

Phytochemical Screening and Antibacterial Activity of Senduduk Leaves (*Melastoma malabathricum* L.)

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ABSTRACT

Melastoma malabathricum L. leaves is a traditional plant native to tropical Asia, subtropical, and Pacific islands. This study aimed to investigate the antibacterial activity of senduduk leaves (*Melastoma malabathricum* L.) against bacteria *Streptococcus pyogenes*, and *Klebsiella pneumoniae*. Method of extraction done by maceration using ethanol 70% to get the extract. The antibacterial activity of the extracts was determined by using Kirby-Bauer Disc Susceptibility Test and with a concentration of 25%, 50% and, 75%. The inhibition zone was recorded from senduduk leaves (*Melastoma malabathricum* L.) extract to indicate the highest antimicrobial activity from this plant. Based on the results of this study, the extract leaves can inhibit the growth of *Streptococcus pyogenes* in concentration 75% (21.8 mm) and *Klebsiella pneumoniae* in concentration 75% (16 mm). The phytochemical analysis detected the presence of alkaloids, flavonoids, saponins, tannins, and terpenoids. The findings may be helpful to future investigators in identifying alternative and new bioactive secondary metabolites like antibiotics to treat resistant human pathogens.

Keywords: *Melastoma malabathricum* L, Phytochemical Screening, Antibacterial; Kirby-Bauer Disc Susceptibility Test.

1. INTRODUCTION

Infectious diseases are one of the biggest problems in the health sector. Infections can be transmitted from animals as well as from humans themselves. In developing countries, the main disease sequence is occupied by various infectious diseases [1]. One of them is Indonesia with the highest morbidity and mortality rates caused by various infectious diseases. These infections are caused by pathogenic microorganisms such as viruses, bacteria, fungi, and parasites [2]. Some of the bacteria that cause infection are *Streptococcus pyogenes* and *Klebsiella pneumoniae*. *Streptococcus pyogenes* is a Gram-positive spherical bacterium that can cause various infections such as pharyngitis, impetigo, endocarditis, pyoderma [3]. *Klebsiella pneumoniae* is a Gram negative bacteria, can cause nosocomial infections and community infections [4]. One of the efficacious medicinal plants used by the community is the Senduduk plant (*Melastoma malabathricum* L.). The Senduduk leaves has benefits as an antibacterial, antioxidant, anti-inflammatory, and antiseptic. [5]

This study aimed to investigate phytochemical screening and the efficacy of the ethanolic extract of the

leaves of *Melastoma malabathricum* L. against the bacteria *Streptococcus pyogenes* and *Klebsiella pneumoniae* using the paper disc diffusion method with concentrations of 25%, 50%, and 75%.

2. MATERIALS AND METHODS

The tools used are Rotary evaporator (Heidoph), autoclave (Nesco®), paper disc (Macherey Nagel).

The materials used are Senduduk leaf extract (*Melastoma malabathricum* L.), 70% ethanol, Mueller Hinton Agar (MHA), Aquadest, DMSO, 0.9% physiological sodium chloride (NaCl), Magnesium (Mg), concentrated HCl, Mayer's reagent, 1% FeCl₃, concentrated H₂SO₄, CH₃COOH, BaCl₂.2H₂O, Chloral hydrate, Tetracycline antibiotics, and pure cultures of *Streptococcus pyogenes* ATCC 19615 and *Klebsiella pneumoniae* ATCC 1706.

2.1. Sample Collection and Preparation

The plant material was collected randomly taken from Dabo Singkep area, Riau Islands. The identification process has been carried out at the Biology Herbarium, Faculty of Mathematics and Natural Sciences, Andalas University Padang, with identification number 168/K-ID/ANDA/VI/2020.

The fresh leaves of *Melastoma malabathricum* L were cleaned thoroughly by using tap water, dirt particles were removed and they were shade dried for 3 days. After drying, the leaves were grinded into a fine powder. The powder was stored in an air-tight container for further use. The powdered plant material was extracted successively with ethanol 70%, and then vacuum dried in a rotary evaporator (Heidoph). All steps were carried out in dark condition.

2.2. Phytochemical Screening

Qualitative phytochemical analysis of the extract was determined by the methods screening tests of tannins, flavonoid, alkaloids, saponin, steroid, and terpenoid as described by Harborne (1987) [6].

2.3. Microbial Strain

The test organisms are *Staphylococcus pyogenes* ATCC 19615, and *Klebsiella pneumoniae* ATCC 1706. Stock cultures were maintained on nutrient agar slants at 4°C and sub cultured in nutrient broth at 37°C before each antimicrobial test.

2.4. Antibacterial Activity Testing

Antibacterial activity testing was carried out using the Kirby-Bauer (KB) method against *Staphylococcus pyogenes* and *Klebsiella pneumoniae*. The concentration extract of the following amounts 25%, 50% and, 75%. Tetracycline 2.5% as a positive control and 5% DMSO as a negative control. In this test, bacteria culture solutions contain a turbidity standard of 0.5 x 10⁶ CFU/ml prepared in normal saline and spread on sterile Mueller Hinton agar plates using the spread plate technique. Then discs containing different concentrates extract, Tetracycline, and DMSO were placed on an agar plate where the selected bacteria were grown. The plates incubated at 37°C for 24 hours. After incubation, the zone of inhibition was recorded. All the tests were performed in triplicates and were repeated three times [7].

2.5. Data Analysis

The experimental were repeated three times, using descriptive data analysis and data presentation in the form of tables. The statistical data such as means and standard deviations was performed using ANOVA (SPSS

software for Windows, version 17.0). The significance of the differences was determined by Tukey’s test at $P < 0.05$

3. RESULTS AND DISCUSSION

3.1. Phytochemical Screening

The photochemical analysis of *Melastoma malabathricum* L. leaves revealed the presence of alkaloids, flavonoids, saponins, tannin, and terpenoid.

Alkaloids can interfere with the integrity of the peptidoglycan component of bacterial cells, flavonoids can bring destruction upon the bacteria as it could cause the membrane to leak out cell material. Other studies had also documented that medicinal plants contain coumarins, flavonoids, phenolics, alkaloids, terpenoids, tannins, and polyacetylenes which have the potential as a bactericidal, bacteriostatic, or fungicidal effect against selected human pathogens [Motaleb, 2011;Dholaria, 2018.] [8].

It is known that saponins are strong hemolytic agents and have soap-like properties. The function of saponins is as an antimicrobial, anti-inflammatory, and anti-cytotoxic.

Table 1. Qualitative phytochemical screening of senduduk leaves (*Melastoma malabathricum* L.)

Phytochemical test	Reagent	Results
Alkaloid	Mayer	+
Flavonoid	Mg, HCL conc.	+
Saponin	Froth test	+
Tannin	FeCL ₃ 1%	+
Steroid	Acetic acid, H ₂ SO ₄ conc.	-
Terpenoid	Acetic acid, H ₂ SO ₄ conc.	+

3.2. Antibacterial Activity Testing

Table 2 summarizes the average microbial growth inhibition of senduduk leaves (*Melastoma malabaricum* L.) extracts. From the results, it can be seen that the concentrations 75% of the extract against *Streptococcus pyogenes* and *Klebsiella pneumoniae* gave a higher inhibition zone compared to other concentrations. This due to the sensitivity of the extract depends on the level of the concentration when it is used against certain microorganisms [9].

The findings of the study may be helpful to future investigators in identifying alternative and new bioactive

secondary metabolites like antibiotics to treat resistant human pathogens. Tannins have chelating properties that have a spasmolytic effect which causes cell membranes to become wrinkled so that it interferes with cell growth [10]

Table 2. Zone of Inhibition from Different Concentrations of Senduduk Leaves (*Melastoma malabathricum L.*) Extract (mm)

Microbes	Concentration			Control positive	Control Negative
	25%	50%	75%	Tetra cyclin	DMSO
<i>S. pyogenes</i> ATCC 19615	14,8	19,7	21,8	33,3	0
<i>K. pneumoniae</i> ATCC 1706	11,7	13,8	16	27,5	0

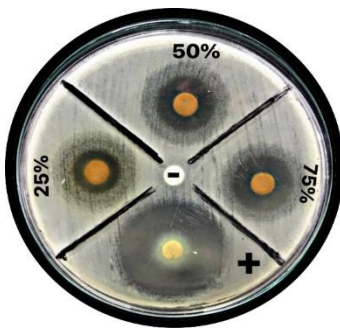


Figure 1. The Results of *Streptococcus pyogenes* antibacterial activity test

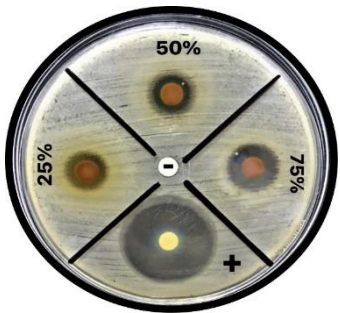


Figure 2. The Results of *Klebsiella pneumoniae* antibacterial activity test

AUTHORS’ CONTRIBUTIONS

The author do contributions to research directly.

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