

Phytochemical Screening of Ant Plant *Myrmecodia rumphii* Becc.

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Abstract—Ant plant *Myrmecodia rumphii* Becc. is an epiphytic plant that is widely used by local people as an herbal medicine to treat various diseases such as rheumatic and tumors. Methanol extract of *M. rumphii* Becc. showed high cytotoxicity against shrimp larvae *Artemia salina* Leach and antioxidant potential as indicated by high inhibitory activity against DPPH radicals. In the present paper, we provide for the first time the results of phytochemical screening of ant plant *M. rumphii* Becc. Powder of *M. rumphii* Becc. was extracted with n-hexane, methylene chloride, ethyl acetate, and methanol then concentrated until concentrated extract was obtained. Test of compound groups was carried out qualitatively. The results showed that there were various metabolites of alkaloids, triterpenoids, steroids, flavonoids, phenolics, and tannins which were scattered in extracts with various levels of polarity. From these results it can be concluded that the plants of *M. rumphii* Becc's contains secondary metabolites which have interesting bioactivity.

Keywords—phytochemical; ant plant; *Myrmecodia rumphii* Becc.

I. INTRODUCTION

Medicinal plants have been known for a long time as bioactive art repositories that have the nature of therapeutic properties that varies and over a long period of time. This term is used to describe chemicals from plants that can improve the health status of an organism but not essential nutrients [1]. The vast array of therapeutic effects associated with medicinal plants includes anti-inflammatory, antiviral, antitumor, antimalarial, and analgesic. The most important of these bioactive constituent of plants are alkaloids, tannins, flavonoids and phenolic compounds.

Ant plant *Myrmecodia rumphii* Becc. is an epiphytic plant of Rubiaceae family that is widely used by local Papuans as an herbal medicine to treat various diseases such as rheumatic and

tumors. Ant plant *M. rumphii* Becc. is one type of ant nest plant originating from Merauke especially in Tomer village. In general, the local Papuan community uses the ant nest *M. rumphii* Becc by drying it in the sun. The dried ant nests are boiled with water for further drinking as medicine.

Many antioxidant compounds can be found in fruits and vegetable including phenolics, carotenoids, anthocyanins, and tocopherols. Previous studies showed high antioxidant activity and cytotoxicity of methanol extracts of *M. rumphii* Beccs. Methanol fraction showed very high cytotoxicity with LC₅₀ 0.48µg/ml. Ethyl acetate fraction showed very high antioxidant activity with 92.66% scavenging activity against DPPH radical [2].

Cytotoxicity activities of various plant extracts indicate the presence of active compounds. *Faropyrum esculantum*, *F. tataricum*, and *F. mill* contain active compounds, including polyphenols, alkaloids, terpenoids, steroids, and phenylpropanoid glycosides. One of the most active constituents of various Chinese herbal medicines is polyphenols which have pharmacological properties such as antibacterial, antiviral, anti-inflammation and antioxidants. Routine, one class of flavonoids, shows antioxidant activity [3]. Phytochemical screening of some Papua endemic plant show that they contain some secondary metabolite compound. Metanol extract of *Piper methysticum* G. Forst, *Xanthostemon novaguineense* Valet, and *Macaranga aleuritoides* F. Muell show the presence of secondary metabolite, i.e. alkaloid, flavonoid, tannins, and saponins [4].

Various plant species from the Rubiaceae family produce various active compounds. The *Uncaria* genus is one of the medicinal natural products, especially alkaloids and triterpenes. The recognized alkaloids compound in *Uncaria* are mitraphylline, which has been isolated from 20 of 34 species of *Uncaria*. Besides, another alkaloid were isolated from 18 species of *Uncaria*, i.e. rhynchophylline, isomitraphylline,

isorhynchophylline. Pentacyclic triterpenoids from *Uncaria* were ursane-type, includes cytotoxic phenolic acid esters. In addition, various flavonoid and coumarin compounds have been isolated [5]. Phytochemical screening of *Morinda morindoides* leaf extract (*Morinda* genus) showed the presence of flavonoids, alkaloids, polyphenols, tannins, saponins, quinones and sterols [6]. *Adina trichotoma* Zoll. & Moritzi. Folium contains alkaloids, terpenoids, glycoside, anthraquinone; *Amaracarpus pubescens* Blume. Folium contains alkaloids, flavonoids, terpenoids, glycoside, anthraquinone; *Canthium glabrum* Blume. Folium contains alkaloids, flavonoids, terpenoids, tannin, glycoside, anthraquinone; *Chiococca javanica* Blume. Folium contains alkaloids, flavonoids, terpenoids, tannins, glycoside, anthraquinone; *Nauclea calycina* (Batl.ex DC.) Merr. Folium contains alkaloids, tannins, glycoside; *Nauclea calycina* (Batl.ex DC.) Merr. Cortex contains flavonoids, terpenoids, tannins, glycoside, anthraquinone; *Posoqueria latifolia* (Lam.) Roem. Schult. Folium contains terpenoids, tannins, glycosides [7]. Leaf extract of *Borreria verticilla* Linn shows the content of triterpenoids, flavonoids, phenols, alkaloids, saponins, tannins, and glycoside [8].

Ant plant from the genus *Hydnophytum* and *Myrmecodia* contain various compounds that make them possess attractive bioactivity. Ant plants *Hydnophytum formicarum* Folium contains terpenoids, alkaloids, tannins, glycoside, and saponins, while *H. formicarum* Cortex contains flavonoids, alkaloids, terpenoids and glycoside compounds [7]. Terpenoids, alkaloids, and phenolics are also contained in ant plant *Myrmecodia pendens* [9]. Phytochemical screening results on the sarang semut of *M. beccarii*, *Myrmecodia* sp., and *Hydnophytum* sp. showed that the three species contained flavonoid, triterpenoid/steroid, and saponin compounds [10].

II. MATERIAL AND METHOD

The material used was *M. rumphii* Becc's ant nest plant. from Tomer Village. The components contained in the sarang semut extract were analyzed by their compounds by a color test with several reagents for terpenoids/steroids, alkaloids, flavonoids, tannins and saponins.

A. Identification of terpenoids/steroids

Identification of terpenoids and steroids was done by dissolving concentrated extracts of ant plant in 0.5 ml of chloroform then adding 0.5 ml of acetic anhydride and dripping mixture with 2 ml of concentrated H₂SO₄ through the tube wall. Triterpenoid positive results in the Lieberman-Burchard reagent test gave a red color and positive steroid test gave a green color.

B. Identification of alkaloids

Identification of alkaloids was carried out by the Mayer, Wagner, and Dragendorf methods. A total of 0.5 grams of concentrated extract of sarang semut were dissolved in 1 ml of 2M HCl and 9 ml of distilled water then heated for 2 minutes, cooled and then filtered. Filtrate was divided into 3 parts, each added with Mayer, Wagner, and Dragendorf reagents. The positive results of alkaloids in the Mayer test were

characterized by the formation of white deposits. Positive results of alkaloids in Wagner test were characterized by the formation of light brown to yellow deposits. While the positive results of alkaloids in the Dragendorf test were characterized by the formation of light brown to yellow deposits.

C. Identification of flavonoids

Identification of flavonoids was carried out by dissolving concentrated extracts of sarang semut in hot methanol and adding 0.1 grams of Mg powder and 5 drops of concentrated HCl. Positive results of flavonoid identification tests were using the Wilstater test indicated by the appearance of red, yellow or orange.

D. Identification of phenolic

Phenolic identification was carried out by adding concentrated extracts of sarang semut with 2 ml FeCl₃ 10% solution. Positive results of phenolic identification were indicated by the appearance of green, red, purple, blue or black [11].

E. Identification of tannins

Identification of tannin was carried out by dissolving concentrated extracts of ant plant in 10 ml of distilled water then filtered. The filtrate was added with 3 drops of FeCl₃ 1%. Positive results of tannin identification tests were using 1% FeCl₃ 3 solution in water giving a strong green, red, purple or black color.

F. Identification of saponins

Saponin identification was carried out by dissolving concentrated extracts of sarang semut in 10 ml of hot water and then shaking them vigorously for 10 seconds. Identification of the presence of saponins was using the Forth test indicated by the formation of foam and can last no less than 10 minutes and was not lost after the addition of 2M HCl [11].

III. RESULT AND DISCUSSION

TABLE I. RESULTS OF PHYTOCHEMICAL SCREENING ON *M. RUMPHII* BECC. ANT PLANT

Phytochemical Test	Extract			
	methanol	ethyl acetate	methylene chloride	n-hexane
Triterpenoid / steroids	+	+	+	+
Phenolic	+	+	+	+
Tannin	+	-	-	-
Saponin	-	-	-	-
Flavonoids	+	+	+	+
Alkaloids:				
Mayer	+	-	-	-
Wagner	+	-	-	-
Dragendorf	+	-	-	-

The results of the study in Table 1 show that *M. rumphii* Becc. contain various secondary metabolites, i.e. triterpenoid/steroid, secondary phenolic, flavonoid, alkaloid, and tannin secondary metabolites which are distributed in methanol, ethyl acetate, methylene chloride and n-hexane.

Steroid/triterpenoid compounds, phenolics, and flavonoids are scattered in all levels of solvent polarity starting from nonpolar, semipolar, and polar while tannin and alkaloid compounds are only found in polar solvents. Thus it is understood that terpenoid, steroid, phenolic, and flavonoid compounds are polar, but some are semi-polar and non-polar.

Tannins are found in methanol extracts but are not present in ethyl acetate, methylene chloride, and hexane extracts. This shows that the tannin class compound found in the plants of *M. rumphii* Becc. Tannin compounds are included in the very polar and large molecules. Besides that, *M. rumphii* Becc, does not contain saponin compounds, characterized by the absence of foam that lasts long enough when the solution was shaken.

Alkaloid test uses 3 types of reactants, namely Mayer, Wagner, and Dragendorf reagents. The test results showed that the positive methanol extract contained alkaloids, while ethyl acetate, methylene chloride, and n-hexane extracts were negative. This result means that the alkaloids contained in the plants of *M. rumphii* Becc. is very polar and most likely contains quite a lot of polar groups. But other ant plants from Merauke Regency such as *M. beccarii*, *Myrmecodia* sp., and *Hydnophytum* sp. do not contain alkaloids [10].

Content of triterpenoid/steroid and flavonoid compounds in the methanol extract of *M. rumphii* Becc. in line with the discovery of flavonoid and triterpenoid/steroid group compounds in methanol extract plants of *M. beccarii*, *Myrmecodia* sp., and *Hydnophytum* sp. [10]. The content of alkaloids and phenolic compounds in *M. rumphii* Becc. in line with the class of compounds contained in *M. pendens* while the presence of tannin class compounds is the same as *M. beccarii* [9].

Phytochemical test results supported the results of previous studies that showed the antioxidant activity of ant plant *M. rumphii* Becc. which is very high [2]. Antioxidant activity is generally owned by phenolic and flavonoid compounds and some terpenoids, steroids, alkaloids, and tannins. Methanol and ethyl acetate extracts contain flavonoid and phenolic compounds, these results are in line with the high antioxidant activity of both extracts. Antioxidant activity of ant plants is related to hydroxyl groups found in flavonoid and phenolic compounds that can donate hydrogen atoms to neutralize DPPH free radicals. When a compound that can donate a hydrogen is mixed with DPPH solution, this free radical will be reduced to non-radical form with loss of violet color. The more hydroxyl groups, the more reduction reactions can occur with DPPH [12]. Ethyl acetate extract of *M. rumphii* Becc. showed inhibition of 92.66% and 91.58% of radical DPPH, respectively [2]. Reference [13] wrote that the ethyl acetate extract of *H. formicarum* Jack's ant nest. showed highest scavenging activity (83.31%) with IC₅₀ 8.40 µg/ml.

Isolation of compounds in ethyl acetate extract of *H. formicarum* Jack produce flavonoid compounds isoliquiritigenin, butin, butein and protocatechualdehyde phenolic compounds thus it can be proposed that the antioxidant potential of ethyl acetate fraction of *H. formicarum* Jack comes from the presence of these compounds. With this analogy, it can be said that high antioxidant activity in plant extracts of *M. rumphii* Becc. caused by phenolic compounds

and flavonoids contained therein. Flavonoids are antioxidants that are very effective in repairing and protecting cell structures [14].

Cytotoxicity of methanol extract *M. rumphii* Becc. against *A. salina* Leach shrimp larvae was indicated by LC₅₀ 0.48µg / ml (very toxic). This cytotoxicity is also affected by the presence of flavonoid compounds that inhibit the eating power of larvae and stomach poisoning. Larval digestive devices will be disrupted by the presence of these compounds. In addition, this compound inhibits the taste receptors in the mouth area of the larvae thus the larvae fail to get a taste stimulus. As a result the larvae fail to recognize the food thus the larvae die of starvation [15].

IV. CONCLUSION

M. rumphii Becc. Sarang semut plants contain various compounds from triterpenoid, steroid, flavonoid, phenolic, alkaloid, and tannin groups which are scattered in various levels of polarity extracts ranging from n-hexane extract, methylene chloride, ethyl acetate, and methanol with high antioxidant and cytotoxicity activity.

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