical country with high air humidity that allows the growth of various types of plants.

According to the records of the World Health Organization (WHO) the utilization of biodiversity (biopospecting) is very large, about 80% of humanity, especially in developing countries still rely on plants (extracts and bioactive ingredients) as medicinal ingredients to maintain their health, lately the world including Indonesia there is a tendency to return to treatment methods that apply the concept of "back to nature" or return to nature, namely utilizing or empowering

the optimal use of natural ingredients both plants and animals to maintain health and medicine. This trend is becoming more and more pronounced, especially in Indonesia especially after being triggered by a prolonged multi-dimensional crisis, especially in the economic sector that has the impact of soaring prices of non-traditional medicines due to more than 90% of raw materials and technology depending on imports.

One of the efforts in the search for medicinal plants can be done by identifying the content of chemical compounds qualitatively by using reagents that are able to provide characteristics of each group of secondary metabolites to know the content of chemical compounds contained in jackfruit leaves (*Artocarpus Heterophyllus)* [21].

Secondary metabolites are small molecules, are specific (not all organisms contain similar compounds), have varying structures, each compound has different functions or roles. In general, secondary metabolite compounds serve to defend themselves or maintain their ecosistension in the environment in which they are located. Secondary metabolites are biomolecules that can be used as lead compounds in the discovery and development of new drugs [2]. Secondary metabolite compounds commonly found in plants are alkaloids, flavonoids, steroids, saponins, terpenoids and tannins [11].

Utilization of secondary metabolite substances is very much. Secondary metabolites can be utilized in the field of farmamology [9]. Among them as antioxidants, antibiotics, anticancer, blood anticoagulants, inhibiting carcinogenic effects, in addition secondary metabolites can also be used as environmentally friendly pest control antiagents.

Phytochemical screening is an early stage to identify the content of a compound in simplisia or plants to be tested. Phytochemicals or plant chemistry studies a variety of organic compounds formed and stockpiled by plants, namely about its chemical structure, biosynthesis, scientific dissemination and biological functions.

Chemical compounds as a result of secondary metabolites have been widely used as dyes, toxins, aromas of food, medicines and so on as well as very many types of plants used medicines - drugs known as traditional medicines so that in need of research on the use of herbs - efficacious plants and know compound chemical that serves as medicine.

Chemical compounds that are the result of secondary metabolism in plants are very diverse and can be classified in several groups of natural ingredient compounds, namely saponins, steroids, tannins, flavonoids and alcohol. To know the content of these compounds is seen from the discoloration that occurs and deposits formed.

Various efforts are made in the search for efficacious plants, starting and identifying the chemical content contained in it as well as the morphological form of the plant that gives characteristics. In this study aims to be able to identify compounds of alkaloids, saponins, flavonoids, tannins and polyphenols, terpenoids and phenolics.

In pharmacological studies on the testing of pharmacological components in the simplisia of medicinal dosage land is closely related to phytochemical tests on a sample that is basically knowing the group of chemical compounds contained in the preparation of the drug ingredients.

Phytochemical tests are conducted based on reactions that produce color or precipitate. Over the year's simple color tests and drip reactions were developed to indicate the presence of certain compounds or specific groups as they have proven to be distinctive and sensitive. Phytochemical tests are still

often used in the shrinking of compounds because it is easy and does not embrace complex equipment but sometimes cannot provide satisfactory results [20].

The main purpose of phytochemical screening is to analyze plants to find out the bioactive content that is useful for treatment. Phytochemicals or plant chemistry is a discipline that studies a variety of organic compounds in plants, namely regarding chemical structure, biosynthesis, metabolism, scientific dissemination and biological functions. The phytochemical filtering approach includes qualitative analysis of the content in plants or plant parts (roots, stems, leaves, flowers, fruits and seeds) especially the content of secondary metabolites which are bioactive compounds such as lignin, saponins and flavonoids.

The method used to perform phytochemical screening must meet several requirements, among others: simple, fast, can be done with minimal equipment, selective to the group of compounds studied, semi-accurate and can provide additional information on whether or not certain compounds of the group of compounds studied [11].

Phytochemical tests that can be performed are qualitative tests in Thin LayerChromatography (KLT) and qualitatively chemically.

Alkaloids are a group of organic compounds most commonly found in nature. Almost all alkaloid compounds are derived from plants and are widespread in various plant types. All alkaloids contain at least one nitrogen atom which is usually alkaline and most of these nitrogen atoms are aromatic rings.

Alkaloids can be separated from most other plant components based on their alkaline properties. Therefore, this group of compounds are often isolated in the form of salts with HCL or H_2SO_4. These salts or free alkaloids are solid in shape forming colorless crystals [2].

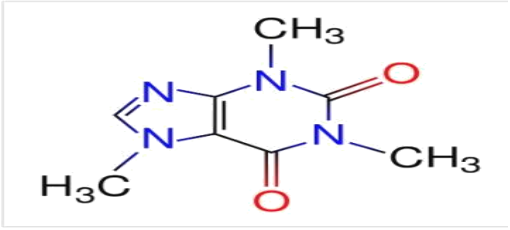

Figure 1. Alkaloid structure

Glycosides are one of the active content of plants belonging to the group of secondary metabolites. In plants glycosides are no longer converted into other compounds, unless they are decomposed due to the influence of the outside environment (e.g. exposed to heat and oxidized air) [11].

Glycosides are compounds of sekunde metabolites that bind to sugar compounds through glycoside bonds. Glycosides play an important role in an organism's living system. Some plants store chemical compounds in the form of inactive glycosides. These chemical compounds will be able to return to active with the help of hydrolase enzymes that cause the sugar part to break up, producing chemical compounds that are ready for use [5].

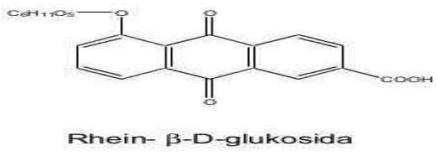

Figure 2. Glycoside Structure

Tannins are an overview of phenolic polymer group compounds. Tannins are ingredients that can turn raw skin into ready-made skin due to its ability to cross-connect proteins and precipitate gelatine in a solution [11].

Tannin compounds are widespread in many plant species, where they play a role in protection from predation, and possibly also as pesticides, and in the regulation of

plant growth. Likewise, damage or modification of tannins with time plays an important role in the maturation of bauh and aging of grapes. Tannins have molecular weights ranging from 500 to more than 3000 (gallic acid esters) and up to 20000 (proanthocynidins) [15].

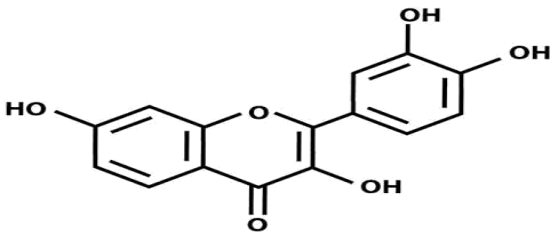

Figure 3. Tannin structure

One of themany kelas spread from phenolic compounds is flavonoids. This group gives color to fruits and flowers. Flavonoids have been widely characterized and classified based on their chemical structure. There are 7 types of flavonoids namely flavon, flavonol, khalkon, xanton, isoflavones, and biflavones [11]. Flavonoids belong to the phenolic compound group with the chemical form C6-C3-C6 [13]. The numbering system is used to distinguish the position of the kabon around its molecules, [14].

These compounds are red, purple, blue and some of the yellow dyes contained in plants. Some flavonoids are intentionally produced by plant tissues in response to infection or injury.

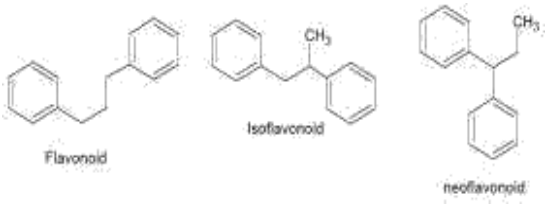

Figure 4. Flavonoid Structure

Saponins are a glycoside that may exist in many kinds of plants. Saponins exist on entire plants with a high concentration of plant kinds in certain parts, and are influenced by plant varieties and growth stages. As glycosides saponins can be hydrolyzed with acids or enzymes to produce aglikon (sapogenins), sugars, and uronic acids [17].

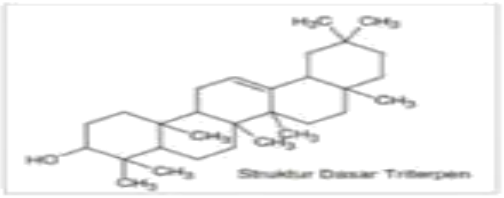

Figure 5. Saponin Structure

Lignin is a complex alcohol derivative compound that causes the cell walls of plants to become hard. Lignin is hydroxylpropane and all lignins contain coniferous alcohol [12].

As a complex polymer, lignin has high molecular features that are formed during condensation of structural units of some of the same type. These structural units are phenylpropane (C6-C3) substituted at two or three positions in its benzene ring.

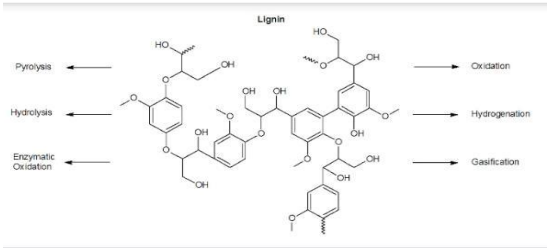

Figure 6. Structure of Lignin

Terpenoids are chemical compounds consisting of several isopren units. Most terpenoids have a cyclic structure and have one or more function groups. This terpenoid compound is one of the chemicals of natural ingredients that are widely used as medicines.

Terpenoids are found abundantly in high-level plants, however, from studies it is known that fungi, marine organisms and insects also produce terpenoids.

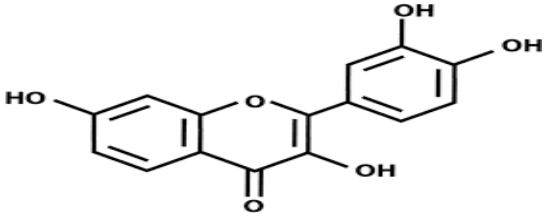

Figure 7. Terpenoid structure

Steroids are one of the most important groups of compounds in the medical field. Steroids in the medical world are often used as medicinal and contraceptive ingredients e.g. androgens. Steroids are a group of natural ingredient compounds whose structure consists mostly of 17 carbon atoms by forming the basic structure of 1.2 cyclopentenoperhidrofenantren.

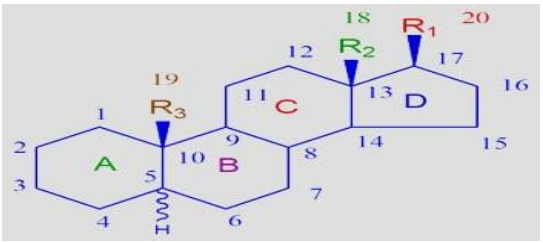

Figure 8. Steroid Structure

Qualitative Chromatography Analysis Thin Layer (KLT)

Chromatography is a method of physical separation based on differences in migration / distribution of analyte in the phase of motion flowing through the silent phase. In this method there is a method of physicochemical separation consisting of a silent phase and a phase of motion. The silent phase is (the absorbent layer) while the motion phase is the developer solution (solvent) [1]. All chromatography has a silent phase (it can be solids, or a combination of solids) and a motion phase (in the form of liquids or gases). The phase of motion flows through the silent phase and carries the components contained in the mixture. Different components move at different rates [1].

Implementation of Thin Layer Chromatography using a uniform layer of silica or alumina on a glass plate or hard metal or plastic [1].

Material Description

Jackfruit Plant (*Artocarpus heterophyllus*), Jackfruit plant is a type of plant that is widely planted in the tropics, such as Indonesia.This plant is quite well known around the world. In English it is called Jack fruit, while in Latin it is called Artocarpusheterophyllus. The plant is thought to have originated in southern India and then spread to other tropical regions. Although until now jackfruit is not a major fruit in Indonesia, but its existence has been very popular and favored as fresh fruit. This plant is generally planted as a garden plant. Jackfruit trees begin to bear fruit after the age of 8-10 years weighing 15-50 kg of fruit. Jackfruit plants bear fruit all year round and are not seasonal fruits. The highest fruit production was achieved between October and December. In Indonesia jackfruit trees have several regional names such as nongko/jackfruit (Java), langge (Gorontalo) [19].

Classification of jackfruit plants [27].

Kingdom : *Plantae*
Divisio : *spermatophyta*
Sub division : *angiospermae*
Class : *dicotyledoneae*
Order : *Urticales*
Familia : *Moraceae*
Genus : *Artocarpus*
Species : *Artocarpus heterophyllus*

The leaves are ovoid and long, the edges are flat, grow intermittently, and are short-stemmed, the upper surface of the leaves is shiny dark green, stiff, and the lower surface of the leaves is light green. The flowers of jackfruit plants are small, grow in groups tightly arranged in bunches, flowers appear from the armpits of branches or on large branches, male and female flowers are found in a sepohon . The image of jackfruit leaves*(Artocarpus heterophyllus)*can be seen in figure 7.

Figure 7. Jackfruit Leaves

RESEARCH METHODS

An experimental method is an experiment conducted to prove a hypothesis. An experiment is an experiment to prove a particular question or hypothesis. Experiments can be at laboratorium or outside the laboratory, experimental work contains the meaning of learning to do, because it can be incorporated into the method of learning [24].

The purpose of the experimental method is that students are able to design, prepare, implement and report on trials.

Tools and Materials

The tools used in this practicum are measuring glasses, beakers, porcelain cups, drip pipettes, volume pipettes, funnels, analytical balances, lumping and pestle.

The materials used in this practicum are aquadest, HCL and jackfruit simplisia as samples.

Working Procedure:

1. Identification of Lignin
   a. Prepared tools and materials to be used
   b. Prepared preparation of simplisia powder on glass objects
   c. Moistened with floroglusin LP. Add hydrochloric acid P.
   d. Observed appearance of cells (red walls of berlignin cells)
2. Saponin Identification
   a. Prepared tools and materials to be used
   b. 0.5 g of powder examined in the test tube
   c. Added 10 ml of hot water, chill then shake vigorously for 10 seconds
   d. Observed appearance of cells (the presence of saponins will be characterized by the formation of a steady froth for no less than 10 minutes as high as 1-10 cm. at the addition of HCL 2 N, if the froth is not lost indicates the presence of saponins)
3. Identification of Flavonoids
   a. Prepared tools and materials to be used
   b. Prepared powder as much as 10 g
   c. Added 100 ml hot water, simmer for 5 minutes and strain in hot condition
   d. Taken 5 ml filtrate obtained then add 0,1 g of Powder Mg and 1 ml HCL concentrated and 2 ml alcohol, shaken and left to split.
   e. Observed cell pumping (flavonoid positive if red, yellow, orange color occurs in the amyl layer of alcohol.

RESEARCH RESULTS

Phytochemical test is a qualitative chemical test conducted as a preliminary test to find out what group of secondary metabolite compounds are present in a sample, in this case in the simplisia of jackfruit leaves. This test is done using a specific reaction for each group that will be tested. This phytochemical test is based on the identification of arna and/or formed deposits. Phytochemical test results can be seen in table 1.

Table 1. Observations of the identification of jackfruit leaves

No	jackfruit leaf identification	result	information
1	Lignin		Positive for lignin
2	Saponin		Does not caontain saponins
3	Flavonoid		Positive for flavonoid

Table 1 shows that in simplisia jackfruit leaves are positively identified to contain flavonoids characterized by the presence of yellow color in the amyl alcohol layer. In addition, it was positively identified as containing lignin which is characterized by the presence of orange cell walls when observed using a microscope.

DISCUSSION

One of the plants that often grow wild and around the community and can be used as a traditional medicinal material namely jackfruit leaves (*Artocarpus Heterophyllus*).

The collected jackfruit leaves are then carried out washing poses, wet and dry sorting to get simplisia. Jackfruit leaves are dried by drying in a place that is not exposed to direct sunlight. After drying the sample is made powder [28].

After obtaining samples in the form of powders, phytochemical screening is carried out to determine the group of active compounds of this plant. Phytochemical screening is a simple way to perform qualitative analysis of the content of compounds contained in plants. In this study the screening conducted was a test of lignin, flavonoids and saponins.

In the identification of lignin, the first thing that is done is simplisia jackfruit leaves crushed using lumping and pestle until it becomes powder. This is so that simplisia can be clearly observed in the mycoscope. After crushing then take a little jackfruit leaf powder using a spatula and put on the glass object, then drip floroglusin LP as much as one drop and add concentrated HCl. The purpose of the tetesinya fluroglusi LP and HCl concentrated to facilitate observation on the microscope. The results obtained from this microscopic observation in the form of orange cell walls, this occurs because the reaction of cells from jackfruit leaves when reacting with LP fluroglusi makes the cell walls become orange. This means that the positive jackfruit leaves contain lignin compounds.

Lignin is a combination of several compounds that are closely related to each other, containing carbon, hydrogen and oxygen, but the carbon proposi is higher than carbohydrate compounds.

Saponin Identification

In the identification of saponins used simplisia material in the form of jackfruit leaves. Where Saponins are complex glycoside compounds with high molecular weight produced mainly by plants, low-level marine animals and some bacteria. Determination of saponin compounds in jackfruit leaves is to enter 0.5 g of powder examined in the test tube and then added 10 ml of hot water, chill then shake vigorously for 10 seconds. The presence of saponins will be characterized by the formation of a steady froth for no less than 10 minutes as high as 1-10 cm, but in the simplisia of jackfruit leaves negative saponins.

Saponins have characteristics in the form of froth, so that when reacted with water and shaken it will form a froth that can last a long time. Saponins are easily soluble in water and insoluble in ether, have a piercing bitter taste and cause sneezing as well as irritation to the membranes of lenders [18].

The first step in testing flavonoid compounds contained in m simplisia jackfruit leaves is done by means of 10 grams of crushed simplisia powder that is added 100 ml of hot water that has been heated on a hot plate. Then bring the hot water that has been contained jackfruit leaf powder for 5 minutes and do the filtering using a circular filter paper with the heat. This filtration is intended to separate the rest of the powder from its filtrate. After the filtrate is obtained then taken as much as 5 ml with added with 0.1 magnesium powder, 1 ml of concentrated HCl and amyl alcohol, then shaken, it is

intended that all the ingredients included can mix and react with the filtrat simplisia from jackfruit leaves. Then allow a few moments to separate the filtrat simplisia. This is obtained from a layer of yellow amyl alcohol which indicates that the sample of positive jackfruit leaf simplisia contains flavonoids.

The purpose of adding Mg and HCL metals is to reduce the benzopiron core contained in the flavonoid structure so that red or orange flavilium salts are formed. Flavonoids are compounds that contain two aromatic rings with more than one group. Phenol compounds with hydroxyl groups increasingly have a greater level of solubility in water or polar in nature, so that they can be extracted in polar solvents.

After testing phytochemical components in the form of lignin, saponins and flavonoids it is known that in the simplisia of jackfruit leaves there are lignin compounds and flavonoid compounds, while for saponin compounds do not show positive results when tested because no froth is formed after the matching in the sample. This study is not in line with the results of phytochemical screening on jackfruit leaves that have. been conducted [8] which shows that jackfruit leaves positively contain flavonoids, saponins and tannins. In addition, [10] it has conducted phytochemical screening of jackfruit leaves. Where the results of phytochemical screening of jackfruit leaves there are several senyaa flavonoids, alkaloids, polyphenols, steroi / terpenoids and tannins [6].

CONCLUSION

Based on the results of research and discussion, the following conclusions can be drawn: Secondary metabolites are chemical compounds synthesized by plants and are a source of medicinal compounds classified above alkaloids, terpenoids, steroids, phenolics, flavonoids and saponins

Phytochemical screening aims to provide an overview of the group of compounds contained in the jackfruit leaf plant (*Artocarpus heterophyllus)*includes examination of lignin, flavonoids and saponins.

The screening method is done by looking at the color test reaction using a color reagent

Based on the results of the study identification of chemical compounds from the simplisia of jackfruit leaves (*Artocarpus heterophyllus)*obtained flavonoid and lignin group compounds contained in it.

Based on qualitative tests of phytochemicals simplisia jackfruit leaves need to be continued quantitative research of the phytochemical content of jackfruit leaves. There needs to be research to develop the efficacy of jackfruit leaves and can be produced into a traditional medicine preparation in the form of herbal medicine, phytopharmaceuticals or standardized herbal medicine to be more easily consumed by the public.

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