Evaluation of Antimicrobial Activities of Garcinia latissima Miq. Stem Bark Extract

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ABSTRACT

Introduction: To evaluate the antimicrobial activities of hexane, ethyl acetate, and methanol extracts from the stem bark of Garcinia latissima Miq.

Method: The G. latissima Miq. was collected from Bogor. This study uses multilevel maceration extraction methods. The antimicrobial activity was determined by the good diffusion method and the broth dilution method.

Result: The ethyl acetate extracts of stem bark were active against Bacillus subtilis, aeruginosa, and Ps aeruginosa, and virtually inactive against Escherichia coli, Candida albicans, and Trichophyton mentagrophytes. The methanol extracts of stem bark were active against B. subtilis and S. aureus, and virtually inactive against E. coli, P. aeruginosa, C. albicans, and T. mentagrophytes. The hexane extracts of stem bark were inactive against B. subtilis, S. aureus, E. coli, P. aeruginosa, C. albicans, and T. mentagrophytes. The 2% methanol extracts of G. latissima Miq. stem bark showed the maximum zone of inhibition against B. subtilis (10.70±0.638 mm), followed by the methanol extracts of G. latissima Miq. stem bark against S. aureus (10.38±0.653 mm). 2% Ethyl acetate extracts of G. latissima Miq. stem bark exhibited a maximum zone of inhibition against B. subtilis (10.35±0.867 mm) followed by P. aeruginosa (10.07±0.971 mm). The results of the antibacterial activity showed that the MeOH extract of G. latissima Miq. stem bark exhibited activities against B. subtilis (MIC/MBC = 625 ppm/2500 ppm) and S. aureus (MIC/MBC = 2500 ppm/5000 ppm). The ethyl acetate extract of G. latissima Miq. stem bark exhibited activities against P. aeruginosa (MIC/MBC = 5000 ppm/5000 ppm) and B. subtilis (MIC/MBC > 5000 ppm/5000 ppm).

Conclusion: The results of the present study revealed most valuable information and also support the continued sustainable use of G. latissima Miq. stem barks in a traditional system of medicine.

Key words: Garcinia latissima, Antimicrobial activities, Stem bark extract, Hexane, Ethyl acetate, Methanol.

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INTRODUCTION

Genus Garcinia comprises 180 species,¹ Clusiaceae (Guttiferae), a largely tropical woody is a family of a 27 genera and 1,090 species, largely restricted to lowland tropics.²,³ Many Clusiaceae from the New World tropics produce resin,² the yellow sap that is used as source of gamboge paint and varnish, e.g. G. mangostana, G. dulcis (Thailand, India, Sri Lanka), G. hanburyi (Thailand), G. morrelia (India). Some of this family is known as traditional medicine, for example, the roots of G. picorrita Meg. and G. atroviridis as fever-lowering drugs, juice leaves given to the woman who runs the maternity, G. cowa Roxb. has been used in Thai folk medicine for its antipyretic property.⁴,⁵ Extracts of G. mangostana showing inhibitory effects against the growth of S. aureus.⁶ Extracts derived from leaves of G. daedalanthera showed inhibitory activity against α-glucosidase enzyme significantly, with IC50 value of 2.33 ug/mL.⁷ Garcinia sp. (Guttiferae) is a reach source of xanthones and various bioactivities of xanthones.⁸ Constituents of EtOH extracts of the stem bark of G. latissima Miq., collected in Central Province of Papua New Guinea were studied.⁹ A novel four new pyranoxanthone named latissaxathone-A, -B, -C, and -D were isolated.⁹ Latissaxathone-MC might be valuable anti-tumor promoters.⁹ MeOISolubles of the Papua New Guinea Garcinia sp. stem barks extracts showed potential antibacterial activity Bacillus subtilis and Staphylococcus aureus.¹⁰ In the area of Papua, there are plants that are empirically has been used as itchy medicine by the local community, i.e. Garcinia latissima. The other potential activity of compounds derived from Garcinia latissima Papua Indonesia has not been studied yet and the data are still limited. Therefore, it will be investigated the biological activities of Garcinia latissima plant originating from Indonesia’s Papua for antimicrobial. The aim of this study it was to develop the native flora of Papua, Indonesia in an attempt to obtain novel drug mainly for an anti-microbial active compound as an alternative to antibiotic drugs which are now resistant to many antibiotics. We examined the anti-microbial activity of hexane, ethyl acetate, and methanol extracts of stem bark of G. latissimain this study and as well the minimal inhibitory concentrations of the active extract. This plant is found in Seram Maluku and Papua but has been cultivated in Bogor Botanic Garden; the local name of Garcinia latissima Miq is Dolomagota (Maluku).¹¹,¹²

MATERIAL AND METHODS

Materials

Garcinia latissima Miq. stem bark were collected from Center for Plant Conservation Botanic Gardens, Indonesian Institute of Sciences. They were identified at The Center for Plant Conservation Botanic Garden, Indonesian Institute of Sciences.
Methods

Extract Preparation
Preparation of stem bark material begins with collecting the stem bark (5.008 kgs) from the healthy plant which is not contaminated with fungi, bacteria, or viruses collected. Determination of plants was conducted to determine the classification of these plants. After washing to remove dirt, a small cut of simplicia were dried at room temperature, or in the oven, to prevent microbial fermentation and degradation of metabolites; besides to minimize chemical reactions that can occur as a result of ultraviolet rays from direct sunlight. Dried material was stored in a sealed container in a cool, dry place. Storage for too long must be avoided, as it can decipher some of the compounds. Milling was done to increase the yield of the extract by expanding the surface area of the sample and solvent penetration into cells. This study uses multilevel maceration extraction methods. 2.116 kgs dried powdered stem bark material was extracted by repeated maceration with (5 x 8L) for 24 hours at room temperature using various solvents: hexane, ethyl acetate, and methanol in a row. The solvents used were a technical level purchased from PT Duta Pratama Chemika, Bogor, Indonesia and was distilled before used. After extraction, the extracts were separated from the solvent by filtration through Whatmann No. 1 filter paper and the filtrate was evaporated to dryness under reduced pressure using rotary evaporator. The residue (crude extract) was collected and stored at 4°C before used.

Phytochemical Screening
The extracts of Garcinia latissima Miq. stem bark were qualitatively tested for detection of tannins, saponins, flavonoids, anthraquinons, terpenoids, and alkaloids following standard phytochemical procedures. The experiment was conducted in triplicates.

Antimicrobial Activity: Inhibition Zone Test
The antimicrobial screening was carried out using the well diffusion method. Four bacterial strains were used in first step as qualitative test for detection of bacteria, or viruses collected. Determination of plants was conducted to determine the classification of these plants. After washing to remove dirt, a small cut of simplicia were dried at room temperature, or in the oven, to prevent microbial fermentation and degradation of metabolites; besides to minimize chemical reactions that can occur as a result of ultraviolet rays from direct sunlight. Dried material was stored in a sealed container in a cool, dry place. Storage for too long must be avoided, as it can decipher some of the compounds. Milling was done to increase the yield of the extract by expanding the surface area of the sample and solvent penetration into cells. This study uses multilevel maceration extraction methods. 2.116 kgs dried powdered stem bark material was extracted by repeated maceration with (5 x 8L) for 24 hours at room temperature using various solvents: hexane, ethyl acetate, and methanol in a row. The solvents used were a technical level purchased from PT Duta Pratama Chemika, Bogor, Indonesia and was distilled before used. After extraction, the extracts were separated from the solvent by filtration through Whatmann No. 1 filter paper and the filtrate was evaporated to dryness under reduced pressure using rotary evaporator. The residue (crude extract) was collected and stored at 4°C before used.

Results and Discussion
Preliminary phytochemical group tests revealed that different extracts of Garcinia latissima Miq. stem bark contain tannins, saponins, alkaloids, and flavonoids (Table 1). The results of the antimicrobial efficacy of hexane, ethyl acetate and methanolic extracts of G. latissima stem barks are presented in Table 2. All of the extracts show the inhibition against the selected pathogens. The zone of inhibition of various extracts of G. latissima Miq. was compared to the commercially available standard antibiotic disc. The standard antibiotics showed positive results against the microbial. Erythromycin against B. subtilis (25.55 mm), gentamycin against S. aureus (22.70 mm), amoxicillin against E. coli (23.85 mm), ciprofloxacin against (21.95 mm), however, S. aureus, B. subtilis and P. aeruginosa were resistant to the hexane extracts of G. latissima Miq. stem bark. E. coli, C. albicans, and T. mentagrophytes were resistant to the ethyl acetate, hexane, and methanol extracts of G. latissima Miq. stem bark. The methanol extracts of G. latissima Miq. stem bark showed the largest zone of inhibition against B. subtilis (10.35 ± 0.867 mm), followed by the methanol extracts of G. latissima Miq. stem bark against S. aureus (10.38 ± 0.653 mm) (Table 3). Ethyl acetate extracts of G. latissima Miq. stem bark exhibited the largest zone of inhibition against B. subtilis (10.35 ± 0.867 mm), followed by P. aeruginosa (10.07 ± 0.971 mm) (Table 3). The results of the antibacterial activity showed that the MeOH extract of G. latissima Miq. stem bark exhibited activities against B. subtilis (MIC/MBC = 625 ppm/2500 ppm) and S. aureus (MIC/MBC = 2500 ppm/5000 ppm). The ethyl acetate extract of G. latissima Miq. stem bark exhibited activities against P. aeruginosa (MIC/MBC = 5000 ppm/5000 ppm) and B. subtilis (MIC/MBC > 5000 ppm/5000 ppm). Maceration method is suitable for both initial and bulk extraction. The main disadvantage of maceration is that the process can be quite time-consuming, can also consume large volumes of solvents and can lead to the potential loss of metabolites. Some compounds may not be extracted efficiently if they are poorly soluble at room temperature. On the other hand, maceration is less likely to lead to the degradation of thermolabile metabolites. Solvent extraction has been performed by process selected. The physical-chemical properties of some common solvents used in natural product extraction are as follows: polarity index of n-hexane 0.0, polarity index of ethyl acetate 4.4, polarity index of methanol 5.1. The initial choice of the most appropriate solvent is based on its selectivity for the substances to be extracted. A selective extraction can also be performed sequentially with solvents of increasing polarity. Medicinal plants contain thousands of substances that could be used for therapeutic purposes. They are precursor for the synthesis of useful drugs and are safe to human health. The growing population concern about health problems has recently led to the development of natural antimicrobials to control microbial disease. The antimicrobial activity found in the plant extracts have been...
attributed to some of the secondary metabolites. Preliminary phytochemical screening revealed that different solvents of extract of *Garcinia latissima* Miq. contain tannins, saponins, flavonoids, and flavonoids (Table 1). The antibacterial activity of plant extracts was not only due to one main active chemical but to the combined action of additional other compounds. It is clear that the chemical structure of the antimicrobial agents found in higher plants belong to most commonly encountered classes of higher plant secondary metabolites. It was reported that the extraction with different types of solvents affect antimicrobial activity inhibition zone. Methods to detect antimicrobial activity can be classified into three groups: diffusion, dilution, and bioautography. The advantage of the diffusion method is high suitability for screening pure substances. Diffusion method is a method that is using disc, holes, or cylinders for sample reservoirs. Dilution method was using a solution or suspension of microbes with a certain concentration. Dilution and diffusion methods can be used both antimicrobial and qualitative test for the determination of minimum inhibitory concentration (MIC) of the mixture (such as extracts) or the pure compound. *G. latissima* Miq. stem bark methanolic extracts showed the highest antimicrobial effect. The MIC and MBC values against *B. subtilis* are 625 and 5,000 ppm. The MIC and MBC values against *S. aureus* are 2,500 and 5,000 ppm. *G. latissima* Miq. stem bark ethyl acetate extracts showed MIC/MBC values against *P. aeruginosa* 5,000 ppm. In vitro antibacterial effects especially against *B. subtilis* and *S. aureus*. The result presented here may explain the traditional use of this plant.

### CONCLUSION

The results of the present study revealed most valuable information and also support the continued sustainable use of *G. latissima* Miq. stem barks in traditional system of medicine. Moreover, a continuous and progressing research is to be conducted to prove the biological ingredients and test the safety, efficiency and to determine the types of compounds responsible for the antimicrobial effect of *G. latissima* Miq stem bark. *G. latissima* Miq. stem bark methanolic extracts showed good in vitro antibacterial effects especially against *B. subtilis* and *S. aureus*. The result presented here may explain the traditional use of this plant.

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### CONFLICT OF INTEREST

No conflict of interest are declared.

### ABBREVIATION USED

- **G. latissima**: *Garcinia latissima*; **MIC**: The minimum inhibitory concentration; **MBC**: The minimum bactericidal; **ATCC**: The American Type Culture Collection; **IZ**: The inhibition zone.

### REFERENCES


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