2012 International Conference on Bioscience, Biochemistry and Bioinformatics
IPCBEE vol.31(2012) © (2012)IACSIT Press, Singapoore

Chemical Composition and Antimicrobial of Essential Oil of *Artemisia kermanensis*

A.Ganjali[+], M.Pourramezani Harati

Islamic Azad University, Kahnooj Branch, Kerman, Iran

Abstract. The plants of *A.kermanensis* were gathered from the heights 2000m of Faryab located in Kerman region of Iran in Oct 2011. Its essential oil was extracted with an outcome of 1.76 %w/w, by hydro distillation method and then was analyzed by gas chromatography coupled with mass spectroscopy technique (GC-MS technique) and calculation of Kovats Retention Indices values. Exactly 41 components were recognized that components having the highest percent are as follow: 1, 8- Cineole (26.93%), Camphor (16.97%), alpha-Thujone (7.52%), Borneol (7.47%), alpha-Terpineol (5.77%). Antimicrobial effects of this essential oil were exactly estimated and examined in Beheshti University laboratory. Its sensitiveness (Minimal Inhibition Concentration) to mentioned micro-organisms in the following: *Staphylococcus aureus* (4µg/ml), *Salmonella typhi* (32µg/ml), *Escherichia coli* (32µg/ml), *Candida albicans* (8µg/ml), *Aspergillus niger* (4 µg/ml), shows that the highest was recognized by comparing with standard samples with the way of dilution and minimum controlling concentration was calculated. As the results show, proper antimicrobial feature of essential oil is in full adaptation with the percent of oxygenated trepenoids.

Keywords: *Artemisia kermanensis*, Essential Oil, Chemical Composition, 1,8-Cineole, Antimicrobial, Ager Dilution, *Staphylococcus aureus, Aspergillus niger*

1. Introduction

Infectious deceases are the most important prevalent (epidemic) deceases in the world that impose a lot of financial burden to human communities. Artificial antibiotics although could have played a significant role in the treatment of infectious deceases problems that had appeared in relation with the manifestation of microbial resistance against antibiotics resulted in inclination to use medicinal plants more than ever (1). Also in food industries people's negative tendency to consume the foods in which chemical preservatives have been used, has caused them to use plant resources as antimicrobial in addition to using them as taster(2). Use of extracts and essential oil of plants as alternatives for artificial preservative materials has found its place in the food industries properly. There for, in order to achieve natural antimicrobial substances researchers have paid their attention on refinement of essential oil and plant extracts (3). In this field of research the results show that many plants of the families of umbelliferae, chicories and so on possess antimicrobial effects (4).

2. Materials and Methods

2.1. Sampling

Aerial parts mentioned species were collected from the heights of Faryab area in Oct 2011. All security consideration was fallowed during their transfer to the Islamic Azad University of Kahnooj. Collected species were dried by sun light by 20% moisture a humidity free environment, dried samples were ground up into powder with grinder.

2.2. Extraction of essential oil

The prepared sample of 50 g powder was put in a 2L-ballon with 300 mL distilled water. Essential oil was extracted by a Clevenger-type apparatus in duration 3.5 h and by hydro distillation method. Obtained

essential oil was collected in n-Hexane solvent and the purified essential was maintained in sample container in the temperature of 4 ^{0}C until their analysis by GC-MS technique.

2.3. Gas chromatography-mass spectrometry (GC-MS)

The analysis of the essential oil was performed using a Hewlett-Packard 6890 network GC System, equipped with a DB-5 capillary column and a HP 5973 mass selective detector in the electron impact mode. Helium was the carrier gas at 1 ml/min. Injector and MS transfer line temperatures were at 250^{0}C and 260^{0}C respectively. Column temperature was set at 40^{0}C for 1 min, then programmed from 40^{0}C to 250^{0}C at a rate of 3^{0}C/min, and finally held isothermally for 20 min. For GC-MS detection an electron ionization system was used with ionization energy of 70 eV. Retention indices were calculated by using retention times of C_8-C_{26} that were injected after the oil at the same chromatographic conditions according to Van Den Dool method (5). The linear retention indices for all the compounds were determined by injection of the sample with a solution containing a homologous series of C_8-C_{26} n-alkanes. The individual constituents were identified by their identical retention indices, referring to known compounds from the literature (6) and also by comparing their mass spectra with either the known compounds or with the Wiley 7 mass spectral database.

Table1. Chemical composition of essential oil from *A.kermanensis* collected in Oct 2011

No.	Compound	%	RI
1	Bicyclo[3.1.0]hex-2-ene	0.26	922
2	alpha-Pinene	0.91	934
3	Camphene	2.28	952
4	Sabinene	0.19	974
5	beta-Pinene	0.33	980
6	Pyridine	0.59	993
7	alpha-Phellandrene	1.21	1005
8	3-Carene	0.64	1011
9	alpha-Terpinene	1.94	1018
10	p-Cymene	1.37	1026
11	beta-Phellandrene	1.67	1031
12	1,8-Cineole	26.93	1041
13	gamma-Terpinene	2.68	1059
14	Artemisia ketone	0.41	1062
15	alpha-Terpinolene	1.21	1084
16	Filifolone	0.51	1088
17	beta-Thujone	0.37	1115
18	alpha-Thujone	7.52	1119
19	Chrysanthenone	0.98	1123
20	Camphor	16.97	1143
21	Nerol oxide	0.20	1153
22	Borneol	7.47	1165
23	3-Cyclohexen-1-ol	4.24	1178
24	4-Ethylbenzaldehyde	0.19	1192
25	alpha-Terpineol	5.77	1207
26	Bicyclo[3.1.1]hept-2-ene-2-methanol	0.42	1233
27	Cyclohexanone	1.71	1247
28	Piperitone	3.47	1272
29	Bicyclo[3.1.1]hept-2-en-4-ol	0.94	1282
30	Bornyl acetate	1.48	1285

31	Promecarb	1.23	1296
32	Methyl cinnamate	0.23	1300
33	4-Iodo-2,6-dioxa-adamantane	0.24	1329
34	Methyleugenol	0.84	1401
35	cis-Davanone	0.98	1586
36	Isohexadecane	0.39	1600
37	2-Fluoro-4-methylanisole	0.23	1611
38	Cyclopropazulen-7-ol	0.17	1620
39	Ethyl methyl ethylphosphonate	0.16	1637
40	Mercaptoacetic acid	0.22	1642
41	Methyl jasmonate	0.43	1647

2.4. Method of Ager Dilution original

First, the mentioned micro-organisms were cultured on culture environment of Moeller Hinton (for bacteria) and sobered dextrose Ager for fungi in order to obtain a fresh culture to fresh or to prepare after 24 hours at 37 ^{0}C for bacteria and 48 hours at 25 ^{0}C for fungi different concentrations of given essential oil were prepared in Ager having culture environment as a form of two fold 1/2,1/2, so that the dilutions were prepared from concentration of 256 mg/L (256,128,64,32,16,8,4,2,1,1/2). According to standard of NCCLS (or CLSI) bacterium should be added 10^4 CFU/mL to achieve this at first a suspension of half Mc. Farmland was provided from bacteria and it was diluted 10 times and then from each bacterium, 5 µL was taken. After, they were put on the water plots of Ager culture environment and different concentration of essential oil. To examine growth and not-growth of micro-organisms all the plots were kept at certain temperature after 24 hours for bacteria and 48 hours for fungi and then the results were analyzed (7).

3. Results and Discussion

The chemical composition of the essential oil was investigated using GC-MS technique. Exactly 41 compounds were identified for essential oil of *A.kermanensis* collected in Oct 2011. According to the Table1, the components having the most percent include: 1, 8- Cineole (26.93%), Camphor (16.97%), alpha-Thujone (7.52%), Borneol (7.47%), alpha-Terpineol (5.77%). According to the Table1, 70.60% of essential oil consists of oxygenated terpenoids. Antimicrobial effects of this essential oil were examined according to the method of Ager dilution on *Staphylococcus aureus* (4µg/ml), *Salmonella typhi* (32µg/ml), *Escherichia coli* (32µg/ml), *Candida albicans* (8 µg/ml), *Aspergillus niger* (4 µg/ml).

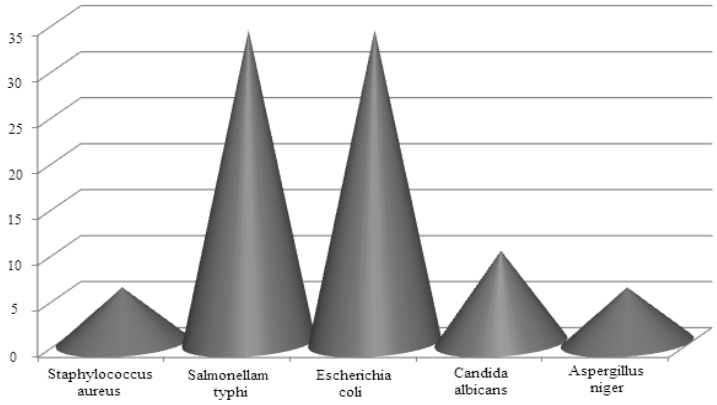

Fig.1. Antimicrobial effects of the essential oil of *A.kermanensis*

4. Conclusion

The essential oil of the plant *A.kermanensis* was extracted by the yield of 1.76 % w/w then analysis by technique of GC-MS. Oxygenated terpenoids compounds consist of 70.60 percent of the whole essential oil. According to Fig.1 micro-organisms of *Salmonella typhi* and *Escherichia coli* in the least dilution and micro-

organisms of *Staphylococcus aureus* and *Aspergillus niger* in the highest dilution were bound by essential oil. This proper antimicrobial feature of essential oil is in full adaptation with the percent of oxygenated trepenoids.

5. Acknowledgements

The author is grateful to Dr. Sardashti from the university of Sistan and Baluchestan (Faculty of Chemistry) for corporation in this work.

6. References

[1] Ayfer D, Turgayo.antimicrobial activities of various medicinal and commercial plant extracts. Turk.J.Biol. 2003, vol 27:157-162

[2] Burts, S. Essential oils: their antimicrobial properties and potential applications in Foods-a review. Int.J.Food.Microboil, 2004, 94; 223-253

[3] Abdelwahed, A.Hayder, N.Kilani, S.Mahmoud, A,chibani, J.Hammami, M. Chemical composition andantimicrobial activity of essential oils from Tunisianpituranthos toruosus. Coss Maire.Flavour.Frag.J. 2006, 21:120-133

[4] Fazly, Bs. Harizdeh, G. Screening of Iranian plants for antimicrobial activity pharmaceutical Biology. 2003, 41:573-583

[5] Van Den Dool .H. and Kratz, PD. A generalization of the retention index system including linear temperature programmed gas-liquid partition chromatography. J. Chromatogr, 1963, 11; 463-471.

[6] Adams, R.P. Identification of Essential Oil Components by Gas Chromatography/Mass Spectroscopy. Allured Publ. Corp., Carol Stream II. 1995.

[7] National Committee for Clinical Laboratory Standards. Performance Standards for Antimicrobial Susceptibility Testing-Eighth Informational Supplement: Approved Standard M100 S8. NCCLS, Wayne, PA. 1998.