



Sudan University of Science and Technology

College of Graduate Studies



Constituents and Antimicrobial Potency of Oils From Some Plant Species

المكونات واختبار مضاد الميكروبات لبعض النباتات

**A Thesis Submitted in Fulfillment for the Requirements of
the Ph.D. Degree in Chemistry**

by

Ezdehar Awad El-Gazali Mohamed

(B.Sc. Chemistry ,M.Sc. Chemistry)

Supervisor

Prof. Mohammed Abdel Karim Mohamed

July, 2021

استهلال

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلِ اعْمَلُوا فَيَسِّرَ اللَّهُ لَكُمْ أَعْمَالَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ
إِلَىٰ عِلْمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنبِّئُكُمْ بِمَا كُنتُمْ تَعْمَلُونَ ﴿١٠٥﴾

(التوبة-105)

صَدَقَ اللَّهُ الْعَظِيمَ

Dedication

To....

The soul of my parents

my husband and son

brothers and sisters

Acknowledgement

First of all, I would like to thank **Allah Almighty** for giving me the ability and strength to accomplish this work.

I would like to express my gratitude and respect to my supervisor Prof. Mohamed Abdel Kareem for his interest ,close supervision and continuous advice.

Thanks for the staff, Dept. of chemistry, Sudan University of Science and Technology for all facilities.

Also thanks are extended to the technical staff of the Dept. of Taxonomy, Medicinal and Aromatic Plants Research Institute,Khartoum,Sudan for their kind help .

Deep thanks to my family for their infinite support.

Abstract

Five plants of medicinal attributes have been investigated. The oils of these plants have been extracted by maceration and then characterized by GC-MS. In addition the antimicrobial activity of the targeted oils has been assessed. GC-MS analysis of *Hyphane thebaica* oil was performed and fifty constituents have been detected. GC-MS analysis of *Acacia mellifera* oil showed that the fatty acids accounts for (87.40%) of the bulk of the oil. *Parkinsonia aculeata* oil gave 33 constituents dominated by : 9,12- octadecadienoic acid methyl ester (40.51%) and hexadecanoic acid methyl ester (16.89%) . *Lucaena leucocephala* oil gave 30 constituents .Major components are: 9,12-octadecadienoic acid-z,z- methyl ester (37.29%) and hexadecanoic acid methyl ester (18.17%). *Sorghum bicolor* oil has been analyzed by GC-MS. Thirty three components were detected .The oil has been dominated by : 9,12-octadecadienoic acid (35.91%) and pentadecanoic acid (11.46%).

The studied oils have been evaluated for their antimicrobial activity and different antimicrobial responses have been observed.

المستخلص

فى هذا البحث تمت دراسة خمسة نباتات ذات استخدامات طبية حيث تم الكشف عن مكونات الزيوت المستخلصة من هذه النباتات بتقنية الكروماتوغرافيا الغازية- طيف الكتلة. ايضا اجرى اختبار مضاد الميكروبات لهذه الزيوت. اعطى تحليل الكروماتوغرافيا الغازية – طيف الكتلة لنبات الدوم خمسون مركبا. وقد كونت الزيوت الدهنيه نسبة (87.40%) من كتلة زيت الشوكه السوداء. اما زيت الرطمه فقد كان به 33 مركبا اهمها :

9,12- octadecadienoic acid methyl ester (40.51%)

hexadecanoic acid methyl ester (16.89%)

وقد احتوى نبات اللوسينا على 30 مركبا اهمها :

9,12-octadecadienoic acid-z,z- methyl ester (37.29%) and hexadecanoic acid methyl ester (18.17%).

احتوت عينة نبات الذره ثنائيه اللون على 33 مركبا اهمها :

9,12-octadecadienoic acid (35.91%) and pentadecanoic acid (11.46%).

فى اختبار مضاد الميكروبات ابدت الزيوت نتائج متفاوتة.

Table of Contents

No.	Subject	Page No.
	الإستهلال	i
	Dedication	ii
	Acknowledgement	iii
	Abstract	iv
	المستخلص	vi
	Table of contents	vii
	Chapter One: Introduction	
1	Introduction	1
1.1	The targeted plant species	1
1.1.1	<i>Hyphaene thebaica</i> L.	1
1.1.2	<i>Acacia meelifera</i>	2
1.1.3	<i>Parkinsonia aculeata</i>	4
1.1.4	<i>Leucaenia leucocephala</i> L	5
1.1.5	<i>Sorghum bicolor</i>	6
1.2	Essential Oils	7
1.2.1	Essential oils extraction methods	8
1.2.2	Chemistry of essential oils	18
1.2.3	Biological Activities of essential oils	19
1.3	Gas chromatography-Mass Spectrometry	22
1.3.1	Gas Chromatography	24
1.3.2	Mass spectrometry	28

	Aim of this study	31
	Materials and Methods	3218
2.1	Materials	32
2.1.1	Plant material	32
2.1.2	Instruments	32
2.1.3	Test organisms	32
2.2	Methods	33
2.2.1	Extraction of oils	33
2.2.2	GC-MS analysis	33
2.2.3	Antimicrobial activity	35
3	Results and Discussion	37
3.1	<i>Hyphane thebaica</i>	37
3.1.1	GC-MS analysis of <i>Hyphane thebaica</i> oil	37
3.1.2	Antimicrobial activity	39
3.2	<i>Acacia mellifera</i>	41
3.2.1	Constituents of <i>Acacia mellifera</i> oil	41
3.2.2	Antimicrobial activity	45
3.3	<i>Parkinsonia aculeata</i>	46
3.3.1	GC-MS analysis of <i>Parkinsonia aculeata</i> oil	46
3.3.2	Antimicrobial Activity	50
3.4	<i>Lucaena leucocephala</i>	51
3.4.1	GC-MS analysis of <i>Lucaena leucocephala</i> oil	51
3.4.2	Antimicrobial assay	53
3.5	<i>Sorghum bicolor</i>	55

3.5.1	The GC-MS analysis	55
3.5.2	Antimicrobial activity	57
	Conclusion and Recommendations	60
	References	61