Ain Shams University
Faculty of Pharmacy
Pharmacognosy department

Chemical and Biological Studies on Volatile Oils of Certain Egyptian Medicinal Plants Belonging to Families Apiaceae and Lamiaceae

A Thesis

Submitted in Partial Fulfillment of the Requirements for the

Master degree
In
Pharmaceutical Sciences
(Pharmacognosy)

By

Anas Mohammad Abdel-Mawgoud Saleh

Bachelor of Pharmaceutical Sciences,
Faculty of Pharmacy, Ain Shams University, 2005

2010

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2010

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و آخر دعوانا أن الحمد لله رب العالمين...

Anas M. Abdel-Mawgoud

List of Abbreviations

Abbreviation	Definition
Plants used in this work:	
C. carvi	*Carum carvi* (caraway)
A. graveolens	*Apium graveolens* (celery)
A. sowa	*Anethum sowa* (dill)
M. piperita	*Mentha piperita* (peppermint)
R. officinalis	*Rosmarinus officinalis* (rosemary)
T. vulgaris	*Thymus vulgaris* (thyme)
General abbreviations:	
B. H. P.	British Herbal Pharmacopoeia
CFU	Colony Forming Unit
MIC	Minimum Inhibitory Concentration
EO	Essential Oil
HD	Hydrodistillation
SD	Steam Distillation
SD_T	Total steam distilled oil of entire fruits or leaves
SD_{T+R}	Oil obtained by addition of recovered oil to SD_T
Rec.	Recovered oil fraction
WD	Water Distillation
WD_F	Total water distilled oil of ground fruits or leaves
WD_T	Total water distilled oil of entire fruits or leaves
CO_2	Carbon dioxide
SFE	Supercritical Fluid Extraction
SCO_2	Supercritical carbon dioxide extraction
GC/FID	Gas chromatograph with flame ionization detector
GC/MS	Gas chromatograph with mass spectrometer
IZ	Inhibition Zones
UV	Ultra violet
μm	Micrometer
Microorganism mentioned in this work:	
A. baumanii	*Acinetobacter baumanii*
A. sobria	*Aeromonas sobria*
A. flavus	*Aspergillus flavus*
A. fumigatus	*Aspergillus fumigatus*
A. niger	*Aspergillus niger*
A. terreus	*Aspergillus terreus*
B. cereus	*Bacillus cereus*
B. subtilis	*Bacillus subtilis*
B. theobromae	*Botryodiploidia theobromae*
B. cinerea	*Botrytis cinerea*
C. albicans	*Candida albicans*
C. herbarum	*Cladosporium herbarum*
C. sporogenes	*Clostridium sporogenes*

Abbreviation	Definition
C. terrigena	*Comamonas terrigena*
C. lunata	*Curvularia lunata*
E. aerogenes	*Enterobacter aerogenes*
E. cloacae	*Enterobacter cloacae*
E. faecalis	*Enterococcus faecalis*
E. faecium	*Enterococcus faecium*
E. coli	*Escherichia coli*
F. oxysporum	*Fusarium oxysporum,*
G. candidum	*Geotrichum candidum*
H. influenzae	*Haemophilus influenzae*
K. pneumoniae	*Klebsiella pneumoniae*
L. ivanovii	*Listeria ivanovii*
L. monocytogenes	*Listeria monocytogenes*
M. luteus	*Micrococcus luteus*
M. canis	*Microsporum canis*
M. gypseum	*Microsporum gypseum*
P. digitatum	*Penicillium digitatum*
P. expansum	*Penicillium expansum*
P. mirabilis	*Proteus mirabilis*
P. vulgaris	*Proteus vulgaris*
P. aeruginosa	*Pseudomonas aeruginosa*
P. fragi	*Pseudomonas fragi*
P. putida	*Pseudomonas putida*
R. leguminosarum	*Rhizobium leguminosarum*
R. stolonifer	*Rhizopus stolonifer*
R. equi	*Rhodococcus equi*
R. glutinis	*Rhodotorula glutinis*
S. cerevisiae	*Saccharomyces cerevisiae*
S. choleraesuis	*Salmonella choleraesuis*
S. enteritidis	*Salmonella enteritidis*
S. pullorum	*Salmonella pullorum*
S. typhi	*Salmonella typhi*
S. typhimurium	*Salmonella typhimurium*
S. pombe	*Schizosaccharomyces pombe*
S. marcescens	*Serratia marcescens*
S. flexneri	*Shigella flexneri*
S. sonnei	*Shigella sonnei*
S. aureus	*Staphylococcus aureus*
S. coagulase	*Staphylococcus coagulase*
S. epidermidis	*Staphylococcus epidermidis*
S. mutans	*Streptococcus mutans*
S. pneumoniae	*Streptococcus pneumoniae*
S. sobrinus	*Streptococcus sobrinus*
V. parahaemolyticus	*Vibrio parahaemolyticus*
Y. lypolitica	*Yarrowia lypolitica*
Y. enterocolitica	*Yersinia enterocolitica*

Contents

Title	Page
Introduction	1
Literature Review	5
1. Taxonomy	5
1.1. Family Apiaceae – Carrot Family	5
1.2. Family Lamiaceae – Mint family	7
2. Chemical Characterization of Volatile Oils	10
2.1. Hydrodistilled Volatile Oil	10
2.2. Supercritical Fluid Extracts	21
3. Therapeutic actions and medicinal uses	26
Family Apiaceae	27
Family Lamiaceae	28
3.1. Antimicrobial Activities	30
3.2. Antioxidants Activities	41
Materials, Methods and Apparatus	47
1. Phytochemical studies	47
1.1. Plant Materials	47
1.2. Reagents, Solvents and Gases	51
1.3. Essential oil isolation	52
1.3.1. Hydrodistillation of essential oils	52
Laboratory Scale Water Distillation (1000 g and 250 g batches)	52
Pilot Scale Steam Distillation (Scale up experiment-10 kg batch)	53
Recovery of oil from condensate	54
1.3.2. Super critical fluid extraction	56
1.4. Analysis of chemical parameters	59
Gas Chromatography - Flame Ionization Detection (GC-FID)	59
Gas Chromatography and Mass Spectrometry (GC-MS)	59
Compounds identification and quantification	60
2. Biological studies	61
2.1. *In vitro* studies for antimicrobial activities	61
Agar-well diffusion method	62
Determination of minimum inhibitory concentration (MIC)	63
2.2. *In vitro* study for anti-oxidant activities	65
Diphenyl-2-picrylhydrazyl radical (DPPH-)-scavenging activity	65
Results	67
1. Phytochemical Studies	67
1.1. Extraction of Essential Oils	67

Title	Page

1.1.1. Hydrodistillation 67
1.1.2. Supercritical Fluid Extraction 76
1.2. Analysis of Essential Oils 77
1.2.1. Caraway fruit oil 77
1.2.2. Celery fruit oil 81
1.2.3. Dill fruit oil 87
1.2.4. Peppermint leaves oil 91
1.2.5. Rosemary leaves oil 107
1.2.6. Thyme leaves oil 118
2. Biological Studies 129
2.1. Antibacterial Activities 129
2.2. Anti-Oxidant Activities 137
Discussion 141
1. Phytochemical studies 141
1.1. Effect of grinding of plant materials 142
1.1.1. Effect on the net yield of essential oil 142
1.1.2. Effect on the composition of essential oil 143
1.2. Effect of extraction method on essential oil 144
1.2.1. Hydrodistillation (WD gainst SD) 144
1.2.2. Time course of changes in oil composition throughout HD process 151
1.2.3. Super critical fliud extraction against WD 162
1.3. Comparison with international standards 165
1.3.1. Essential oils yield & distillation time 165
1.3.2. Essential oils composition 168
2. Biological studies 177
2.1. Antibacterial Activities 177
2.2. Anti-Oxidant Activities 185
Summary 189
1. Extraction of Essential Oils 190
1.1. Hydrodistillation 190
1.2. Supercritical Fluid Extraction 192
2. Analysis of Essential Oils 192
3. Biological Activities of Essential Oils 196
3.1. Antibacterial Activities 196
3.2. Anti-Oxidant Activities 198
Achievements & Recommendations 199
References 201
Appendix I

List of Tables

Table No.	Page
1: Chemical constituents of caraway oil	10
2: Chemical structures of main compounds of caraway oil	11
3: Chemical constituents of celery oil	12
4: Chemical structures of main compounds of celery oil	13
5: Chemical constituents of dill oil	13
6: Chemical structures of main compounds of dill oil	14
7: Chemical constituents of peppermint oil	15
8: Chemical structures of main compounds of peppermint oil	16
9: Chemical constituents of rosemary oil	17
10: Chemical structures of main compounds of rosemary oil	18
11: Chemical constituents of thyme oil	19
12: Chemical structures of main compounds of thyme oil	20
13: Composition of the SFE celery fruit extract and hydrodistilled oil	22
14: Composition of Rosemary leaf oils isolated by SFE, SD and HD	23
15: CO_2 extracts and essential oil composition of *Thymus zygis*	25
16: Selected plants from family Apiaceae	47
17: Selected plants from family Lamiaceae	47
18: mean particle sizes of different plants samples	51
19: Caraway – water distillation – laboratory scale (1.0 kg)	67
20: Caraway – steam distillation – pilot scale (10.0 kg/10)	68
21: Celery – water distillation – laboratory scale (1.0 kg)	69
22: Celery – steam distillation – pilot scale (10.0 kg/10)	70
23: Dill – water distillation – laboratory scale (1.0 kg)	70
24: Dill – steam distillation – pilot scale (10.0 kg/10)	71
25: Peppermint (Fayoum – June) – laboratory scale (1.0 kg)	72
26: Peppermint (Fayoum – October) – laboratory scale (1.0 kg)	72
27: Peppermint (Bani-Swif – October) – laboratory scale (1.0 kg)	72
28: Peppermint (Fayoum – June) – pilot scale (10.0 kg/10)	73
29: Peppermint (Fayoum – October) – pilot scale (10.0 kg/10)	73
30: Peppermint (Bani-Swif – October) – pilot scale (10.0 kg/10)	73
31: Rosemary – water distillation – laboratory scale (1.0 kg)	74
32: Rosemary – steam distillation – pilot scale (10.0 kg/10)	74
33: Thyme – water distillation – laboratory scale (1.0 kg)	75
34: Thyme – steam distillation – pilot scale (10.0 kg/10)	75
35: Extraction of selected plants volatile constituents by SFE	76
36: Chemical composition of caraway oil fractions from WD	79
37: Chemical composition of caraway oil fractions from SD	79
38: Chemical composition of caraway SFE extract versus WD oil	80

Table No. **Page**

39: Chemical composition of celery oil fractions from WD 84
40: Chemical composition of celery oil fractions from SD 85
41: Chemical composition of celery SFE extract versus WD oil..... 86
42: Chemical composition of dill oil fractions from WD..... 89
43: Chemical composition of dill oil fractions from SD..... 90
44: Chemical composition of dill SFE extract versus WD oil..... 90
45: Chemical composition of peppermint (1) oil fractions from WD ... 99
46: Chemical composition of peppermint (1) oil fractions from SD .. 100
47: Chemical composition of peppermint 1 SFE extract and WD oil 101
48: Chemical composition of peppermint (2) oil fractions from WD . 103
49: Chemical composition of peppermint (2) oil fractions from SD .. 104
50: Chemical composition of peppermint (3) oil fractions from WD . 106
51: Chemical composition of peppermint (3) oil fractions from SD .. 107
52: Chemical composition of rosemary oil fractions from WD..... 114
53: Chemical composition of rosemary oil fractions from SD..... 116
54: Chemical composition of rosemary SFE extract versus WD oil . 117
55: Chemical composition of thyme oil fractions from WD 126
56: Chemical composition of thyme oil fractions from SD 127
57: Chemical composition of thyme SFE extract versus WD oil 128
58: Anti *S.aureus* activities of caraway oil fractions..... 129
59: Anti *S.aureus* activities of celery oil fractions..... 130
60: Anti *S.aureus* activities of dill oil fractions..... 131
61: Anti *S.aureus* activities of peppermint oil fractions 132
62: IZ of different rosemary oil fractions against S.aureus 133
63: Anti *S.aureus* activities of rosemary oil fractions 134
64: IZ of different Thyme oil fractions against S.aureus 135
65: Anti *S.aureus* activities of thyme oil fractions 135
66: Chemical specifications of caraway oil 169
67: Chemical specifications of celery oil 170
68: Chemical specifications of dill oil 171
69: Chemical specifications of peppermint oil..... 172
70: Chemical specifications of rosemary oil..... 173
71: Chemical specifications of thyme oil..... 175

List of Figures

Figure No.	Page
1 : Photos of Plants	50
2 : Laboratory water distiller (Clevenger apparatus)	53
3 : Pilot scale steam distiller	54
4 : Stages of steam distillation	55
5 : Phase diagram of CO_2	57
6 : HP 7680T SFE module	58
7 : Inhibition zones measurement and determination of MIC	64
8 : MIC of caraway oil (Rec. fraction) against *S. aureus*	130
9 : MIC of celery oil (SD2 fraction) against *S. aureus*	131
10 : MIC of dill oil (Rec. fraction) against *S. aureus*	132
11 : MIC of peppermint oil (2) (Rec. fraction) against *S. aureus*	133
12 : MIC of rosemary oil (Rec. fraction) against *S. aureus*	134
13 : MIC of thyme oil (SD1 fraction) against *S. aureus*	135
14 : MIC of thyme oil (Rec. fraction) against *S. aureus*	136
15 : DPPH scavenging activity of Caraway (SD 6)	137
16 : DPPH scavenging activity of Celery oil (SD8)	138
17 : DPPH scavenging activity of Dill (SD5)	138
18 : DPPH scavenging activity of Peppermint (2) (SD3)	139
19 : DPPH scavenging activity of Rosemary (SD2)	139
20 : DPPH scavenging activity of Thyme (SD3)	140
21 : Effect of grinding on the net yield of essential oil	142
22 : Effect of grinding on the composition of essential oil	143
23 : Time consumed during WD against SD	145
24 : The yield of WD against SD (SD_T & SD_{T+R})	145
25 : Extraction of caraway fruit oil by WD versus SD	146
26 : Extraction of celery fruits oil by WD versus SD	146
27 : Extraction of dill fruit oil by WD versus SD	146
28 : Extraction of peppermint leaves oil by WD versus SD	147
29 : Extraction of rosemary leaves oil by SD versus SD	147
30 : Extraction of thyme leaves oil by WD versus SD	147
31 : Composition of recovered oil against steam distilled oil	148
32 : Compositions of hydrodistilled essential oils	150
33 : GC-FID analysis of caraway oil prepared by WD and SD	152
34 : GC-FID analysis of celery oil prepared by WD and SD	153
35 : GC-FID analysis of dill oil prepared by WD and SD	154
36 : GC-FID analysis of peppermint (1) oil from WD and SD	156
37 : GC-FID analysis of peppermint (2) oil from WD and SD	157
38 : GC-FID analysis of peppermint (3) oil from WD and SD	158
39 : GC-FID analysis of rosemary oil prepared by WD and SD	160

Figure No. **Page**

40 : GC-FID analysis of thyme oil prepared by WD and SD..... 161
41 : The yeild of SFE against WD..... 163
42 : The composition of SFE extract against WD oil 163
43 : IZ of caraway oil fractions and its carvone contents..... 179
44 : IZ of celery oil fractions and its limonene contents..... 180
45 : IZ of dill oil fractions and its carvone contents..... 181
46 : IZ of peppermint oil fractions and its menthol contents 181
47 : IZ of rosemary oil fractions and its 1,8 cineole contents..... 182
48: IZ of thyme oil fractions and its *p*-cymene contents 183
49 : MIC of selected plants against *S. aureus* 184
50 : DPPH scavenging activity (IC_{50}) of selected oils..... 188

Introduction

Essential oils are volatile natural complex products; each is made up of many, sometimes hundreds, of distinct molecules (terpene hydrocarbon, alcohols, aldehydes, ketones and esters (>90%) and/or phenylpropane derivatives) which come together to form the oil's characteristic aroma and therapeutic properties (Cal, 2006; Wagner and Bladt, 2001). Essential oils are accumulated in aromatic plants as secondary metabolites. They can be biosynthesized by all plant organs, i.e. buds, flowers, leaves, stems, twigs, fruits, roots, wood or bark, and are stored in secretory cells, cavities, canals, epidermal cells or glandular trichomes. They are usually obtained by hydro-distillation first developed in the middle ages by Arabs (Bakkali *et al.*, 2008).

At present, approximately 3000 essential oils are known, 300 of which are commercially important especially in the industries of pharmaceutical products, cosmetics and perfumery. Essential oils or some of their components are used in a wide scope for many purposes that range from the use of their fragrant aromas in perfumes, cosmetics, and sanitary products, to their use in food preservation. Medically, they exhibit a broad range of useful biological activities as antimicrobial, analgesic, sedative, anti-inflammatory, spasmolytic and local anesthetic remedies which prompted their use in pharmaceuticals, in addition to the popular use in aromatherapy. Essential oils also exhibit many uses in the field of agronomy and agriculture (Hajhashemi *et al.*, 2003; Perry *et al.*, 2003; Silva *et al.*, 2003).

Essential oils are extracted from various aromatic plants generally localized in temperate to warm countries like Mediterranean and tropical countries where they represent an important part of the traditional pharmacopoeia. Egypt is blessed with fertile soil and