# Detection of Spectral Signature of Mangrove Forests along Red Sea Using Hyperspectral Data and Evaluation of Antimicrobial Activity of Mangrove Endophytic Fungi

Thesis

Submitted for the partial fulfillment of the Degree of
M.Sc. in Microbiology

**By**


## Manar Ahmed Mohamed Basheer

B.Sc. Microbiology / Chemistry (٢٠١٢)

DEPARTMENT OF MICROBIOLOGY
FACULTY OF SCIENCE
AIN SHAMS UNIVERSITY


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# Approval sheet

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إِنَّهُ مَن

يَتَّقِ

وَيَصبِر

فَإِنَّ اللهَ

لا يُضيعُ أَجْرَ المُحسِنِين

سورة يوسف

# *Dedication*

*I dedicate this work to my dear and beloved* ***affectionate mother*** *and* ***sisters****, asking Allah to conserve them, provide them with his grace and generosity, and to bless them in the life and the hereafter.*

# *Acknowledgments*

*Firstly, my best praise and endless thanks to* ***Almighty Allah****, who provided me with his grace andblessing in my all life.*

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***This thesis has not been previously submitted for any degree at this or any other university***

**Signed**

*Manar Ahmed Mohamed Basheer*

## Abstract

Medicinal plants endophytes are a promising trend to meet the rising threat of drug-resistant strains of human pathogens. Mangrove plants (*Avicennia marina*) have been used in folklore medicines where extracts from mangrove species have confirmed inhibitory activity against human, animal and plant pathogens. Marine endophytic fungi are an important and novel resource of natural bioactive compounds with their potential applications in agriculture, medicine and food industry. This study focuses particularly on testing the antimicrobial activity of mangrove endophytic fungi isolated from South Safaga and Wadi Abu Hamrah mangrove along the Red Sea against different human pathogens, for mapping, monitoring of mangroves ecosystem and for determining their spectral properties using hyperspectral remote sensing techniques. A total of ٣٥ endophytic fungi were isolated from mangroves leaves at two study areas and were identified. Crude extracts of the endophytic fungi were screened for their antimicrobial activity using well diffusion method against the following pathogenic microorganisms; *S. aureus, S. pyogenes, P. vulgaris, K. pneumoniae, B. subtilus, C. albicans, P. chrysogenum and A.niger.* The most effective extracts which exhibited significant activity against most of the tested pathogens were obtained from *Aspergillus aculeatus, Aspergillus niger, Aspergillus terreus, Eurotium amstelodami, Exserohilum rostratum, and Mucor racemosus*.

**Keywords:** Mangroves, *Avicennia marina*, The Red Sea, Endophytic fungi, Antimicrobial activity.

# LIST OF ABBREVIATION

| | |
|---|---|
| **ANOVA** | Analysis of Variance |
| **ASD** | Analytical Spectral Devices |
| **$^{o}$C** | Degree Celsius |
| **ENVI** | Environmental for Visualizing images |
| **ETM** | Enhanced Thematic Mapper |
| **ETM+** | Enhanced Thematic Mapper (on Landsat satellites) |
| **FLAASH** | Fast Line-of-sight Atmospheric Analysis of Spectral Hypercubes |
| **FOV** | Field of View |
| **GIS** | Geographical Information System |
| **GPS** | Global Positioning System |
| **HSD** | Honest Significant Difference |
| **Landsat** | A series of NASA earth resource satellites |
| **LULC** | Land Use / Land Cover |
| **MEA** | Malt Extract Agar medium |
| **MEB** | Malt Extract Broth medium |
| **MIR** | Middle Infrared |
| **MSS** | Multiple Spectral Scanner |
| **NARSS** | National Authority for Remote Sensing and Space Sciences |
| **NASA** | National Aeronautics and Space Administration |
| **NDVI** | Normalized Difference Vegetation Index |
| **NIR** | Near Infrared |
| **NRPS** | Non-ribosomal peptide synthase |
| **PKS** | Polyketide synthase |
| **SWIR** | Short Wave Infrared |
| **TM** | Thematic Mapper (on Landsat satellites) |
| **UTM** | Universal Transverse Mercator |
| **WGS** | Worldwide Geographic System |

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