

Analysis Of Saponin Content in Ruruhi Plant (*Syzygium polycephalum* Merr) in Kendari City, Southeast Sulawesi

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Abstract.

*The Ruruhi plant (*Syzygium polycephalum* Merr.) is a local, unique and flowering plant belonging to the Myrtaceae tribe, the guava group, which disperses by seeds. The purpose of this study was to determine the saponin content in leaf of Ruruhi plant (*Syzygium polycephalum* Merr.) in Kendari City, Southeast Sulawesi Province. The analysis method uses UV-Vis Spectrophotometry. The results showed that the mature leaf of the Ruruhi plant contained 0,825 mg/10 ml of saponins and 0,566 mg/10 ml of young leaf. Thus there was a difference between the saponin content in young leaf and mature leaf, respectively 0,566 mg/10 ml and 0,825 mg/10 ml.*

Keywords: *Ruruhi (*Syzygium polycephalum* Merr.), Saponin and UV-Vis Spectrophotometry.*

I. INTRODUCTION

Saponin is a secondary compound found in many plants in the roots bark, leave, seed, and fruit that function as a defense system. Saponin is one of the most common types of glycoside found in plant. Furthermore, saponin have characteristics in their shape that are similar to foam. The presence of saponin can be characterized by the presence of a bitter taste, the formation of a stable foam in a liquid solution and the ability to form molecules with cholesterol. Saponins consist of sugars which usually contain glucose, galactose, glucuronic acid, xylose, rhamnase or methyl pentose which are bound to hydrophobic aglycones (sapogenins), namely triterpenoids or steroids to form glycosides [1]. Saponin is glycoside that have aglycone in the form of steroid and triterpenoid [2]. Saponins can lower the surface tension of the water, which will result in the formation of foam on the surface of the water after being shaken. This property has similarities with surfactants. The decrease in surface tension is caused by the presence of soap compounds which can damage the hydrogen bonds in water. This soap compound has two parts that are not the same polarity. The chemical structure of saponins is a glycoside composed of glycon and aglycone. The glycon portion consists of sugar groups such as glucose, fructose, and other types of sugars. The aglycone part is a sapogenin. This amphiphilic nature can make natural ingredients containing saponins to function as surfactants. In addition, another role of pharmacological steroid saponins is to treat rheumatic diseases, anemia, diabetes, syphilis, impotence, and antifungal while triterpenoid saponins act as antibacterial, antifungal, anti-inflammatory and expectorant [3].

One of the flowering plants that are believed to contain saponins and can be used as medicinal ingredients is the Ruruhi plant (*Syzygium polycephalum* Merr.). This plant is one of the local, unique and flowering plants belonging to the Myrtaceae tribe, the guava group and disperses by seeds. Fruits and flowers emerge from the stems and cluster. In addition, Ruruhi plants are one of the biological natural resources that are often found growing wild in forests and yards, and have various benefits [4]. Currently, the threat of COVID-19 in Indonesia is still increasing. Based on Kompas.Com [5] explained that the number of patients infected with Covid-19 in Indonesia is still growing, so a solution is needed to solve this problem,

one of which is by using renewable energy that can be made from the use of natural materials or materials from plant organs. one of them is Ruruhi plant. So as to produce plant-based medicinal ingredients made from the hydrolysis of the Ruruhi plant saponins. However, the level of saponins from the Ruruhi plant is not clearly known, so further testing is needed to determine the level of the saponin content of the Ruruhi plant, especially the leaf of the plant. Therefore, researchers are interested in conducting research on the Saponin Content Analysis of the Ruruhi Plant (*Syzygium polycephalum* Merr.) in Kendari City, Southeast Sulawesi, in order to determine the level of saponins to support the soil production of medicinal raw materials and at the same time preserve the local natural resources of Kendari City.

II. MATERIAL AND METHODS

This research was conducted in September-November 2021. Located in Kendari City, Southeast Sulawesi. Sample analysis was carried out at the Chemistry Laboratory, Faculty of Mathematics and Natural Sciences, Halu Oleo University.

The steps in carrying out the test method are as follows:

Sampling Leaf, Ruruhi plants, were collected from one Ruruhi plant that grows in Kendari City. Then in the sampling of plant leaf, young leaf and mature leaf are selected. After that the samples were taken to the laboratory for further analysis.

- Sample Preparation, the leaf of the Ruruhi plant were cleaned with water then the samples were air-dried for 3 days. Furthermore, the dried leaf samples were then blended until they became powder. Then the sample is filtered so that the powder can be separated from the remaining parts that have not been refined.

- Preliminary Test Foam Test, Powder of each sample as much as 0.5 g is put into a test tube that already contains 10 ml of distilled water, shaken and added one drop of 2 N hydrochloric acid solution. The test tube is allowed to stand and note the presence or absence of foam stable. The sample contains saponins if a stable foam is formed with a height of 1-3 cm for 30 seconds.

- Color Test, 0.5 g of powder for each sample was put into a test tube containing 10 ml of chloroform, heated for 5 minutes with a water bath while shaking. Next, a few drops of LB reagent were added. If a brown or violet ring is formed, it indicates the presence of triterpene saponins, while green or blue color indicates the presence of steroidal saponins.

- Sample Extraction, Extraction is done by maceration method using methanol as solvent. A total of 10 grams of simplicia from the Ruruhi plant was put into an erlenmeyer then soaked with 60 ml of methanol. Then the Erlenmeyer tube was covered with aluminum foil and allowed to stand for 3 days with occasional shaking. Next, the extract was filtered to obtain filtrate I and the extracted simplicia (debris). Debris was extracted again with 40 ml of methanol and allowed to stand for 2 days with occasional shaking. The results of the extract (filtrate II) were mixed with filtrate I, to obtain a liquid extract. The liquid extract was then put into a bowl and evaporated in the maceration cupboard until a thick extract was obtained.

- Measurement of Saponin Compound Levels with UV-Vis Spectrophotometry. 2 ml of isolate was put into a UV-Vis spectrophotometer cuvette. Observations were made at a wavelength of 209 nm which is the maximum wavelength for saponin compounds.

III. RESULT AND DISCUSSION

Research Results of Ruruhi Plant (*Syzygium polycephalum* Merr.)

In general, Ruruhi plant (*Syzygium polycephalum* Merr.) is local plants, unique from the guava tribe or Myrtaceae, often found in Southeast Sulawesi, especially Kendari City. In addition, Ruruhi plants (*Syzygium polycephalum* Merr.) grow wild in the forest and are spread through the seed dispersal process [6] (**Figure 1**). The fruits and flowers of this plant emerge from the stem and are clustered. Ruruhi plant is also one of the biological natural resources that have many diverse benefits. The use of Ruruhi plants (*Syzygium polycephalum* Merr.) in some communities in Kendari City is used as daily necessities whose processing is traditionally, for example, the leaf of the Ruruhi plant are used by the community as fresh vegetables, acid substitutes and medicinal ingredients.

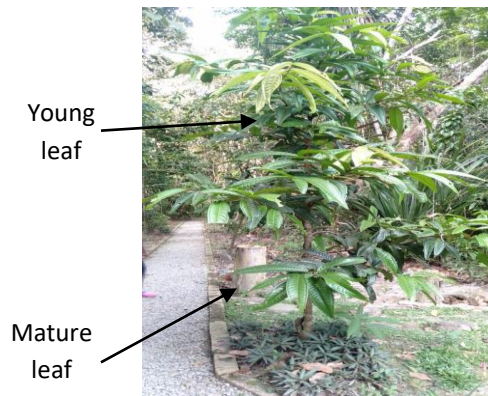


Fig 1. Ruruhi plant morphology

Leaf are one part of the plant that is believed to store a lot of secondary metabolite products. These secondary metabolites are commonly found in plants, including saponins which can be used as medicinal ingredients. This is in accordance with the statement of Fransisca et al., [7] that the saponin group has potential as a diuretic by reducing plasma volume by removing water and electrolytes, especially sodium, so that in the end cardiac output decreases. In addition, this saponin compound is one of the secondary metabolites that can be used in pharmacology as an antioxidant, antibiotic, anticancer, blood anticoagulant, inhibits carcinogenic effects and can be used as an environmentally friendly anti-pest control agent [8].

UV-Vis Spectrophotometric Analysis of Ruruhi Plant (*Syzygium polycephalum* Merr.)

In general, samples taken from the research location in the form of young leaf and mature leaf of this Ruruhi plant were dried and then mashed, this was intended to facilitate the process of saponin biochemical testing. Saponin compounds in plants can be identified by stable foam when dissolved in water, these compounds contain sugar molecules with 2 types of aglycogens, namely steroids (C-27) and triterpenoids (C-30) which are glycosides [3]. Saponins include phytochemical compounds that can inhibit the increase in blood glucose levels and inhibit gastric emptying through the absorption of glucose in the small intestine. Slowing gastric emptying causes food absorption to take longer and blood glucose levels to improve [9]. From the results of the analysis of the saponin content of young leaf and mature leaf on Ruruhi plant (*Syzygium polycephalum* Merr.)

using UV-Vis spectrophotometry analysis method, it was shown that there were differences in the content of saponin compounds in mature and young leaf. Adult leaf contain saponins of 0,825 mg/10 ml and young leaf contain saponin compounds of 0,566 mg/10 ml (**Figure 2**). This shows that the saponin content in mature leaf is more than the saponin content in young leaf. This is presumably because in mature leaf the leaf formation phase is earlier than the formation phase in young leaf. In addition, the difference in bioactive compounds in mature and young leaf was due to the fact that mature leaf had a greater ability to synthesize bioactive compounds so that the secondary metabolite content was more than that of young leaf. Then the age of the leaf also plays a role because the more mature the leaf of the plant, the more bioactives they contain, including the saponin metabolites contained in the leaf of the Ruruhi plant. This is in line with the statement by Bahriul et al., [10] that the older the plant, the more bioactive compounds it contains and the increase in bioactive compounds through the synthesis process when plants are exposed to direct light.

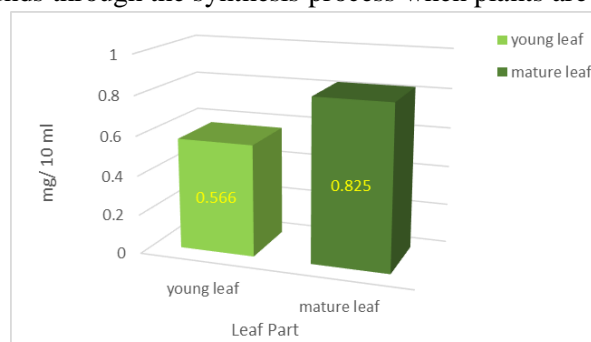


Fig 2. The results of the analysis of the content of saponins

Natural ingredients with high levels of saponins are expected to replace the function of surfactants with lower levels of irritation and are environmentally friendly in cleaning preparations [11]. Then saponins from plant leaf, are able to increase the efficiency of the fermentation process through the mechanism of decreasing the population of protozoa in the rumen, namely by reducing the predatory nature of protozoa against bacteria [12]. In the prevention or treatment of disease, saponins act as antibacterial, antifungal, antiviral, controlling blood glucose levels, and are able to inhibit the growth of tumor cells [2]. The role of triterpenoid saponins in prevention and treatment is as an expectorant, which is to stimulate the secretion of phlegm from the respiratory tract. In addition, this type of saponin also has activity as an anti-inflammatory (reducing inflammation) and larvicidal (killing mosquito larvae in water reservoirs) [13].

IV. CONCLUSION

The conclusion from the results of this study was that the saponin content in young leaf was different from the saponin content in mature leaf, which was 0,566 mg/10 ml in young leaf and saponin content in mature leaf was 0,825 mg/10 ml.

REFERENCES

- [1] Francis, G., Z. Kerem, H. P. S. Makkar, K. Becker. 2002. The Biological Action of Saponins in Animal Systems: A Review. *Br. Nurt's Journal*. (88): 587-605
- [2] Yanuartono, Purnamaningsih, H., Nururrozi, A., and Indrajulianto, S. 2017. Saponins: Impact on Livestock (Review). *Sriwijaya Animal Husbandry Journal*, 6(2): 79-90
- [3] Darma, W., and Marpaung, M. P. 2020. Analysis of Types and Levels of Saponins from Yellow Root Extract (*Fibraurea chloroleuca* Miens) Gravimetrically. *Journal of Chemistry and Chemical Education*, 3(1): 51–59
- [4] Dewi, WDNT., and Karya, A. 2018. Study of Ethnobiology About Utilization of Ruruhi Plants (*Syzygium polyecephalum* Merr.) in Kendari City, Southeast Sulawesi. *Journal of Biowallacea*, 5(2): 812-824
- [5] Purnamasari, D.M. 2021. UPDATE 19 April: Covid-19 Cases in Indonesia Reach 1,609,300, Add 4,95 <https://national.kompas.com/read/2021/04/19/16274241/update-19-april-case-covid-19-di-indonesia-reach-1609300-add-4952>. Retrieved April 20, 2021
- [6] Irnawati. Zubaydah, W. O. S., and Arifah. 2017. Anthocyanin Total and Antioxidant Activity of Ruruhi (*Syzygium polyecephalum* Merr.) Fruits. *Pharmacol*, 6(3): 169–175
- [7] Fransisca, M., Fadraersada, J., dan Prasetya F., 2019. Potensi Madu sebagai Penurun Tekanan Darah dan Kolesterol. Proceeding if Mulawarman Pharmaceuticals Conferences. **Journal homepage:** //prosiding.farmasi.unmul.ac.id.samarinda, 16-17 oktober 2019
- [8] Ergina, Nuryanti, S., and Purpitasari, ID. 2014. Qualitative Test of Secondary Metabolites Compounds in Palado Leaf (*Agave angustifolia*) Extracted With Water and Ethanol. *Akad Journal. Kim.*, 3(3): 165-172
- [9] Budi, M. E. 2016. Analysis of Saponin Content in Leaf and Stem *Carica pubescens* Lenne and K. Koch. *El-Hayah*, 5(4): 143–152
- [10] Bahriul, P., Rahman, N. and Diah, A. W. M. 2014. Activity Test of Bay Leaf (*Syzygium polyanthum*) using 1,1-Diphenyl-2-Pikrylhydrazil. *Chemistry academic journal*, 3(3): 368–374.
- [11] Nurzaman, F., Djajadisastira, J., Elya, B. 2018. Identification of Saponin Content in Cambodian Red Extract (*Plumeria rubra* L.) and Surfactant Power in Cosmetic Preparations. *Indonesian Pharmaceutical Journal*, 8(2):85-93
- [12] Susanti, S and Marhaeniyanto, E. 2014. Levels of Saponins in Plant Leaf Potentially Suppressing Methane Gas In-Vitro. *World of Science*, 14(1):29-38
- [13] Noviyanty, Y., Hepiyansori, and Dewi, B.R. 2020. Identification and Determination of Saponin Compounds Ethanol Extract of Senggani Flower (*Melastoma malabathricum* L) Gravimetric Method. *Oceana Biomedicina Journal*, 3(1) 45–53.