

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿وَهُوَ الَّذِي أَنْزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجْنَا بِهِ نَبَاتَ كُلِّ شَيْءٍ
فَأَخْرَجْنَا مِنْهُ خَضِرًا نُخْرَجُ مِنْهُ حَبًّا مُتَرَاكِبًا وَمِنَ النَّخْلِ مِنْ
طَلْعِهَا قِنْوَانٌ دَانِيَةٌ وَجَنَّاتٍ مِنْ أَعْنَابٍ وَالزَّيْتُونَ وَالرُّمَّانَ
مُشْتَبِهًا وَغَيْرَ مُتَشَابِهٍ انظُرُوا إِلَى ثَمَرِهِ إِذَا أَثْمَرَ وَيَنْعِهِ إِنَّ فِي
ذَلِكَ لَآيَاتٍ لِقَوْمٍ يُؤْمِنُونَ﴾
سورة الأنعام (99)

صدق الله العظيم

Dedication

To

Mother and Father,

Sisters, Nephews and Nieces,

Fiancé and Friends

Acknowledgment

First of all I would like to thank **Almighty Allah** the most **Gracious** the **Compassionate** for giving me strength and health to complete this work.

I would like to express my great thanks and respect to my supervisor Prof. Mohamed Abdl-Ekarim for his sincere help and guidance, his patience and his support that made the whole work come to final conclusion.

I would also like to thank the technical staff, Faculty of pharmacy, University of Medical Sciences for the GC-MS analysis.

Appreciation to Sudan University of Science and Technology for all laboratory facilities.

Nevertheless great thanks to my colleagues in my batch for their kindness and help.

Never forget to thank every teacher who provided me with knowledge in my life.

Abstract

The oil of *Piper longum L.* fruit was analyzed by GC-MS where 118 Constituents were detected being dominated by:

Cubedol (9.93%); 2,4-Diphenyl-6-(2-hydroxy-3-tolyl)pyrimidine (8.42%); 2-[2,4-dimethoxybenzylidene]-2H-thiazole (3.36%); Chloroacetic acid dodec-9-ynyl chloroacetate (3.12%); Shyobunone (3.00%); Gamma – muurolene (2.27%).

In the cup plate agar diffusion bioassay, the oil showed different antimicrobial responses against test organisms. Significant activity against *Staphylococcus aureus* and *Escherichia coli* at 100 mg/ml was observed. Also the oil showed excellent activity against *Staphylococcus aureus* at 50 mg/ml. However, only partial activity was shown for the yeast *Candida albicans*.

مستخلص البحث

تم اختبار فعالية الزيت الثابت المستخلص من ثمرة نبات عرق الذهب ضد أنواع البكتريا القياسية وكانت الفعالية لهذا الزيت هامة. ثم حددت مكونات الزيت بتقنية الكروماتوغرافيا السائلة الغازية طيف الكتلة حيث اتضح وجود 118 مكوناً أهمها:

Cubedol (9.93%); 2,4-Diphenyl-6-(2-hydroxy-3-
2-[2,4-dimethoxybenzylidene]-2H- tolyl)pyrimidine (8.42%);
acid dodec-9-ynyl (3.36%); Chloroacetic thiazole
(3.00%); Gamma – (3.12%); Shyobunone chloroacetate
(2.27%). muurolene

100 mg/ml وعند اختبار الزيت كمضاد للبكتريا أبدى الزيت نشاطاً عالياً عند
تركيز ضد:

Staphylococcus aureus, Escherichia coli

وعند تركيز (50mg/ml) أعطى الزيت فعالية ممتازة ضد بكتريا:

Staphylococcus aureus

Table of Contents

الإية	I
Dedication	II
Acknowledgment	III
Abstract	IV
مستخلص البحث	V
Table of Contents	VI

Chapter One Introduction

1-	Introduction	2
1.1-	<i>Piper longum L.</i>	2
1.2-	Essential oils	7
1.3-	Extraction of essential oils	10
1.4-	Chromatography	19
1.4.1-	Gas chromatography	20
1.4.2-	Mass spectrometry	21
1.4.3-	Gas Chromatography-Mass Spectrometry (GC/MS)	23
1.4.4-	Applications of GC-MS	24
1.4.5-	Data analysis and interpretation in GC/MS	26
1.5-	Antibacterial assay	28
	Aim of this study	29

Chapter Two Materials and Methods

2-	Materials and Methods	33
2.1-	Materials	33
2.1.1-	Plant material	33
2.1.2-	Instruments	33
2.1.3-	Test organisms	33

2.2-	Methods	34
2.2.1.	Preparations of reagents for phytochemical screening	34
2.2.1.1-	Flavonoid test reagents	34
2.2.1.2-	Alkaloid test reagents	34
2.2.1.3-	Preparations of plant extract for phytochemical screening	35
2.2.2-	Phytochemical screening	35
2.2.2.1-	Test for unsaturated sterols and for triterpenes	35
2.2.2.2-	Test for Flavonoids	35
2.2.2.3-	Test for alkaloids	36
2.2.2.4-	Test for tannins	36
2.2.2.5-	Test for saponins	36
2.2.3-	Extraction of oil from fruits of <i>Piper longum</i>	37
2.2.4-	Esterification of oil	37
2.2.5-	GC-MS analysis	37
2.2.6-	Antimicrobial assay	39
2.2.6.1-	Preparation of bacterial suspensions	39
2.2.6.2-	Preparation of fungal suspensions	40
2.2.6.3-	Testing for antibacterial activity	40

Chapter Three Results and Discussion

3-	Results and Discussion	43
3.1-	Phytochemical Screening	43
3.2-	GC-MS Analysis	43
3.3-	Antimicrobial assay	50
Conclusion		53
Recommendations		53
References		