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RESEARCH ARTICLE

Yield Analysis and Phytochemical Screening of Ethanol Extract of *Phaleria macrocarpa* Leaves

Ira Cinta Lestari[1,5], Dharma Lindarto[2], Syafruddin Ilyas[3], Tri Widyawati[4], Suryani Eka Mustika[6]

[1] Philosophy Doctor in Medicine Programme, Faculty of Medicine, Universitas Sumatera Utara
[2] Department of internal Medicine, Faculty of Medicine, Universitas Sumatera Utara
[3] Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Sumatera Utara
[4] Department of Pharmacology & Therapeutic, Faculty of Medicine, Universitas Sumatera Utara
[5] Department of Histology, Faculty of Medicine, Universitas Islam Sumatera Utara
[6] Department of Anatomy Pathology, Faculty of Medicine, Universitas Islam Sumatera Utara

Corresponding email: iracinta.lestari@fk.uisu.ac.id

Abstract: The leaves of *Phaleria macrocarpa* have the potential to be used as raw materials for medicines made from natural ingredients, but more research is needed to determine their content and efficacy. This research examines the yield and phytochemical compound content of an ethanolic extract of *Phaleria macrocarpa* leaves. This study is a descriptive one. The weight ratio of the extract divided by the simplicial multiplied by one hundred per cent was used to calculate the extract yield. Compounds from the flavonoids, saponins, tannins, alkaloids, steroids, and triterpenoids classes were screened for phytochemical content. The estimated result of the extract obtained was 14.58%, and the phytochemical test revealed that the extract contained flavonoids, alkaloids, tannins, glycosides, saponins, and steroids.

Keywords: yield, ethanol extract, *Phaleria macrocarpa*, phytochemical screening

INTRODUCTION

Phaleria macrocarpa is a Papuan medicinal plant that people of Indonesia and Malaysia have long used.[1] This plant treats diabetes, gout, kidney problems, cancer, heart disease, impotence, allergies, insect bites h, haemorrhoids, strokes, blood-related diseases, migraines, acne, and skin problems.[1] Stem, leaves, and fruit plant parts are most commonly used.[2] Toxicity tests on *Phaleria macrocarpa* fruit have shown that it is safe to use as medicine.[3] However, research into the leaves of this plan still needs to be completed.

The antioxidant effects and tyrosinase inhibition of *Phaleria macrocarpa* leaves have been studied.[4–6] *Phaleria macrocarpa* leaf ethanol extract has been shown to inhibit the carbohydrate-digesting enzyme

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glucosidase, resulting in an antihyperglycemic effect.[7] In streptozotocin-induced diabetic rats, oral administration of *Phaleria macrocarpa* leaf ethanol extract reduced blood glucose levels, improved pancreas histopathology, and reduced testicular damage.[8,9] The immunomodulatory effect of *Phaleria macrocarpa* leaf has been shown to increase the phagocytic activity of macrophages in mice and the cytotoxic activity of NK 1 cells in the spleen.[10,11]

Safety, efficacy, and quality must be carefully monitored to using *Phaleria macrocarpa* leaves as a raw material for medicines made from natural ingredients. As a result, the amount of extraction yield and the bioactive compounds found in *Phaleria macrocarpa* leaves must be determined.[12]

This research examines the yield and phytochemical compound content of an ethanolic extract of *Phaleria macrocarpa* leaves.

METHODS

This study used a descriptive approach to determine the yield and class of phytochemical compounds in an ethanolic extract of *Phaleria macrocarpa* leaves. The phytochemical compounds studied were flavonoids, alkaloids, tannins, glycosides, saponins, steroids, and triterpenoids. Herbarium Medanense, Faculty of Mathematics and Natural Sciences, Universitas Sumatera Utara, has identified the *Phaleria macrocarpa* plant to be studied.

Fresh *Phaleria macrocarpa* leaves were obtained from Dataran Tinggi Village, East Binjai District, Binjai City, North Sumatra, for this study. Ethanol 96%, chloroform, Meyer's reagent, Mg powder, Amyl Alcohol, concentrated HCL, Mayer's reagent, Dragendorff, Bouchardart, FeCl3, Molish, H2SO4, aquades, Liebermann-Burchard reagent, aluminium foil, and filter paper are among the other materials used. The instruments used are an evaporator, analytical balance, vortex incubator, test tube, pipette, blender, filter, and micropipette.

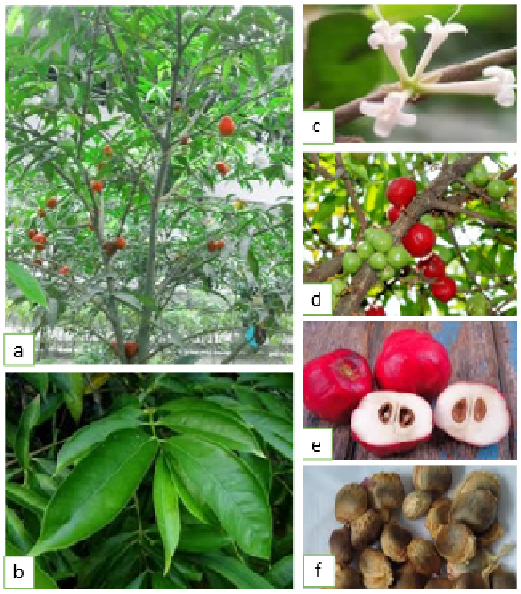

Figure 1. Plant parts of *Phaleria macrocarpa* a) whole tree, b) leaves, c) flowers, d) and e) fruit, f) seeds.

Collection and identification of plant materials

In the morning, *Phaleria macrocarpa* leaves are picked in groups of 3-10 from the base, selecting leaves that are evenly green in colour and intact. The leaves are

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cleaned of dirt and washed several times with running water until clean before being spread out evenly on parchment until the water is absorbed. The leaves were then weighed and dried in a drying cabinet. The sample was considered dry after it had dried. The sample was then mashed with a grinder until it became a simplicial powder. Simplicia was placed in a closed plastic container and stored in a dry, light-protected place before use.

Extraction of plant materials

Extraction was performed by weighing the *Phaleria macrocarpa* leaf simplicial as needed and adding 96% ethanol solvent with a *Phaleria macrocarpa* leaf: solvent ratio of 1:10 (w/v). After a continuous 15 minutes of stirring, the *Phaleria macrocarpa* leaves and ethanol solvent were left to stand for 24 hours. To obtain the extract using a solvent, the extraction product was filtered through filter paper to remove any leftovers. The maceration process was repeated three times until the filtrate was nearly transparent. After evaporating the filtrate, a thick extract of *Phaleria macrocarpa* leaves was obtained. The thick extract was stored in a glass bottle at 2-8°C.

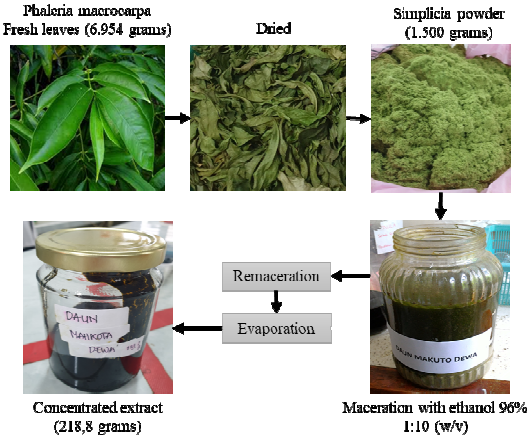

Figure 2. The extraction process of *Phaleria macrocarpa* leaves.

Yield analysis

The extract yield was calculated using the weight of the extract divided by the simplicial multiplied by one hundred per cent.

Phytochemical screening

Test for flavonoids

A 0.5-gram sample was added to 10 millilitres of hot aqua dest, which was then boiled for ten minutes and filtered while still hot. The filtrate was then taken from 5 millilitres and mixed with 0.1 grams of magnesium powder, 1 millilitre of concentrated hydrochloric acid (HCl), and 2 millilitres of amyl alcohol before separation.

Test for alkaloids

After weighing a 0.5-gram sample, 9 ml of aqua dest and 1 ml of 2N hydrochloric acid were added, and the mixture was heated for two minutes over a water heater before being cooled and filtered. After filling three test tubes with

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the filtrate, 0.5 millilitres were added. In the first, second, and third tubes, two drops of Mayer's reagent, two drops of Dragendorff's reagent, and two drops of Bourchardat were added, respectively. The formation of yellow, orange, and brown precipitates in the first, second, and third tubes, respectively, confirmed the presence of alkaloids.

Test for tannins

A 0.5-gram sample was collected and dissolved in 10 millilitres of distilled water before filtering through filter paper. In addition, two drops of 1% FeCl3 reagent were added to the filtrate, which was taken up to a total of 2 millilitres. Tannins are present if the colour is blue or blackish-green.

Test for glycosides

A 0.5-gram sample was added to hot aqua dest, boiled for ten minutes, and filtered while still hot. The filtrate was counted in five millilitres, with five drops of Molish solution and one millilitre of sulfuric acid. Positive glycosides form a purple ring.

Test for saponins

A 0.5-gram sample was taken, placed in a test tube, and mixed with 10 millilitres of distilled water. For 10 seconds, the water was heated, cooled, and vigorously shaken. Foam formed for at least 10 minutes, reaching 1-10 cm heights. One drop of 2N hydrochloric acid was added. Saponins are present if the foam does not disappear.

Test for steroids and triterpenoids

A one-gram sample, 20 millilitres of chloroform, and Liebermann Burchard reagent (concentrated sulfuric acid and anhydrous acetic acid) were placed in a dry test tube. A bluish-green, orange or purple ring on triterpenoids and steroids indicates a positive reaction.

RESULTS AND DISCUSSION

This study yielded 1,500 grams of *Phaleria macrocarpa* leaf Simplicia powder. The extraction method of maceration with ethanol as the solvent yielded a concentrated extract of 218.8 grams of *Phaleria macrocarpa* leaves. As a result, the extract yield is 14.58%.

Extraction is used to separate a substance when its solubility in two insoluble liquids differs. In this study, *Phaleria macrocarpa* leaves were extracted using the maceration method. Maceration, which involves immersing compounds in organic solvents at room temperature, separates them. Because of its simplicity and ease of use, the maceration method is frequently used in research. To obtain as much of the extracted compound as possible, the immersion or remaceration process can be repeated.[13]

The type and amount of solvent significantly used influence the type and number of extracted compounds. Plant compounds are typically found in the cell; the solvent must diffuse into the cell to dissolve the desired compound's molecules. The pressure difference between the inside and outside of the cell causes a breakdown of cell walls and membranes during the

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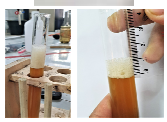
immersion process, allowing secondary metabolites in the cytoplasm to dissolve in the solvent. The solvent that flows into the cell can cause the protoplasm to swell and its contents to dissolve based on their solubility. [14]

The solvent ethanol was chosen for this study because it is an excellent polar organic solvent for extracting plant dry matter such as leaves, roots, and stems. Ethanol solvent can dissolve polar compounds in leaves and is a safe food solvent that is inexpensive and easy to obtain.[15]

The yield is the product's dry weight divided by the weight of the raw material. The amount of bioactive content in the raw material affects the yield value. [16]

Phytochemical tests were conducted to determine the class of compounds in the plant samples under investigation. The phytochemical screening method examines the colour test reaction using a colour reagent. 17 The compound class test was performed on *Phaleria macrocarpa* leaf extract, and a colour change was considered a positive result. The phytochemical tests on the ethanol extract of *Phaleria macrocarpa* leaves are shown in Table 1.

Table 1. Phytochemical qualitative test results of ethanol extract of *Phaleria macrocarpa* leaves

Secondary Metabolites	Test Results	
Flavonoids	(+)	
Alkaloids	(+)	
Tannins	(+)	
Glycosides	(+)	
Saponins	(+)	
Steroids/ Triterpenoids	(+ / -)	

According to Table 1, *Phaleria macrocarpa* leaves contain various flavonoid compounds, alkaloids, tannins, glycosides, saponins, and steroids. Flavonoid compounds, tannins, and alkaloids have antioxidant properties that can protect against free radicals. [16,18] Antioxidants work to neutralise free radicals, thereby protecting the body from degenerative diseases and cancer.[19] Flavonoids also act as analgesics by inhibiting the action of the cyclooxygenase enzyme, which produces prostaglandins.[20]

Saponin group compounds have antibacterial and antiviral properties, as well as the ability to lower blood sugar levels and prevent blood clots.[21] Steroids have antibacterial and antioxidant properties and can interact with cell phospholipid membranes that lipophilic compounds cannot. This can lead to decreased membrane integrity,

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morphological changes in cell membranes, and cell membrane brittleness and lysis.[16]

Phaleria macrocarpa leaves contain active substances similar to *Phaleria macrocarpa* fruit. Mangiferin, polyphenols, and phenols are also found in the leaves of *Phaleria macrocarpa*.[18,22] Phalerin (4,5-trihydroxy, 4'-methoxy benzophenone-3-O-β-D-glucoside) is the main active ingredient found in the leaves of *Phaleria macrocarpa*. Phalerin is a glucoside benzophenone compound.[23] The phalerin content of the crown of the gods has the potential to be anti-breast cancer. [24]

The number of phytochemicals in a plant is heavily influenced by its environment. Furthermore, it is influenced by both internal and external factors. External factors such as light, temperature, humidity, pH, soil nutrient content, altitude, and genes play a role. As a result, it is assumed that the difference in growth location will affect plant growth and development. As a result, these plants' metabolic processes will be disrupted, resulting in quantitative differences in the content of the produced compounds. [18]

CONCLUSIONS

This study yielded 14.58% of *Phaleria macrocarpa* leaf ethanol extract, and phytochemical screening revealed that the extract contained alkaloids, tannins, glycosides, saponins, steroids, and flavonoid compounds.

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