

**UNIVERSITI TEKNOLOGI MARA**

**ANTIMICROBIAL PROPERTIES OF MARINE  
ENDOPHYTIC FUNGI EXTRACTED FROM SELECTED  
MALAYSIAN SEAWEEDS**

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## TABLE OF CONTENTS

	<b>PAGE</b>
<b>TITLE PAGE</b>	
<b>ACKNOWLEDGMENTS</b>	ii
<b>LIST OF TABLES</b>	iii
<b>LIST OF FIGURES</b>	iv
<b>LIST OF ABBREVIATIONS</b>	v
<b>ABSTRACT</b>	vi
<b>CHAPTER ONE (INTRODUCTION)</b>	
1.1 Background of study	1
1.2 Problem statements	3
1.3 Objective of study	4
<b>CHAPTER TWO (LITERATURE REVIEW)</b>	
2.1 Antibiotic resistance	5
2.2 Natural product	6
2.3 Endophytes and host relationship	7
2.4 Bioactive compounds of secondary metabolites	9
2.5 Marine natural products	10
2.6 Seaweed	11
2.7 Metabolites produced by marine endophytic fungi	13
<b>CHAPTER THREE (METHODOLOGY)</b>	
3.1 The extraction of marine endophytic fungi	17
3.2 Preparation of extraction	17
3.3 Antimicrobial activity of marine endophytic fungi	18
3.3.1 Antibacterial activity	18
3.3.2 Antifungal activity	20
<b>RESULT AND DISCUSSION</b>	22
<b>CONCLUSION</b>	35

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## ABSTRACT

Marine organisms possess unique structural features as compared to terrestrial organisms. The secondary metabolites produced by marine endophytic fungi have been regarded as an important source contributes to the natural chemotherapeutic agents. Due to the emergence of antibiotics resistance by certain pathogenic bacteria, there is an urge to seek for new candidates for alternative drugs. In search for a new source of active metabolites, seaweeds have been studied for the past several years. In this study, five marine endophytic fungi isolated from four Malaysian brown seaweeds *Cystoseira nudicaulis*, *Mesogloia vermiculata*, *Euclidean denticulatum* and *Padina australis* were investigated for the antimicrobial properties by using antibacterial assay and disc diffusion method. The endophytes were grown in two types of media, PDA and PDA with 3% artificial sea salt (PDA3%). Out of ten marine endophytic fungi extracts, eight extracts (CN PDA, CN PDA3%, MV PDA, MV PDA3%, ED1 PDA, ED1 PDA3%, ED2 PDA and PA7 PDA3%) exerted weak (growth inhibition <20%) to moderate (growth inhibition  $\geq$ 37%) antibacterial activity against pathogenic bacteria *B.subtilis*, *E.coli*, *P.aeruginosa*, *S.aureus*, *S.enterica* and *S.typhimurium*. As for antifungal activity, eight extracts (CN PDA, CN PDA3%, MV PDA, MV PDA3%, ED1 PDA, ED1 PDA3%, ED2 PDA3%, PA7 PDA and PA7 PDA3%) exhibited zone inhibition in the range of  $6.5\pm 0.71$  to  $12.0\pm 1.41$  mm against pathogenic fungi *A.niger*, *C.albicans* and *T.rubrum*. Fungicidal activity of extracts CN and ED1 (both from PDA3%) was observed at the minimal concentration tested (0.625 mg/ml). The antimicrobial activity strength of extracts CN, MV, ED1, ED2 and PA7 was influenced by certain factors such as chemical composition, salinity and concentration of extracts. Marine endophytic fungi extracts isolated from seaweeds of *Cystoseira nudicaulis*, *Mesogloia vermiculata* and *Euclidean denticulatum* have a promising potential as an alternative source for antimicrobial drugs by inhibiting both of pathogenic bacteria and fungi growth. Further study should be carried out in order to have better understanding on their mechanism(s) of action and to identify the bioactive compounds which responsible for antimicrobial activities.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of study

Plants have been served as major important sources secondary metabolites and this includes endophytes (Strobel & Daisy, 2003). Endophytes are microorganisms including fungi and bacteria which reside on the internal parts of the plants tissue without causing harm to their host plants (Selim et al., 2012, Strobel & Daisy, 2003). Due to some extent endophytes is capable of producing bioactive compounds which enables to protect themselves and their host from pathogens and herbivores (Joseph & Priya, 2011; Selim et al., 2012). However, most of the endophytes were isolated from the terrestrial plants rather than from marine plants (Ariffin et al., 2011; M'ario et al., 2011).

Since the oceans constitute 70% of the earth's surface, it provides a lot of opportunities for the discovery of new bioactive compounds. Marine organisms such as sponges, seaweed and microorganisms are prolific source with structurally unique bioactive compounds (Abad et al., 2011). Seaweed are photosynthetic organism with simple structure ranges from the microalgae to macroalgae and these macroalgae are