

UNIVERSITI TEKNOLOGI MARA

**ANTIMICROBIAL ACTIVITY OF MALAYSIAN
HONEY AGAINST *STAPHYLOCOCCUS AUREUS*
AND *PSEUDOMONAS AERUGINOSA***

ABDUL MUHAIMIN MOHD NASIR @ NAZIR

**Dissertation submitted in partial fulfillment of the requirements for
the degree of Bachelor of Pharmacy (Hons.)**

Faculty of Pharmacy

January 2012

ACKNOWLEDGEMENT

Firstly, I would like to praise Allah SWT, whom with His willing giving me the opportunity to complete this study. I would like to thank my supervisor and co-supervisor Dr. Rozaini Mohd Zohdi and Assoc. Prof. Dr. Kalavathy A/P Ramasamy for giving me valuable suggestions, help enormously on polishing and formatting my work, and never stop supporting me throughout my research.

I would also like to thank the postgraduate students especially Siti Aisyah Sayadi for their on-going advice, guidance, and patience during my study. I would like to acknowledge staff and lecturer of Universiti Teknologi MARA specifically from Faculty of Pharmacy that had given valuable information, suggestions and guidance in the compilation and preparation of this study.

Deepest thanks and appreciation to my partner, Muhammad Affiq Muhammad and friends whom contributed directly or indirectly either by cooperation, encouragement and constructive suggestion from the beginning till the end.

Last but not least, my biggest thank should go to my family. Without their support and encouragement I could not have been what I am and where I am now.

TABLE OF CONTENTS

	Page
TITLE PAGE	
APPROVAL	
ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ABBREVIATIONS	vii
ABSTRACT	viii
CHAPTER ONE (INTRODUCTION)	1
1.1 Background	1
1.2 Problem Statement	3
1.3 Significance of Study	3
1.4 Objective of Study	4
1.5 Hypothesis	5
CHAPTER TWO (LITERATURE REVIEW)	6
2.1 <i>Staphylococcus aureus</i>	6
2.2 <i>Pseudomonas aeruginosa</i>	10
2.3 Honey	12
2.4 Antibacterial properties of Honey	13
2.5 Manuka Honey and Unique Manuka Factor	16
2.6 Malaysian Honeys	17
CHAPTER THREE (MATERIALS AND METHODS)	19
3.1 Bacterial Strains and Culture Media	19
3.2 Honey Samples	19
3.3 Honey Preparation	20
3.4 Determination of minimum inhibitory concentration (MIC)	20
3.4.1 Microdilution plate method	20
3.4.2 MTT reduction assay	23
3.5 Determination of minimum bactericidal concentration (MBC)	24
CHAPTER FOUR (RESULT)	25
4.1 Determination of minimum inhibitory concentration (MIC)	25
4.2 Determination of minimum bactericidal concentration (MBC)	27
CHAPTER FIVE (DISCUSSION)	30
CHAPTER SIX (CONCLUSION)	35
BIBLIOGRAPHY	37

ABSTRACT

The emergence of antibiotic resistance bacteria has lowered the success rates of antibiotic therapy thus becoming a major concern world-wide. This has resulted in the re-evaluation of the therapeutic use of ancient remedies including honey. The antibacterial activity of honey has been associated with its osmolarity, acidity, hydrogen peroxide, and non-hydrogen peroxide components. The aim of our study was to investigate the potential of Malaysian honeys namely Tualang, Gelam, Acacia, and Nenas as an antibacterial agent against *Staphylococcus aureus* and *Pseudomonas aeruginosa*. The antibacterial activity was examined by determining the MIC using the broth dilution assay on microtiter plates while MBC was determined by re-inoculation into agar plates from a well with each concentration of honey where bacterial growth was inhibited (from the broth of MIC assay). The honey samples were tested at 45%, 39%, 33%, 21%, 15%, 9%, and 3% (v/v) dilution. The result showed that all tested honey including artificial honey had substantial antibacterial activity against *S.aureus* and *P.aeruginosa*. Manuka honey had the lowest MIC values compared to other tested honeys and artificial honey, which are 15% (v/v) for *S.aureus* and 21% (v/v) for *P.aeruginosa*. Among local honeys, Acacia and Gelam honey had the lowest MIC value (21% v/v), and thus the best activity, against *S.aureus*. While Tualang and Nenas honey had higher MIC against *S.aureus* which is 27% (v/v) compared to other tested honey. When tested against *P.aeruginosa*, all four types of local honeys had equal MIC value (27% v/v). Malaysian honeys exhibited variable activities against different microorganisms. The difference in floral source of honey may contributed to the variation in the potency of the antibacterial activity. Further research should be done to assess the antibacterial activity of Malaysian honeys to reveal its true potential.

CHAPTER 1

INTRODUCTION

1.1 Background

The emergence of antibiotic resistance bacteria has lowered the success rates of antibiotic therapy thus it becomes a major concern world-wide. Therefore, alternative treatment using natural products which are relatively cheap, non-toxic, and easily available are being proposed (Manyi-Loh *et al.*, 2010). This has resulted in the re-evaluation of the therapeutic use of ancient remedies including honey.

Modern society has now rekindled interest in the therapeutic use of honey mainly due to its powerful antibacterial and antioxidant properties (Alvarez-Suarez *et al.*, 2010). There is a large body of evidence indicating that honey has high antibacterial activities against gram positive and negative bacteria as well as fungi. (Hassanain *et al.*, 2010; Mandal *et al.*, 2010). The antibacterial activity of honey has been associated with its osmolarity, acidity, hydrogen peroxide, and non-hydrogen peroxide components (Alvarez-Suarez *et al.*, 2010).