Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.3, No.4, 2013

Phytochemical Analysis of Some Plants In Indonesia

Tukiran
Chemistry Department, Faculty of Mathematics and Natural Sciences, State University of Surabaya
Jl. Ketintang, Surabaya, 60231, East Java, Indonesia
E-mail of the corresponding author: btukiran@yahoo.com.

The research is financed by Directorate General of Higher Education, Indonesian Ministry of National Education. Grant Number: 081/38/HK/LT/2013.

Abstract
Phytochemical analysis of eight plants in Indonesia such as *Aglaia odorata* Lour (Meliaceae), *Aglaia odoratissima* Blume (Meliaceae), *Xylocarpus moluccencis* (Lamk.) M.Roem (Meliaceae), *Rhizophora apiculata* Bl. (Rhizophoraceae), *Rhizophora stylosa* Griff. (Rhizophoraceae), *Rhizophora mucronata* Lamk. (Rhizophoraceae), *Bruguiera gymnorrhiza* Lamk. (Rhizophoraceae), and *Avicennia marina* (Forsk.) Vierh. (Verbenaceae) were investigated. A phytochemical analysis for the detection of triterpenoids, steroids, alkaloids, phenolic compounds, saponins and flavonoids, was performed using standard procedures. Hexane, chloroform, and methanol were used as solvents. Bioactive ingredient such as triterpenoids, alkaloids and phenolic compounds were detected in most of the plant parts tested. Saponin was not detected in any of the plant extracts, except MeOH extract of *Aglaia odorata* Lour.
Keywords: Meliaceae, Phytochemical, Rhizophoraceae, Verbenaceae

1. Introduction

The Meliaceae or the Mahogany family, is a flowering plant family of mostly trees and shrubs (and a few herbaceous plants, mangroves) in the order Sapindales. The family includes about 50 genera and 550 species (Pennington and Styles, 1975). Whereas, Rhizophoraceae is a family constituted by tropical or subtropical flowering plants. Among the better known members are mangrove trees of the genus *Rhizophora*. There are around 149 species distributed in sixteen genera, most native to the Old World (Stevens, 2001). Then, Verbenaceae family includes around 75 genera and 3000 species of herbs, shrubs and trees of tropical and subtropical parts of the world (Conn, 1992). Verbenaceae is a family of mainly tropical flowering plants growth in Indonesia well. Phytochemical surveys are now seen as the first step towards the discovery of useful drugs now that the tropical rain forest has been identified as a potential source due to its diverse richness in flora (Rathi *et al*., 2008). The main objectives of the research was to study the preliminary phytochemical analysis of the plants belonging to three families above, i.e. the stem bark or bark of 8 plants such as *Aglaia odorata* Lour (Meliaceae), *Aglaia odoratissima* Blume (Meliaceae), *Aglaia elaeagnoidae* (Meliaceae), *Xylocarpus moluccencis* (Lamk.) M.Roem (Meliaceae), *Rhizophora apiculata* Bl. (Rhizophoraceae), *Rhizophora stylosa* Griff. (Rhizophoraceae), *Rhizophora mucronata* Lamk. (Rhizophoraceae), *Bruguiera gymnorrhiza* Lamk. (Rhizophoraceae), and *Avicennia marina* (Forsk.) Vierh. (Verbenaceae) (see Table 1).

2. Material and Methods

2.1 Collection of plant materials

The stem bark or bark of 8 selected plants was collected from East Java, Indonesia. The selected plants were identified at Herbarium LIPI, Purwodadi, Pasuruan, East Java where the specimens were deposited**.**

2.2 Preparation of solvent extracts

All of the plants washed with tap water were shade dried for two – three weeks and then powdered with the help of a blender. 50 g each of the stem bark or bark powder samples of *Aglaia odorata* Lour (Meliaceae), *Aglaia odoratissima* Blume (Meliaceae), *Xylocarpus moluccencis* (Lamk.) M.Roem (Meliaceae), *Rhizophora apiculata* Bl. (Rhizophoraceae), *Rhizophora stylosa* Griff. (Rhizophoraceae), *Rhizophora mucronata* Lamk. (Rhizophoraceae), *Bruguiera gymnorrhiza* Lamk. (Rhizophoraceae), and *Avicennia marina* (Forsk.) Vierh. (Verbenaceae) separately were successively extracted by maceration with hexane, chloroform, and methanol. The extracts were tested for triterpenoids, steroids, alkaloids, phenolic compounds, saponins and flavonoids. The various phytochemical tests

were performed with slight modification to find out the secondary metabolites (Harborne, 1996 and Rathi, *et al*., 2008).

2.3 Preliminary phytochemical tests (Harborne, 1996 and Rathi *et al*., 2008)
The phytochemical tests were carried out to find the presence of the chemical constituents such as steroids, triterpenoids, alkaloids, phenolic compounds, flavonoids and saponins by the following procedures:

2.3.1 Alkaloids
Chloroform extract was added ammonia until getting pH value 8 – 9, filter then the extract that was neutralized with 2 ml sulfuric acid 2N. Aqueous layer formed, taken and to which are added one or two drops of Mayer's reagent. Alkaloid solution produces white yellowish turbidity or precipitate when a few drops of Mayer's reagents are added.

2.3.2 Triterpenoids and steroids
A few extract was treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then, concentrated solution of sulfuric acid was added slowly. The test is called "*Libermann-Burchard Test*". The samples were then observed yielding red violet color for triterpenoid and green bluish color for steroids.

2.3.3 Phenolic compounds
Alcoholic solution of test solution was added one drop of ferric chloride 5%. The samples were then observed giving intense color (green, red, purple, blue, or black) for the presence of phenolic compounds.

2.3.4 Flavonoids
A few extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 3 – 5 drops of concentrated hydrochloric acid was added. The test is commonly called "*Shinoda Test"* and red or blue color was observed for flavonoids (Markham, 1988).

2.3.5 Saponins
Test solution was added by H_2O and shaken well, foamy lather was appeared in the samples for saponins.

3. Result and Discussion
Air-dried stem bark or bark of *Aglaia odorata* Lour (Meliaceae), *Aglaia odoratissima* Blume (Meliaceae), *Xylocarpus moluccencis* (Lamk.) M.Roem (Meliaceae), *Rhizophora apiculata* Bl. (Rhizophoraceae), *Rhizophora stylosa* Griff. (Rhizophoraceae), *Rhizophora mucronata* Lamk. (Rhizophoraceae), *Bruguiera gymnorrhiza* Lamk. (Rhizophoraceae), and *Avicennia marina* (Forsk.) Vierh. (Verbenaceae) are successively macerated with hexane, chloroform, and methanol. The results of different extracts have been tested for steroids, triterpenoids, alkaloids, phenolic compounds, flavanoids and saponins as presented in Table 2.

As known that triterpenoids, steroids, and saponins are the classes of terpenoids. Triterpenoids, have developed structurally become several new types of class such as tetranortriterpenoids and limonoids, are chemical constituents abundantly found in Meliaceae family (Connolly and Hill, 2002; Castellanos *et al*., 2002; Jacobson, 1995; and Greger *et al.,* 2001). It was reported that almost all the tested plant possessed triterpenoids, except chloroform extract of *Aglaia odorata* and *Rhizophora mucronata.* However, it was known that *Aglaia odorata* are rich sources of phenolic compouds i.e. rocaglamide and its derivates (Proksch *et al*., 2001; Greger *et al*., 2001; Janprasert *et al*., 1993; and Nugroho *et al*., 1996a; 1996b).

Steroids is a type of organic compound that contains a characteristic arrangement of four cycloalkane rings that are joined to each other. Plants have a variety of more than 40 well-identified and studied sterols (Law, 2000 in Muhammet *et al*., 2006), which are termed *phytosterols* and are predominantly present in oilseed plants. Cereals are recognised as a significant source of phytosterols as well, whereas phytosterol content in vegetables and nuts is considerably lower (Piironen *et al*., 2000; Piironen *et al*., 2003; Normen *et al*., 1999 in Muhammet *et al*., 2006). In this work, it was informed that almost of the selected plants consist of steroids, except chloroforom extract of *Bruguiera gymnorrhiza, Aglaia odoratissima, Rhizophora mucronata,* and *Aglaia odorata.*

Alkaloids are a group of naturally occurring chemical compounds that contain mostly basic nitrogen atoms. This group also includes some related compounds with neutral and even weakly acidic properties (Manske, 1995). In the present study, almost all the plants showed the presence of alkaloids, except chloroform extracts of *Rhizophora apiculata* and *Bruguiera gymnirrhiza*.

As reported that phenolic compounds are plant secondary metabolites that constitute one of the most common and widespread groups of substances in plants. As stated by Harborne, the term "phenolic" or "polyphenol" can be precisely defined chemically as a substance which possesses an aromatic ring bearing one (phenol) or more (polyphenol such as flavonoids) hydroxyl substituents, including functional derivatives (esters, methyl ethers, glycosides, etc.)(Vincenzo, 2006). In this study, all extracts of the plants showed the presence of phenolic compounds, except hexane extracts of *Aglaia odorata* and *Aglaia odosatissima*.

Saponins are a class of chemical compounds, one of many secondary metabolites found in natural sources, with saponins found in particular abundance in various plant species. More specifically, they are amphipathic glycosides grouped, in terms of phenomenology, by the soap-like foaming they produce when shaken well in aqueous solutions, and, in terms of structure, by their composition of one or more hydrophilic glycoside moieties combined with a lipophilic triterpene derivative (Hottetsmann and Marston, 1995). It was reported only in MeOH extract of *Aglaia odorata* consisting of saponins in this study.

Harbone (1984 in Rathi *et al*., 2008) reported that flavonoids were mainly water insoluble and they could be extracted only with ethanol. Flavoinods are a group of compounds found in plants and plant-based foods. Flavonoids appear to have antioxidant properties that may lower the risk of some diseases. As reported that almost all of the plant kingdom possess flavones and flavonols. However, in the present study, it was recorded that chloroforom extracts of *Aviccenia marina, Bruguiera gymnorrhiza, Rhizophora stylosa, Rhizophora mucronata* and *Xylocarpus moluccencis* showed the presence of flavonoids.

4. Conclusion

It is concluded that in the present study, phytochemicals such as triterpenoids, alkaloids, and phenolic compounds were detected in most of the plant parts tested. Meanwhile, seven of eleven and five of eleven of the plant parts screened consist of steroids and flavonoids, respectively. Saponin was not detected in any of the plant extracts, except MeOH extract of *Aglaia odorata* Lour. Bioinsecticide studies of all the plant parts selected are in progress to know which plants are as effective source of bioinsecticides.

Acknowledgements

We would like to thank to our students for their support for this work. We also grateful to the Herbarium LIPI Staff, Purwodadi, Indonesia for identification of the plant.

References

Castellanos, L., Correa, R.S.D., Martinez, E. and Calderon, J.S. (2002). Oleanane Triterpenoids from *Cedrela Montana* (Meliaceae), *Z. Naturforsch*, 57c, 575–578.

Chhetri, Himal Paudel, Nisha Shrestha Yogol, Jyoti Sherchan, Anupa K.C., S. Mansoor and Panna Thapa, (2008). Phytochemical and Antimicrobial Evaluations of Some Medicinal Plants of Nepal, *Kathmandu University Journal of Science, Engineering and Technology,* Vol. I, No. V, September 2008, 49–54.

Conn, B.J. (1992). Verbenaceae. *Flora of New South Wales*. in G. J. Harden (ed.), NSW University Press: Kensington NSW, Vol. 3, 611 – 618.

Connolly, Joseph D. and Robert A. Hill. (2002). Triterpenoids, *Nat. Prod. Rep.*, 2003, 20, 640–659.

Greger, H., Pacher, T., Brem, B., Bacher, M., and Hofer, O. (2001). Insecticidal Flavaglines and Other Compounds from Fijian *Aglaia* Species, *Phytochemistry*, 57, 57–64.

Harborne, J.B. (1996). *Metode Fitokimia: Penuntun Cara Modern Menganalisis Tumbuhan*. Cetakan Kedua. Penerjemah: Padmawinata, K. dan I. Soediro. Bandung: Penerbit ITB.

Hostettmann, K. and A. Marston (1995). *Saponins*. Cambridge: *Cambridge University Press*. P. 3ff. ISBN 0-521-32970-1. Oclc 29670810.

Jacobson, M. (1995). Insecticides, Insect Repellants, and Attractants from Arid/Semiarid-Land Plants, 138–146.
Janprasert, J., Satasook, C., Sukumaland, P., Champagne, D.E., Ismant, M.B., Wiriyachitra, P., and Towers, G.H.N. (1993). Recoglamide, a Natural Benzofuran Insecticide from *Aglaia odorata, Phytochemistry*, 32 (1), 67–69.
Manske, R. H. F. (1965). *The Alkaloids. Chemistry and Physiology*. Volume VIII. – New York: Academic Press, p. 673.
Marliana, Soerya Dewi, Venty Suryanti, and Suyono (2005). The Phytochemical Screenings and Thin Layer Chromatography Analysis of Chemical Compounds in Ethanol Extract of Labu Siam Fruit (*Sechium edule* Jacq. (Swartz.), *Biofarmasi,* 3 (1), 26–31.
Michalak, A. (2006). Phenolic Compounds and Their Antioxidant Activity in Plants Growing under Heavy Metal Stress, *Polish J. of Environ. Stud.* 15(4), 523–530.
Muhammet Kemal G.l. and Samija Amar, (2006). Sterols and The Phytosterol Content In Oilseed Rape *(Brassica napus L.), Journal of Cell and Molecular Biology,* 5, 71–79.
Nugroho, B.W., Edrada, R.A., Gussregen, B., Wray, L. and Proksch, P. (1996a). Insecticidal Rocaglamide Derivates from *Aglaia duppereana*, *Phytochemistry*, 1455 –1461.
Nugroho, B.W., Edrada, R.A., Gussregen, B., Wray, L. and Proksch, P. (1996b). Insecticidal Rocaglamide Derivates from *Aglaia elliptica* and *Aglaia harmsiana*, *Phytochemistry*, 1579 – 1584.
Pennington, T.D. and Styles, B.T. (1975). A Generic Monograph of the Meliaceae, *Blumea,* 22, 419 – 540.
Proksch, P. and Endrada, R.A. (2001). Chemistry and Biological Activity of Roclagamide Derivates and Related Compound in *Aglaia* Spesies (Meliaceae), *Current Organic Chemistry*, 52, 253–263.
Rathi, J. Martin, S. Absara, K. Priyadharshini and V. Jegathambika, (2008). Qualitative Phytochemical Screening of Some Locally Available Insecticidal Plants, *Journal of Biopesticides*, 52–54.
Stevens, P.F. (2001). Angiosperm Phylogeny Website – Rhizophoraceae. Version 9, June 2008, http://www.mobot.org/MOBOT/Research/APweb/
Vincenzo Lattanzio, Veronica M. T. Lattanzio and Angela Cardinali. (2006). Role of Phenolics in the Resistance Mechanisms of Plants Against Fungal Pathogens and Insects, *Phytochemistry: Advances in Research*, 23–67.

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Table 1. Plant Used for the Preliminary Phytochemical Analysis

No.	Local name	Botanical name	Family	Part used
1.	Pacar Cina	*Aglaia odorata* Lour	Meliaceae	Stem Bark
2.	Pancal Kidang	*Aglaia odoratissima* Blume	Meliaceae	Stem Bark
3.	Nyiri Batu	*Xylocarpus moluccencis* (Lamk.) M.Roem	Meliaceae	Stem Bark
4.	Bakau Minyak	*Rhizophora apiculata* Bl.	Rhizophoraceae	Stem bark
5.	Api-api Jambu	*Avicennia marina* (Forsk.) Vierh	Verbenaceae	Stem Bark
6.	Bakau Daun Besar	*Bruguiera gymnorrhiza* Lamk.	Rhizophoraceae	Stem bark
7.	Bakau Hitam	*Rhizophora mucronata* Lamk.	Rhizophoraceae	Bark
8.	Bakau Merah	*Rhizophora stylosa* Griff.	Rhizophoraceae	Stem Bark

Table 2. Phytochemical Analysis of the Stem Bark or Bark of 8 Selected Plants

No.	Extracts	Triterpenoids	Steroids	Alkaloids	Phenolic Compounds	Saponins	Flavonoids
1.	$CHCl_3$ of RA	+	+	-	+	-	-
2.	$CHCl_3$ of AM	+	+	+	+	-	+
3.	$CHCl_3$ of BG	+	-	-	+	-	+
4.	$CHCl_3$ of RS	+	+	+	+	-	+
5.	$CHCl_3$ of AOs	+	-	+	+	-	-
6.	$CHCl_3$ of RM	-	-	+	+	-	+
7.	Hex. of AO	+	+	+	-	-	-
8.	$CHCl_3$ of AO	-	-	+	+	-	-
9.	MeOH of AO	+	+	+	+	+	-
10.	Hex. of AOs	+	+	+	-	-	-
11.	$CHCl_3$ of XM	+	+	+	+	-	+

- : Absent +: Present

AM: *Avicennia marina,* AO: *Aglaia odorata,* AOs: *Aglaia odoratissima,* BG: *Bruguiera gymnorrhiza*, RS: *Rhizophora stylosa,* RM: *Rhizophora mucronata,* RA: *Rhizophora apiculata*, and XM: *Xylocarpus moluccencis.*

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