Ain- Shams University
Faculty of Science
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"Antifungal Activity of some Desert Plant Extracts Against some Clinical Isolates and Chemical Elucidation of the Bioactive Compounds"

For Fulfillment of Philosophy Degree of Science in Microbiology

Thesis
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أهدي هذة الرسالة الى روح **أ.د./ الزهراء احمد كرم الدين**
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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

Heba Sayed Ibrahim

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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-*Albicans Candida*
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 demonsted 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)**.