

Research Article

## Phytochemical Study of Green Meniran Herb (*Phyllanthus niruri* L.) and Red Meniran Herb (*Phyllanthus urinaria* L.) in Jekan Raya Sub-district of Palangka Raya City, Central Kalimantan Province

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### ABSTRACT

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Kalimantan is one of the islands in Indonesia that is famous for its rich biodiversity. Knowledge about the use of traditional medicine using plants has been passed down from generation to generation among the ethnic natives of Kalimantan. One of the typical Kalimantan plants that is efficacious as traditional medicine and contains various potential secondary metabolites is meniran. Based on ethnobotanical studies in Central Kalimantan, meniran is boiled to treat fever, dysentery, jaundice, malaria, therefore further research is needed for the chemical content of meniran which is efficacious. This study aims to determine the phytochemical of green meniran herb (*Phyllanthus niruri* L.) and red meniran herb (*Phyllanthus urinaria* L.). Determination of plant samples was carried out for both types of meniran. Then processing, extraction and identification of chemical content. The yield values of each extract obtained were 7.40% and 8.76%. As for the results of phytochemical studies, green and red meniran herb both contain alkaloid, tannins and flavanoids, but green meniran is indicated to have steroid content and red meniran contains triterpenes. Secondary metabolites possessed by these two types of meniran plants are beneficial for health, including as antioxidants, antibacterial, antiviral, anticancer and a number of pharmacological activities that are significant in improving one's health and minimizing the risk of infection by pathogens. However, further research is needed to test the activity of the content of these two types of meniran as a basis for the manufacture of traditional medicines.

**Keywords:** Phytochemical; *Phyllanthus niruri* L.; *Phyllanthus urinaria* L.

## INTRODUCTION

Indonesia has a diversity of plants that can be developed into traditional medicines to be used for health purposes. Out of a total of around 30,000-50,000 plant species, only about 7,500 have been identified as medicinal plants (LIPI 2015). Traditional medicines from plants contain properties for treatment in overcoming and preventing diseases (Hutasuhut et al. 2022). In general, there are 332 plant species used by the Dayak Kaharingan (Purwaningsih 2011).

Kalimantan is one of the islands in Indonesia that is famous for its rich biodiversity. In addition, knowledge about the use of traditional medicine using plants has been passed down from generation to generation among the ethnic natives of Kalimantan (Fahruni et al. 2018).

Central Kalimantan is one of the provinces in Indonesia that has the potential to have extraordinary natural resources, especially in the field of medicine. Daily life Dayak people in Central Kalimantan still practice traditional medicine. The community often uses traditional medicine, and people often use plants because they are known to have benefits and they believe in their efficacy (Ibrahim 2016).

Ethnobotanical Study of Medicinal Plants in Tumbang Jala Village - Central Kalimantan there are 60 species of medicinal plants that are still used, for example, medicinal plants using the local name Akar ginseng kuning "Kaju ginseng" (*Rennelia elliptica*), Akar kuning "Ahkah bahenda" (*Cosciniium fenestratum*), Bandoan "Uru patinong" (*Ageratum conyzoides* L.), Alang-alang "Tapuhkah" (*Imperata cylindrica* L.), Green Meniran "Uru Handalai Bahijau" (*Phyllanthus niruri* L.), Red Meniran "Uru Handalai Bahandang" (*Phyllanthus urinaria* L.) and various other species medicinal plants (Ricky, Puspita, and Mangalik 2019).

The medicinal properties of each of these plants are inseparable from the role of the secondary metabolites contained therein. Secondary metabolites are composed of a variety of specific small molecules with varied structures and different functions and benefits. These nutritious compounds include flavonoids, alkaloids, saponins, triterpenes, steroids, and tannins (Ergina et al. 2014).

The percentage of the Indonesian population that has consumed herbal medicine is 59.12%, both in rural and urban areas, and 95.60% feel the benefits; specifically, based on data, meniran is consumed by 13.93% (Kemenkes RI 2017).

One of the studies on the phytochemical content of meniran with samples originating from India showed that the strongest contents detected in meniran leaves were lignans, flavonoids, saponins, tannins, and steroids, while there were several other chemical compounds, namely anthroquinones and glycosides (Mehta et al. 2019). Based on isolation research and identification of secondary metabolite content of meniran samples in Makassar with reagents, the presence of alkaloid, flavanoid, and terpenoid content was revealed, but after isolation

with liquid hexane, powder isolates were formed, which were strongly suspected to be flavanoids and terpenoids (Risnawati, Muharram, and Jusniar 2021).

This herb in Central Kalimantan is known as Uru Handalai (worm grass), which is used as traditional medicine. In Palangkaraya, especially in Central Kalimantan, there have been no measurements of herbal phytochemicals for green meniran and red meniran. For the closest research related to inventory data on traditional Dayak medicines in Murung Raya district, there are chemical contents of meniran fruit, namely phylantin, potassium, minerals, and substances. It is useful for treating diseases such as coughs and excessive menstruation (Ibrahim 2016).

Meniran plants in the village of Tumbang Jala in central Kalimantan are used for the treatment of fever, dysentery, jaundice, and malaria by processing the whole tananman and then drinking the boiled water (Ricky, Puspita, and Mangalik 2019). Some of the types of meniran have the potential to be used as traditional medicine, namely green meniran herb (*Phyllanthus niruri* L.) and meniran red herb (*Phyllanthus urinaria* L.) (Noorcahyati 2012; Handayani and Nurfadillah 2014).

Phytochemical studies qualitatively play an important role in identifying potential active compounds in plants. The results of this phytochemical study can be used to determine the benefits of plants for health (Hutasuhut et al. 2022).

## **MATERIALS AND METHODS**

### **Material**

Powder and extract solution of green meniran herb (*Phyllanthus niruri* L.) and red meniran herb (*Phyllanthus urinaria* L.), Dragendorff reagent, ethanol 96%, FeCl<sub>3</sub> solution, HCl 2 N solution, H<sub>2</sub>SO<sub>4</sub> solution, Mg Metal 0,1 g, Mayer's reagent.

### **Method**

#### ***Plant Determination***

Meniran green herb (*Phyllanthus niruri* L.) and red meniran herb (*Phyllanthus urinaria* L.) will be collected and examined in advance to be determined. This determination aims to determine the correctness of the plants to be studied, avoid errors in sample collection, and avoid the possibility of mixing with other plants. Sample determination was carried out at the Pharmacy Study Program Laboratory, Faculty of Science and Technology, Mandala Waluya University.

### ***Sampling and Processing***

The sampled meniran was taken in the lowlands of the garden area and this plant grows well, within the area of Jekan Raya sub-district, Palangka Raya city, Central Kalimantan. The herbs are washed thoroughly and dried. After drying, the samples were then pollinated.

### ***Sample Extraction***

The powdered samples were then extracted by maceration using 96% ethanol in a ratio of 1:4. The filter liquid is collected, and the dregs are re-macerated again with the same filter liquid. This process was carried out for 7 days to obtain the maximum bioactive compounds (Carmagnani et al. 2020). The results of the maceration are accommodated and then evaporated with a rotary evaporator until a concentrated extract is obtained.

### ***Identification of Chemical Content***

#### ***Identification of Tannin Content***

The identification of tannins was carried out by adding the test extract to a  $\text{FeCl}_3$  solution. Gallotannins and ellagotannins will give a blue-black precipitate, and condensed tannins will give a greenish-black precipitate (Khafid et al. 2023; Hutasuhut et al. 2022).

#### ***Identification of Alkaloid Content***

As much as 2 mL of the test extract solution was evaporated over a porcelain cup until residue was obtained. The residue was then dissolved in 5 mL of HCl 2 N. The solution obtained was then divided into three test tubes. The first tube was added with HCl 2 N, which served as a blank. The second tube contained 3 drops of Dragendorff reagent, and the third tube contained 3 drops of Mayer's reagent. The formation of an orange precipitate in the second tube and a white to yellowish precipitate in the third tube indicates the presence of alkaloids (Khafid et al. 2023; Hutasuhut et al. 2022).

#### ***Identification of Flavonoid Content***

The test was carried out by taking as much as 2 mL of the test extract and heating it for about 5 minutes. After heating, each was added with 0.1 g of Mg metal and 5 drops of concentrated HCl. If the solution is formed from yellow to orange to red, then it is positive for flavonoids (Ergina et al. 2014).

#### ***Identification of Saponin Content***

The test extract was put into a test tube, to which 10 mL of hot water was added, cooled, and then shaken vigorously for 10 seconds. Steady froth is formed

for not less than 10 minutes, as high as 1–10 cm. On the addition of HCl 2 N, the foam did not disappear (Khafid et al. 2023; Hutasuhut et al. 2022).

#### *Identification of Steroid Content*

The test was carried out by taking 2 mL of the test extract. After that, the extract was added along with 3 drops of concentrated HCl and 1 drop of concentrated H<sub>2</sub>SO<sub>4</sub>. If the solution forms a green color, then it is positive for steroids (Ergina et al. 2014).

#### *Identification Triterpene Content*

As much as 0.2 gram of condensed extract of meniran herb was put into a test tube, and then 10 mL of petroleum ether solvent was added. Furthermore, the sample is placed in a funnel that has been given a layer of cotton that has been moistened with water at the mouth of the tube, heated for 10 minutes on a water bath, cooled, and then filtered. The filtrate was evaporated in a porcelain cup. If the residue smells aromatic, it indicates the presence of triterpene group compounds (Tambunan et al. 2019).

## RESULTS

The green meniran plants (Figure 1) and red meniran (Figure 2) were taken and the sample determination process carried out at the Pharmacy Study Program Laboratory, Faculty of Science and Technology, Mandala Waluya University. All parts of the meniran plant are used.



**Figure 1. Uru Handalai Bahijau**  
(*Phyllanthus niruri* L.)



**Figure 2. Uru Handalai Bahandang**  
(*Phyllanthus urinaria* L.)

Before carrying out a phytochemical study, the initial step taken was to carry out the extraction process to obtain the extract. The extraction method used is the maceration method because the process is easier and uses a fairly simple tool (Mashar and Annah 2020). The results of the maceration of each 3 kg of green

meniran herb simplicia and red meniran herb yielded as much as 222 grams of green meniran extract and 263 grams of red meniran extract. Table 1 shows that the yield values of each extract obtained were 7.40% and 8.76%. These results meet the requirements of the Indonesian Herbal Pharmacopoeia, namely a yield of not less than 7.2% (Depkes RI, 2000).

$$\text{Yield Calculation} = \frac{\text{extract weight obtained}}{\text{powder weight}} \times 100\%$$

**Table 1.** Yield Value from EBMP

Sample	Yield (%)*
Green meniran extract	7,40
Red meniran extract	8,76

\*Extract yield was calculated for simplicia powder

The identification of chemical content was carried out on extracts of green meniran herb and red meniran herb using a qualitative method using color reagents. This method is a simple qualitative analysis method to determine the content of secondary metabolites in samples (Tandi et al. 2020). In this research, the content of tannins, alkaloids, flavonoids, saponins, steroids, and triterpenes was identified in the extract. The identification results obtained are shown in table 2.

**Table 2.** Identification of Chemical Content of Green Meniran Herb and Red Meniran Herb

Chemical Content	Results	
	Green Meniran	Red Meniran
Tannin	+	+
Alkaloid	+	+
Flavonoid	+	+
Saponin	-	-
Steroid	+	-
Triterpenes	-	+

The results showed that the green meniran herb samples contained secondary metabolites, namely tannins, alkaloids, flavonoids, and steroids. Meanwhile, the red meniran herb samples contained secondary metabolites, namely tannins, alkaloids, flavonoids, and triterpenes.

## DISCUSSION

These secondary metabolites consist of various specific small molecules that have varied structures as well as different benefits and roles. Secondary metabolites in plants play a role in protecting each plant against various threats from the environment. In addition, secondary metabolites also act as guiding compounds in the discovery and development of new traditional medicines (Ergina et al. 2014; Khafid et al. 2023).

Tannins are secondary metabolites of the polyphenol group. Tannins with high molecular weight contain hydroxyl or carboxyl-like groups and have the ability to form effective complex compounds or can react with other macromolecules under certain conditions, such as proteins (Sieniawska 2015; Astiti et al. 2019). Due to their ability to react with proteins and their antioxidant properties, tannins can play a role in protecting plants from insects, pathogens, and animals (Sieniawska 2015; Watrelot and Norton 2020). Various studies show the effectiveness of tannins pharmacologically. The effect of tannins can be produced through two different mechanisms, namely as a complex structure that cannot be absorbed with binding properties so that it can produce local effects or as tannins that can be absorbed so that it can produce systemic effects in various organs (Sieniawska 2015). These effects include antibacterial (Serrano et al. 2009), antiviral (Ajala et al. 2014; Lin et al. 2013), cardioprotector activity (Jastrzebska et al. 2006; Isenburg et al. 2004), cytotoxic activity (Actis-Goretta et al. 2008), antidiabetic activity (Serrano et al. 2009), antiobesity (Moon et al. 2007; Hung et al. 2005), anti-inflammatory (Agyare et al. 2011), antiulcer activity (Vasconcelos et al. 2010), antioxidant activity (Chandranayagam et al. 2013), protects bone marrow hematopoietic stem cells (Xiong et al. 2014), inhibits the occurrence of skin tumors (Okuda 2005), and inhibits the occurrence of tumors in the digestive tract (Okuda 2005).

Alkaloids are nitrogen-containing secondary metabolites derived from amino acid biosynthesis. The main requirement for an alkaloid compound is that it contains a nitrogen atom at every position in its molecule, but does not include nitrogen in amide or peptide bonds. Therefore, an increase in the formation of amino acids can also affect the increase in alkaloids (Pratiwi et al. 2020; Setyati et al. 2020; Bribi 2018). Alkaloids are formed from the photosynthetic carbohydrates that undergo glycolysis to become acetyl coenzyme A. Acetyl coenzyme A, through the tricarboxylic acid cycle, will form amino acids, which are precursors for the formation of aliphatic alkaloids. Alkaloids can also be produced from aromatic amino acids produced from phosphoenolpyruvate via the shikimic acid pathway (Setyati et al. 2020). Alkaloid group compounds have a strong pharmacological effect. Examples of plants that contain alkaloids are those that provide narcotic analgesic effects, namely morphine and codeine, apomorphine (a derivative of morphine), which is used for Parkinson's disease, papaverine as a muscle relaxant, and the antimicrobial agents sanguinarine and berberine. Several potent anticancer agents have also been developed from alkaloid compounds (Salminen et al. 2011). Various studies have shown the effectiveness of alkaloids pharmacologically, namely antibacterial, antifungal, antiviral, and acting on the nervous system (Bribi 2018). Traditionally, plant alkaloids play an important role in folk medicine as laxatives, antitussives, sedatives, and in the treatment of other diseases. Today, some alkaloids have become models for

modern drugs, such as codeine, brucine, morphine, ephedrine, and quinine (Gutiérrez-Grijalva, López-Martínez, and Contreras-Angulo, 2020).

Flavonoids are secondary metabolites formed from phosphoenolpyruvate and pyruvate from the glycolysis stage in the plant respiration process. Phosphoenolpyruvate will be formed into phenolic compounds via the shikimic acid pathway, while pyruvate will be formed via the malonic acid pathway (Setyati et al. 2020). Flavonoids are the largest group of phenolic compounds. Flavonoids can be found in all green plants, except algae, as well as in all plant parts, such as roots, leaves, plant bark, stamens, fruit, plant seeds, and flowers (Astiti et al. 2019). Flavonoids are reported to have antioxidant, antibacterial, and a number of pharmacological activities that are significant in improving one's health and minimizing the risk of infection by pathogens (Tessema et al. 2023). The chemical properties of flavonoids are determined by their chemical structure, degree of hydroxylation, conjugation, other substitutions, polymerization, oxidation state, glycosylation pattern, degree of polymerization, and other (Heim et al. 2002; Kumar and Pandey 2013).

Steroids are terpenoid compounds that have a carbon base framework with four fused rings. Steroids play a role in controlling metabolism in the body, maintaining body homeostasis, and improving the function of sexual organs (Hutasuhut et al. 2022). Steroid compounds are reported to be effective as antibacterial (Liu et al. 2021), antiviral (Joshi et al. 2020), antitumor (Tian et al. 2020), anti-inflammatory (Zhang et al. 2019), regulators of the body's immune system (Tian et al. 2020), as well as other biological functions.

Triterpenes are secondary metabolites derived from terpenoids, which have a carbon skeleton composed of six isoprene units (Khafid et al. 2023). Triterpenes are colorless, crystalline compounds with high melting points. Triterpenes contain oleanolic acid and ursolic acid, which act as antibacterials, besides that, triterpene compounds also act as antimicrobials and anti-insects (Babbar 2015; Wang et al. 2016). Triterpenes have biological activities, namely anticancer, antioxidant, anti-inflammatory, antiobesity, antihypertensive, and antidiabetic (Khafid et al. 2023). Seven triterpenoid were identified and isolated from the whole plants of *P. urinaria*; 3*R*-*Z*-coumaroyltaraxerol (1), oleanolic acid (2),  $\beta$ -betulinic acid (3), 3-oxofriedelan-28-oic acid (4), betulin (5), 3*R*-*E*-coumaroyltaraxerol (6), and 8-norlup-20(29)-ene-3,17 $\beta$ -diol (7) (Ye Wu, et al. 2017).

The results of qualitative analysis of secondary metabolites can play an important role in the development of traditional medicine, especially when using green meniran herbs and red meniran herbs. The results of this study can form the basis of information regarding the content of bioactive compounds for further research so that they can be used more widely.

## CONCLUSIONS

Finally, the conclusion of research on the content of secondary metabolites of meniran originating from the land in the sub-district of Jekan Kota Palangka Raya, Central Kalimantan Province, has been processed in such a way through sample preparation, extraction, and phytochemical screening of herbs. Extract Green meniran herb contains secondary metabolites, namely tannins, alkaloids, flavonoids, and steroids, while red meniran herb extract contains secondary metabolites, namely tannins, alkaloids, flavonoids, and triterpenes. This secondary metabolite information is expected to provide a reference to continue the next research so that this plant can be used as a traditional medicine.

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