

**STUDY OF ANTIMICROBIAL ACTIVITY OF *Bruguiera cylindrica* LEAF
EXTRACT AGAINST *Escherichia coli* AND *Staphylococcus aureus***

By

Farida Almasyhur
14312033

BACHELOR'S DEGREE
in

ELECTRICAL ENGINEERING – BIOMEDICAL ENGINEERING
CONCENTRATION
FACULTY OF LIFE SCIENCES AND TECHNOLOGY



SWISS GERMAN UNIVERSITY
EduTown BSD City
Tangerang 15339
Indonesia

August 2016

Revision after Thesis Defense on 22nd July 2016

STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

Farida Almasyhur

Student

Date

Approved by:

Kholis Abdurachim Audah, PhD

Thesis Advisor

Date

Hery Sutanto, M.Si.

Thesis Co-Advisor

Date

Dr. Dipl.-Ing. Samuel P. Kusumocahyo

Dean

Date

Farida Almasyhur

ABSTRACT

STUDY OF ANTIMICROBIAL ACTIVITY OF *Bruguiera cylindrical* LEAF EXTRACT AGAINST *Escherichia coli* AND *Staphylococcus aureus*

By

Farida Almasyhur
Kholis Abdurachim Audah, PhD, Advisor
Hery Sutanto, M.Si, Co-Advisor

SWISS GERMAN UNIVERSITY

The aim of this study is to discover the antimicrobial activity of *Bruguiera cylindrica* leaf extract using three different solvent based on the level of polarity against two different grams of bacteria, *Escherichia coli* and *Staphylococcus aureus*. Zone of inhibition determination using agar-disk diffusion has been studied. Two different concentrations of each solvent - ethanol, water, and hexane, has been also studied. The result showed that the highest diameter of zone of inhibition against both bacteria was ethanol extract, which significantly yielded 14.30 mm diameter of zone of inhibition against *Staphylococcus aureus* and 13.30 mm diameter of zone of inhibition against *Escherichia coli*. Along with the result of inhibition zone determination, highest concentration of flavonoid and phenolic content yielded by ethanol extract with flavonoid compound concentration of 979.49 ± 28.32 mg QCE/100 g dry mass and total phenolic compound concentration of 1877.97 ± 39.88 mg GAE/100 g dry mass. In conclusion, ethanol extract was very effective to establish antimicrobial activity against multidrug bacteria.

Keywords: Bruguiera cylindrica, multidrug-resistant bacteria, antimicrobial activity, flavonoid, total phenolic content



SWISS GERMAN UNIVERSITY

DEDICATION

I dedicate this works for my beloved family



ACKNOWLEDGEMENTS

First of all, I want to thank Allah SWT for His blessings and guidance over all of this period of time. For giving me the strength to keep going from the very beginning until the end of the thesis work.

I place on my record, my sincere thanks to thank Mr. Kholis Abdurachim Audah, PhD as my advisor and Mr. Hery Sutanto, M.Si. as my co-advisor for ideas, insights, advices, concern and continuous encouragement despite their busy schedule during the thesis work.

This thesis work would not have been possible without the support of my big family for encouraging me in all of my pursuits and inspiring me to study as hard as I can. I am especially grateful to my parents and brothers, who supported me in each and every way, for their unconditional and endless love, and for believing in me.

I take this opportunity to also express gratitude to all my fellow Life Sciences and Technology friends, for their loads of help, all the happy moments during the stressful and hard time. Thank you for the sharing the joy and the hardships with me, I really embrace and appreciate all that we have gone through together. I wish you tons of luck for your future.

Last but not least, I would like to thank Life Sciences lecturers and staffs, also everyone who could not completely be mentioned for their help and support.

TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR	2
ABSTRACT.....	3
DEDICATION	5
ACKNOWLEDGEMENTS	6
TABLE OF CONTENTS	7
LIST OF FIGURES	9
LIST OF TABLES	10
CHAPTER 1 - INTRODUCTION	11
1.1. Background	11
1.2. Research Problems	12
1.3. Research Objectives	12
1.4. Significance of Study	13
1.5. Research Questions	13
1.6. Research Hypothesis	13
CHAPTER 2 - LITERATURE REVIEW	14
2.1. Plant as Natural Sources	14
2.2. Mangrove	14
2.2.1. <i>Bruguiera cylindrica</i>	15
2.3. Antibiotic and Multidrug Resistant Bacteria.....	18
2.3.1. <i>Staphylococcus aureus</i>	20
2.3.2. <i>Escherichia coli</i>	22
2.4. Potential Antimicrobial Agents	24
2.4.1 Flavonoid	24
2.4.2. Phenolic Compound	25
2.5. Antimicrobial Discovery	26
2.6. Extraction of Mangrove <i>Bruguiera cylindrica</i> leaves	27
2.7. Antimicrobial Activity Testing	27
2.7.1. Agar Disk-Diffusion Assays	27
2.8. Determination of Potential Antibacterial Agents	28
2.8.1. Thin Layer Chromatography	29
2.8.2. Folin-Ciocalteu Assay	30
2.8.3. Aluminum Chloride Assay.....	31
CHAPTER 3 – RESEARCH METHODS	32

3.1. Time and Venue	32
3.2. Materials and Equipment	32
3.2.1. Raw material	32
3.2.2. Chemical Materials	32
3.2.3. Other Materials	32
3.2.4. Equipment	33
3.3. Design of Experiment	33
3.4. Experimental Procedure	34
3.4.1. Raw material preparation	34
3.4.2. <i>Bruguiera cylindrica</i> leaves extraction	34
3.4.3. Reagent preparation	34
3.4.3.1. 0.5 M McFarland Standard	34
3.4.3.2. Concentrated sample preparation	34
3.4.3.3. Bacterial Culture Preparation	35
3.4.3.4. Nutrient Agar Preparation	35
3.4.3.5. 7.5% Sodium Carbonate Solution	35
3.4.3.6. Preparation of Gallic Acid Standard Curve	35
3.4.3.7. Preparation of Quercetin Solution Standard Curve	36
3.4.3.8. Folin reagent preparation	36
3.4.3.9. 10% Aluminum Chloride Solution	36
3.4.3.10. 1M Potassium Acetate Solution	36
3.4.4. Analysis of Extract	36
3.4.4.1. Antibacterial activity test by Disk-Diffusion Assay	36
3.4.4.2. Thin Layer Chromatography (TLC)	37
3.4.4.3. Total Phenolic Compound Testing	37
3.4.4.4. Total Flavonoid Content Testing	37
3.5. Data analysis	37
CHAPTER 4 – RESULTS AND DISCUSSIONS	39
4.1. Potential Antimicrobial Agent Content Analysis	39
4.1.1. Total Phenolic Content Analysis	39
4.1.2. Flavonoid Content Test	40
4.2. Thin Layer Chromatography	42
4.3. Antimicrobial Activity of <i>Bruguiera cylindrica</i> Leaf Extract	43
CHAPTER 5 – CONCLUSIONS AND RECOMENDATIONS	47
5.1. Conclusions	47
5.2. Recommendation	47
REFERENCES	48
APPENDICES	52
CURICULUM VITAE	59