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2020-2021(Artikel 8. eai.12-10-2019.2296364(MSCEIS2020).pdf

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CHARACTER COUNT

10962 Characters

PAGE COUNT

5 Pages

FILE SIZE

192.3KB

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Antibacterial Activity of *Lannea coromandelica* Extract

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Abstract. The aim of this research was to determine the antibacterial activity of *Lannea coromandelica* extract. The *klika* of *L coromandelica* was extracted by wet and dry method using ethyl acetate and ethanol 70% that acquired 4 types of extracts namely ethanol extract 70% of wet *klika Kayu Jawa* (KJBE70%), extract ethanol 70% of dry *klika Kayu Jawa* (KJKE70%), ethyl acetate extract of dry *klika Kayu Jawa* (KJKEA), and extract of wet *klika Kayu Jawa* (KJBEA). Extracted by maceration, and then examined their antibacterial activity. The results from this research shown that all extracts have an antibacterial activity to inhibited bacteria growth which includes *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas sp.*, and *Vibrio parahaemolyticus*.

Keywords: *Lannea coromandelica*, Antibacterial activity, Extract

1 Introduction

Kayu Jawa (*Lannea coromandelica*) is a plant of the Anacardiaceae family, a tropical tree and grows wildly and hence it is available in various places. *L. coromandelica* is spread in various regions, namely the Himalayas (Swat-Bhutan), Assam, Burma, Indo-China, Ceylon, Andanan Island, China, and Malaysia [1]. *L. coromandelica* is also widely distributed on the island of Sulawesi, especially in the South Sulawesi region. *L. coromandelica* is not only used as a hedge and fodder plant, but has been empirically used by the people of South Sulawesi, especially the Bugis and Makassar tribes as traditional medicine because *L. coromandelica* has a property that is believed to be very effective in treating internal and external wounds such as mouth sores, toothache, abdominal pain, diarrhea, eye pain, gout, bruises, scratches, and burns. Other uses of *L. coromandelica* are analgesic, anti-ulcer, and aphrodisiac, the sap is for healing wounds, the leaves treat swelling due to sprains, and have the potential to be used as antioxidants, antimicrobial, and anti-inflammatory [2]. Besides that *L. coromandelica* contains carbohydrate compounds, steroids, glycosides, terpenoids, tannins, and flavonoids [3].

Antibacterial is a substance or drug to eradicate microorganisms obtained from synthesis or derived from non-organic compounds. [4] in their research on the potential of methanol extract of *L. coromandelica* bark showed that had an antibacterial effect against *Staphylococcus aureus* bacteria and was thought to contain 5-hydroxymethylfurfural active compounds and 1,2,3-benzenetiolitol antibacterials.

In general, *L. coromandelica* has been used as traditional medicine, but scientific studies are still limited. Therefore, it has the potential to be scientifically developed as a source of herbal raw materials that are antibacterial due to the presence of bioactive compounds. This study aims to determine the antibacterial activity of *L. coromandelica* extract.

ICSCEIS 2019, October 12, Bandung, Indonesia
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DOI 10.4108/eai.12-10-2019.2296364

2 Methods

2.1 Preparation of Sample

Samples of *L. coromandelica* were obtained from Pattojo, Soppeng Regency, South Sulawesi. *Klika* samples were taken and collected as much as 5 kg then fresh clica was wet sorted, and washed with water then air-dried. *L. coromandelica* sample consists of 2 types, namely wet and dry samples. *L. coromandelica* which is taken directly and then shredded is called wet simplicia while dry *L. coromandelica* simplicia is prepared by shredded and then wrapped in aluminum foil and put in an oven at 40 ° C for a certain time and declared dry after weighing the material until a constant weight is obtained and then blended using a blender until a dry simplicia powder is obtained.

2.2 Extraction

Wet and dry *L. coromandelica klika* was extracted using the maceration method and used 2 types of solvents namely ethyl acetate and 70% ethanol. Wet and dry *L. coromandelica klika* samples were weighed as much as 350 grams, put into each jar and soaked with each solvent until simplicia was submerged then covered with aluminum foil that had been perforated with occasional stirring. The solvent is replaced every 1 x 24 hours and is repeated 3 times. The soaked sample is filtered using a whatman filter paper to produce pulp and macerate. Macerate was concentrated using Rotary vacuum evaporator at a temperature of 40 °C to obtain 70% Ethanol extract of wet *L. coromandelica Klika* (KJBE70%), Ethyl Acetate extract of wet *L. coromandelica Klika* (KJBEA), Ethanol extract of 70% dry *L. coromandelica klika* (KJKE70%), Dry *L. coromandelica Klika* Ethyl acetate extract (KJKEA)

2.3 Antibacterial Activity

The antibacterial activity test of the *L. coromandelica* klika extract was carried out by observing the inhibition zone using the diffusion method by means of wells. Each petri dish contains 1 sample with 3 different concentrations as well as positive and negative controls. Samples used were KJBE70%, KJKE70%, KJBEA, and KJKEA. Tests using the bacteria *Staphylococcus aureus*, *Escherichia coli*, *Vibrio parahaemolyticus*, and *Pseudomonas sp*. and each treatment was repeated three times. *L. coromandelica* klika extract with a volume of 10 µl, negative control (DMSO), and positive control (tetracycline concentration of 2.5 x 10-3 mg / µl) were injected into Agar Nutrient medium wells. The treated petri dishes were incubated in an incubator at 37 ° C for 24 hours. Furthermore, the measurement of the inhibition zone diameter was measured using the calipers in millimeter (mm).

2.4 Statistical Analysis

Antibacterial activity data were statistically analyzed by using analysis of variance (ANOVA) at a significance level of $\alpha = 5\%$ then continued with Tuckey's further tests using SPSS (Statistical Package for Social Science) version 22.

3 Results and Discussion

3.1 Yield of Klika Kayu Jawa (*Lannea coromandelica*)

The highest extract results obtained from the maceration process of 350 g of the sample are KJKE70% of 20.09 g, KJBE70% of 18.22 g, KJBEA at 10.05 g and KJKEA at 6.18 g. The yield of each extract was 5.74%, 5.21%, 2.87%, and 1.76%, respectively. A comparison of yield results from the wet and dry *L. coromandelica* extract can be seen in Table 1

Table 1. The yield of extract *L. coromandelica*.

Extract	Yield (%)
KJBE70%	5.21
KJBEA	2.87
KJKE70%	5.74
KJKEA	1.76

3.2 Antibacterial Activity

Antibacterial activity of various concentrations of *L. coromandelica* extract was indicated by the presence of a clear zone around the well. The clear zone around the well is a diffusion area of the extract which inhibits bacterial growth. Inhibition Zone Diameter of all extracts can be seen in Table 2, Table 3, Table 4 and Table 5.

The results showed that KJBEA extract was the extract with the highest antibacterial activity compared to other extracts, this was because KJBEA extract contained phenolic compounds that had the ability to interfere with bacterial metabolism so that bacterial growth could be inhibited. In accordance with a phytochemical screening of *L. coromandelica* extract has secondary metabolites namely flavonoids, saponins, and tannins. This is consistent with the opinion of [5] which states that polar extract compounds can easily penetrate the cell walls of gram-negative bacteria due to the hydrophilic group. In addition, according to [6] the cell wall of Gram-negative bacteria contains a protein group called porin which forms hydrophilic pores in the outer membrane layer of the cell so that polar compounds can more easily penetrate the cell wall. flavonoids as antimicrobials by damaging the permeability of bacterial cell walls, microsomes and lysosomes [7].

The results showed that the 5% KJKEA extract was more sensitive to inhibiting the growth of gram-positive bacteria, namely *S. aureus* than gram-negative bacteria, this was because KJKEA extract had terpenoid compounds which belonged to non-polar compounds, terpenoids could inhibit the autolysin enzyme, thereby affecting cell growth, cell division, and the timing of the formation of peptidoglycan. This is in accordance with the opinion of [8] suggesting that gram-positive bacteria (*S. aureus*) are more sensitive to non-polar compounds due to the basic components of gram-positive cell wall compilers are peptidoglycan and one of the constituents is alanine amino acids which are hydrophobic (non-polar) so that it is easily penetrated by non-polar compounds.

The type of solvent used affects the antibacterial activity of *L. coromandelica* Klika extract. Semi-polar ethyl acetate solvent is more optimal for extracting antimicrobial compounds because it can dissolve more compounds. This is presumably because ethyl acetate has

hydrophilic and lipophilic properties so that the polarity becomes optimum and the antimicrobial substances obtained are maximal [9].

Table 2. Inhibition Zone Diameter of KJBE70%.

Experiment	Inhibition Zone Diameter (mm)			
	E. coli	*S. aureus*	*Pseudomonas sp.*	*V. parahaemolyticus*
Negative Control (DMSO)	7,00a	7,00a	7,00a	7,00a
KJBE70% 5%	7,00a	11,31b	15,00c	11,82b
KJBE70% 10%	7,00a	12,99b	16,51b	12,31b
KJBE70% 15%	7,00a	14,15b	17,85b	14,16b
Positive Control	38,88a	40,23a	36,57a	35,72a

Table 3. Inhibition Zone Diameter of KJKE70%.

Experiment	Inhibition Zone Diameter (mm)			
	E. coli	*S. aureus*	*Pseudomonas sp.*	*V. parahaemolyticus*
Negative Control (DMSO)	7,00a	7,00a	7,00a	7,00a
KJKE70% 5%	7,00a	7,00a	10,58b	7,00a
KJKE70% 10%	7,00a	7,00a	12,15b	10,98b
KJKE70% 15%	7,00a	7,00a	13,90c	11,61b
Positive Control	38,71a	40,70a	36,69a	37,95a

Table 4. Inhibition Zone Diameter of KJKEA.

Experiment	Inhibition Zone Diameter (mm)			
	E. coli	*S. aureus*	*Pseudomonas sp.*	*V. parahaemolyticus*
Negative Control (DMSO)	7,00a	7,00a	7,00a	7,00a
KJKEA 5%	7,00a	11,99b	7,00a	7,00a
KJKEA 10%	7,00a	10,32b	7,00a	7,00a
KJKEA 15%	7,00a	10,97b	7,00a	7,00a
Positive Control	38,53a	41,14a	39,03a	39,40a

Table 5. Inhibition Zone Diameter of KJKEA.

Experiment	Inhibition Zone Diameter (mm)			
	E. coli	*S. aureus*	*Pseudomonas sp.*	*V. parahaemolyticus*
Negative Control (DMSO)	7,00a	7,00a	7,00a	7,00a
KJKEA 5%	12,39a	14,40ab	18,43c	17,50bc
KJKEA 10%	12,75a	16,49b	18,55c	18,67c
KJKEA 15%	14,08a	16,41b	19,88c	20,14c
Positive Control	42,50b	41,83b	37,73a	40,15ab

4 Conclusion

Antibacterial activity test results showed that *L. coromandelica* all extracts have the antibacterial activity to inhibited bacteria test growth (Escherichia coli, Staphylococcus aureus, Pseudomonas sp., and Vibrio parahaemolyticus. The L. coromandelica klika ethyl acetate extract (KJBEA) had the highest antibacterial properties and inhibited the growth of all tests of bacteria, while the dry *L. coromandelica* klika ethyl acetate extract (KJKEA) had the lowest antibacterial properties and only inhibited the growth of Staphylococcus aureus bacteria.

Acknowledgments. The authors gratefully acknowledge the financial support by the Ministry of Research and Higher Education Indonesia and also to Universitas Negeri Makassar (UNM) for the use of laboratory instruments.

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