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"Antifungal Activity of some Desert Plant Extracts Against some Clinical Isolates and Chemical Elucidation of the Bioactive Compounds"

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Declaration

This dissertation has not previously been submitted for a degree at this or at any other university and is the original Work of the writer

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List of CONTENTS

Title	Page No.
List of Content	i
List of Tables	iv
List of Figures	v
List of Abbreviations	vi
CHAPTER I . Introduction & Literature Review	
Introduction	1
1. Emerging fungal infections in immunocompromised patients	4
2. Fungal pathogenesis	5
3. Infection by <i>Candida</i>	6
4. Other yeasts infection (Trichosporonosis)	8
5. <i>Aspergillus</i> species infection	9
6. Antifungal drugs	10
6.1. Polyenes	11
6.2. Azoles	11
6.3. Allylamines	12
6.4. Echinocandins	12
6.5. Fluorinated pyrimidine analog	13
7. Natural products from plant sources	16
8. Major groups of antifungal compounds from plants	16
8.1. Alkaloids	16
8.2. Terpenoids and essential oils	17
8.2.1.General overview	17
8.2.2.Biological activity of essential oils	18
8.2.2.1.Antifungal activity	18
8.3. Phenolics	19
8.3.1. Flavonoids	20
8.3.2. Tannins	20
8.3.3 Phenolic acids	21
8.4. Coumarins:	22
9. Combined herb drug therapy	23
10. Medicinal Plants under Investigation	24
10.1 <i>Mesembryanthemum crystallinum</i> L. (Ice plant)	26
10.2. <i>Nicotiana glauca</i> R. C. Graham	26
10.3. <i>Peganum harmala</i> L.	27

10.4. <i>Atriplex halimus</i> L.	28
10.5. <i>Brassica tournefortii</i> Gouan	29
10.6. <i>Alhagi maurorum</i> Medic	29
CHAPTER II. Materials & Methods	
1. Samples collection	32
1.1. Collection and identification of plants	32
1.2. Tested fungal species	32
2. Media and reagents used	33
3. Preparation of crude plant extracts	34
3.1. The ethanolic crude extracts	34
3.1. The water extracts	34
4. Fractionation by different organic solvent	34
5. Antifungal activity testing	34
5.1 Antifungal standard drug	34
5.2. Inoculum preparation of tested fungal species	35
5.3. Susceptibility testing	35
5.3.1. Screening antifungal activity using agar diffusion method	35
5.3.2. Combination testing	36
5.3.3. Determination of the minimum inhibitory concentration (MIC)	36
5.3.4. Determination of the minimum fungicidal concentration (MFC)	36
6. In vitro cytotoxicity using (MTT) assay	37
6.1. Cell line and cell culture	37
6.2. Sub-culturing of cells	37
6.2.1 Hemocytometer	38
6.2.2 Cell count with trypan blue	38
6.3. Cell cytotoxicity determination by MTT assay	38
7. Mode of action studies	40
7.1.Determination of ergosterol content in the plasma Membrane	40
7.2. Determination of endogenous reactive oxygen species (ROS) production	41
7.3. Effect of the plant extract on cell membrane integrity	41
8. Microscopic study of fungal morphology	42
9. Chemical identification of most potent extracts	42
9.1. Gas Chromatography/Mass Spectrometry	42
9.2. Chromatographic investigation of the most active extract of <i>Alhagi maurorum</i> Medic	43
9.2.1. Paper Chromatography	43
9.2.2. Qualitative and quantitative determination of the phenolic compounds	44

using (HPLC) technique	
10. Statistical analysis	45
CHAPTER III. Experimental Results	
1. Antifungal study	46
1.1. Susceptibility testing	46
1.1.1. Screening antifungal activity using agar diffusion method	46
1.1.2. Combination testing	51
1.1.3. Determination of the minimum inhibitory concentration (MIC)	53
1.1.4. Determination of the minimum fungicidal concentration (MFC)	55
2. The cytotoxic activities of petroleum ether extract of <i>M. crystallinum</i> L.	56
3. Mode of action studies	57
3.1. Determination of ergosterol content in the plasma Membrane	57
3.2. Determination of endogenous reactive oxygen species (ROS) production	58
3.3. Effect of the plant extract on cell membrane integrity	59
4. Microscopic study of fungal morphology	61
4.1. Observing morphological changes under light microscope	61
4.2. Observing morphological changes under Atomic Force Microscopy (AFM)	63
5. Phytochemical study	66
5.1. Gas Chromatography/Mass Spectrometry	66
5.2. Chromatographic investigation of the most active extract of <i>Alhagi maurorum</i> Medic	76
5.3. Identification of phenolic compounds using HPLC	77
CHAPTER IV. Discussion	
Summary	78
References	90
Arabic summary	93

LIST OF TABLES

Table No.	Title	Page
1	Antimicrobial mechanism of action of some phytochemicals	23
2	Human pathogenic fungal species	32
3	Inhibition zone diameter of the ethanolic crude extracts of desert plants against tested fungal species using agar well diffusion method	48
4	Inhibition zone diameters of selected desert plants extract extracts against tested fungal species using agar well diffusion method	49 50
5	Combined antifungal activity of different plant extracts and fluconazole against tested fungal species	52
6	Combined antifungal activity of petroleum ether extracts of <i>Brassica tournefortii</i> Gouan and <i>Atriplex halimus</i> L. against tested fungal species	53
7	MIC values of the most active desert plants extracts on tested human fungal species	54
8	MFC values of the most active desert plants extracts on tested human fungal species.	55
9	Reduction percent of ergosterol content in tested fungal species by petroleum ether extract of <i>M. crystallinum</i> .L.	57
10	The chemical constituents of the petroleum ether extract of <i>Mesembryanthemum crystallinum</i> L.	68
11	The chemical constituents of the petroleum ether extract of <i>Nicotina glauca</i> R. C. Graham	69
12	The chemical constituents of the petroleum ether extract of <i>Peganaum harmala</i> L.	70
13	The chemical constituents of the petroleum ether extract of <i>Atriplex halimus</i> L.	71
14	The chemical constituents of the petroleum ether extract of <i>Brassica tournefortii</i> Gouan	72
15	Comparison between common compounds in petroleum ether extracts of the five tested plants	74
16	Ethyl acetate extract of <i>Alhagi maurorum</i> Medic	76
17	Phenolic composition of ethyl acetate extract for <i>Alhagi maurorum</i> Medic	77

LIST OF FIGURES

Fig. No.	Title	Page
1	Antifungal drugs target in fungal cell	15
2	Desert plants used in the study A: <i>Mesembryanthemum crystallinum</i> L. B: <i>Nicotina glauca</i> R.C. Graham, C: <i>Peganaum harmala</i> L., D: <i>Atriplex halimus</i> L.: E, <i>Brassica tournefortii</i> Gouan and F: <i>Alhagi maurorum</i> Medic.	25
3	The cytotoxicity of the petroleum ether extract of <i>M. crystallinum</i> L.	56
4	Effect of petroleum ether extract of <i>Mesembryanthemum crystallinum</i> L. on the generation of endogenous ROS	58
5	Effect of petroleum ether extract of <i>Mesembryanthemum crystallinum</i> L. on nucleic acid content	59
6	Effect of petroleum ether extract of <i>Mesembryanthemum crystallinum</i> L. on protein content.	60
7	Morphological changes in <i>Candida albicans</i> induced by <i>Mesembryanthemum crystallinum</i> L. (A) Control untreated cells, (B) cells treated with sub - MIC extract concentration, (C) cells treated with the sub- MFC extract concentration	61
8	Morphological changes in <i>A. fumigatus</i> induced by <i>Mesembryanthemum crystallinum</i> L. (A) Contro untreatedl cells, (B) cells treated with sub - MIC extract concentration, (C) cells treated with the sub- MFC extract concentration	62
9	Topographic images of <i>C. albicans</i> cells, (A): untreated control cells, (B): cells treated with Sub-MIC of extract, (C): cells treated with Sub-MFC of extract	64
10	Topographic images of <i>A. fumigatus</i> , (A): untreated control cells, (B): cells treated with Sub-MIC of extract, (C): cells treated with Sub-MFC of extract	65
11	GC- MS of petroleum ether extract of A: <i>Mesembryanthemum crystallinum</i> L., B: <i>Nicotina glauca</i> R. C. Graham, C: <i>Peganaum harmala</i> L., D: <i>Atriplex halimus</i> L. and E: <i>Brassica tournefortii</i> Gouan.	73
12	HPLC of ethyl acetate extract of <i>Alhagi maurorum</i> Medic	77

LIST OF ABBREVIATIONS

ABBERVIATION	ITEM
AFM	Atomic Force Microscopy
°C	Degree Celsius
CLSI	Clinical and Laboratory Standards Institute
DCFH-DA	2',7'-dichlorofluorescein diacetate
DMSO	Dimethyl sulfoxide
GC-MS	Gas Chromatography- Mass Spectrometry
h	Hour
HPLC	High Performance Liquid Chromatography
IC50	50% Inhibitory Concentration
L	Liter
mg	Milligram
µg	Microgram
µL	Microliter
mL	Milliliter
MIC	Minimum Inhibitory Concentration
MFC	Minimum Fungicidal Concentration
MTT	3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide
NCCLS	National Committee of Clinical Laboratory Standards
NAC	Non- <i>Albicans Candida</i>
PDA	Potato Dextrose Agar
PDB	Potato Dextrose Broth
ROS	Reactive Oxygen Species

rpm	Revolutions per minute
RPMI	Roswell Park Memorial Institute
s	Second
TLC	Thin Layer Chromatography
UV	Ultraviolet
WHO	World Health Organization

Abstract

Antifungal activities of six selected Egyptian desert plants belonging to families Aizoaceae, Brassicaceae, Solanaceae, Fabiaceae, Zygophyllaceae and Chenopodiaceae were investigated against six human pathogenic fungal species (*Candida albicans*, *Candida tropicalis*, *Trichosporon* sp., *Aspergillus fumigatus*, *Aspergillus flavus* and *Aspergillus versicolor*). Aqueous as well as organic crude extracts of the selected desert plants were screened against the different human pathogenic fungal species. Results demonstrate that the non-polar fraction of *Mesembryanthemum crystallinum* L. and *Atriplex halimus* L. exhibited the most antagonistic activity. The MIC values of fractions against yeasts and moulds ranged from 0.195 to 6.25 mg/ml, whereas the fungicidal activity ranged from 0.781 – 12.5 mg/ml. Notably, the majority of combinations between plant extracts and antifungal drugs and/or plant fractions showed synergistic antifungal activities against the tested fungal species. As for the possible mechanism for the observed antifungal activity of the petroleum ether fraction of *M. crystallinum* L., a significant reduction in the ergosterol content and leakage of plasma and cellular membranes of the tested fungal species was noticed. Cytotoxic test demonstrated that the petroleum ether fraction of *M. crystallinum* L. is more toxic to fungal cells than mammalian cell.

CHAPTER I

INTRODUCTION

Mycotic diseases are global in distribution, but maximum cases are recorded from subtropical and tropical countries. Mycoses are important from public health and economic point of view. Globally, 800 million people in the world have suffered from one or other types of fungal diseases. *Candida*, *Aspergillus*, *Pneumocystis* and *Cryptococcus* are important opportunistic fungi responsible for high mortality, especially in immunocompromised patients. *Candida* species are the fourth most common cause of nosocomial bloodstream infections. The source of infection is exogenous, and infection is mainly acquired by inhalation of infectious fungal spores from the saprobic environment. The demonstration of fungal agent and its isolation from clinical specimens is still considered the gold standard the diagnosis of mycotic disease. Several systemic and topical drugs are available for the controlling of disease, but most of them are expensive and have many side effects. Therefore, development of cheap, safe and potent chemotherapeutic agents is imperative for the management of mycoses, which cause life threatening disease (Pal, 2017).

Plant constituents are proved to be one of the most promising antimicrobial sources as they are considered to be safer compared with synthetic compounds because of their natural origin (Rajeh *et al.*, 2010; Abreu *et al.*, 2012; Savoia, 2012 and Upadhyay *et al.*, 2014). It is well known that about quarter part of current medications is derived from compounds of plant source (Rates, 2001 and WHO, 2014). Plant derived components could have other target sites than synthetic antimicrobials and subsequently having different mechanisms of action against microorganisms (Ahmad & Beg, 2001; Upadhyay *et al.*, 2014 and Petrosyan *et al.*, 2015). Plant secondary metabolites are mostly responsible for their antimicrobial properties (Savoia, 2012).