Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2015, 7(12):861-864

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Analysis of the chemical composition of essential oil extracted from Syrian *Inula viscosa (L)*

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ABSTRACT

Leaves and flowers of Inula viscosa (L.) were collected from fields in Kafr Hoor village in western south of Syria. Essential oil was isolated by classical method of steam distillation using the Clevenger-type apparatus. Its chemical composition was analyzed by GC/MS. The analysis figured out the identification of 51 components in aerial parts. Major components of Essential oils were characterized by Sesquiterpens, Phenols, Hydrocarbons, Monoterpenes, Aldehyde & Ketones, Diterpene , Alcohol , Tetraterpene with percentage amounted to about 23.8 % 8.8 % 7.8% ,7.3 % , 5.8 % 5.2 % 4.5 % , 2.1 % respectively .

Keywords: Syrian *Inula viscosa*, Essential Oil, GC-MS, Caryophyllene, Syria.

INTRODUCTION

The *Inula viscosa* Aiton belongs to the Asteracease family yet is widely spread in the eastern Mediterranean countries and it mainly grows in southern and western regions of Syria. The leafs and flowers of *I.viscosa* is widely used in traditional medicine in Syria especially in healing wounds. Many studies on the chemical composition of the essential oil components of this plant have been previously reported, some of those studies revealed that the aerial parts of *Inula viscosa* are being used as Anti-inflammatory [1,2] , Anthelmintic, Antipyretic, Antiseptic, Antitumoral [3,4] and Antiphlogistic activity [5,6], in addition to treating gastro duodenal and lung disorders[7,8].

EXPERIMENTAL SECTION

1- Plant material

The aerial parts (Leaves and flowers) of *Inula viscosa (L.)* were collected in the flowering seasons, namely October2013, from the fields of Kafr Hoor village in western south of Syria .The plant was identified by Emad Al-Kady, Prof. at the Faculty of science at Damascus university, Damascus , Syria.

2- Isolation of the essential oil

By applying the steam distillation extraction method using a Clevenger type apparatus for 4 h in the lights of the British Pharmacopeia. The essential oil was collected and stored at 4°C in order to be analysed by gas chromatography/mass spectrometry (GC/MS). The concentration of Essential oil was expressed in milliliters/100 g of dry weight of plant material. The moisture content of the material analysis was determined after oven-drying at 105 °C for 24 h.

3- GC–MS analysis conditions

The following conditions were applied: column HP5-MS, injection temperature 280°C, source temperature 230-280°C, fragment energy 70eV and the volume injection is 1:l. By the way it should be mentioned here that the whole essential oil compositions was also analyzed under the same conditions .Gas chromatography–mass spectroscopy (GC–MS) analysis of oil samples was carried out on a Agilant 6890N gas chromatograph coupled to a HP 5973

mass selective detector (MSD). A DB-35 column (30 m · 0.2 mm film thickness 0.25 lm) was used. The analysis was performed using the following temperature program. Helium was used as the carrier gas at 0.9 ml/min of flow rate , oven isotherm at 50°C for 2 min then from 50°C to 170°C at 7° C/min then from 170°C to 250°C at 10°C/min, the injector and detector temperatures were held at 275° C. Mass spectra were recorded with ionisation energy of 70 eV and interface temperature of 250° C.

4- Identification of components

The identification of the oil components was based on a comparison of their retention indices relative to (C4–C24) n-alkanes with those of literature. Further identification was made by matching their recorded mass spectra with those stored in the NIST mass spectral library of the GC–MS data system or with the published mass spectra [9,14].

RESULTS AND DISCUSSION

Steam distillation of aerial parts of *Inula viscosa* yielded light yellow-colored essential oil 0.17 % . the obtained oil was analyzed by GC/MS .The chromatogram of aerial parts is shown in **Figure 1**

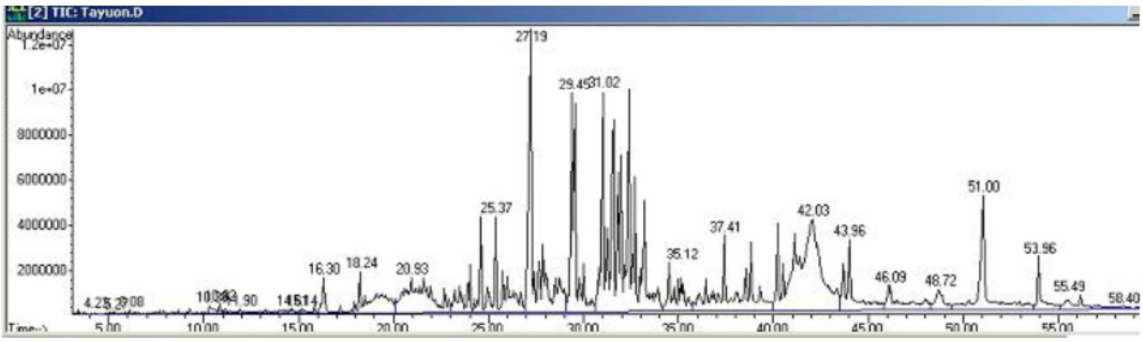

Figure 1.GC/MS chromatogram of the essential oil extracted from the aerial parts of Syrian *Inula viscosa*(*l.*)

Fifty one components representing 87% of the peak area of the oil extracted from aerial parts were identified and listed in **Table [1].**

Table1: Essential oil composition of Syrian *Inula viscosa* (l). aerial parts obtained by steam Distillation

RI	RT	Component name	percentage	Confirmation
1198	9.55	Caryophyllene oxide	1.9	GC-MS
1278	10.21	Eucalyptol	0.3	GC-MS
1295	10.58	Linalool	4.6	GC-MS
1344	11.48	1-Limonene	1.3	GC-MS
1364	12.54	a-terpineol	1.6	GC-MS
1381	12.99	Edulan 1 dihydro	2.2	GC-MS
1389	13.24	Eugenol	2.7	GC-MS
1399	14.12	Copaene	0.8	GC-MS
1405	14.87	b-Damascenone	1.2	GC-MS
1419	14.98	caryophyllene	1.3	GC-MS
1425	15.41	Gama-selinene	1.4	GC-MS
1473	15.78	Valencene	1.6	GC-MS
1481	16.35	b-cadinene	1.2	GC-MS
1493	16.86	a-cadinene	0.8	GC-MS
1574	17.49	1.8-Cineol	1.9	GC-MS
1594	18.74	Benzaldehyde	2.1	GC-MS
1607	19.20	cyclooctane	2.7	GC-MS
1615	22.45	Hotrienol	1.5	GC-MS
1618	22.87	3.5-Octadien-2-one	0.9	GC-MS
1642	23.98	6-Methyl-3.5-Heptadien-2-one	1.6	GC-MS
1656	24.89	1-undecanol	2.4	GC-MS
1667	26.87	1-Boreneol	1.7	GC-MS
1678	28.94	1-Terpinen-4-ol	1.5	GC-MS
1690	30.04	Alpha -Terpineol	1.1	GC-MS
1708	30.32	p-cymene-8-ol	2.1	GC-MS
1759	30.61	Trance-Geraniol	2.4	GC-MS
1762	30.98	Edulan I .dihydro	2.7	GC-MS
1786	32.46	Methyl eugenol	1.3	GC-MS
1840	33.74	Theaspirane B	1.6	GC-MS
1855	34.39	Cyclosativene	1.1	GC-MS
1861	37.15	a-Ylangene	0.6	GC-MS

1922	37.45	a-Terpineyl Acetate	0.8	GC-MS
1930	37.99	Longifolene	1.3	GC-MS
1998	39.21	Trans-caryophyllene	1.4	GC-MS
2126	39.44	Phytol	3.9	GC-MS
2145	40.11	1H-Indene 1	1.8	GC-MS
2149	40.75	ethylideneoctahydro	2.1	GC-MS
2154	40.78	Beta-Damascenone	2.1	GC-MS
2174	41.18	Aromadendrene	1.7	GC-MS
2296	41.67	- Eudesma-4(14).11-diene	1.3	GC-MS
2314	42.11	Alpha-Amorphene	1.1	GC-MS
2355	42.61	B=Eudesmene	1.2	GC-MS
2647	44.66	Nerolidol	1.1	GC-MS
2658	44.89	Azulene	9.2	GC-MS
2687	45.83	Cedren-13-ol	1.3	GC-MS
2691	46.03	Pentadecenol	0.6	GC-MS
2714	46.44	Ascabin	0.1	GC-MS
2732	46.87	Retene	1.3	GC-MS
2745	46.99	VulgarolB	0.1	GC-MS
2765	47.15	12-carboxyeudesina-3-11(13)diene	1.3	GC-MS
2779	47.55	Ethyl palmitate	1.2	GC-MS
		Total Area %	87	

The essential oils extracted from aerial parts of *Inula viscosa* was characterized by a high content of Sesquiterpens , Phenols, Hydrocarbons , Monoterpenes, Aldhyed &Ketones, Diterpene , Alcohol , Tetraterpene with percentage amounted about 23.8%,8.8 %,7.8%,7.3%, 5.8% 5.2% 4.5% , 2.1% respectively .**Table 2**

Table 2.The major chemical groups of essential oil extracted from aerial parts of Syrian *Inula viscosa*

Chemical Group	Sesqui-Terpens	Phenols	Hydro-Carbons	Mono-Terpenes	Aldhyed &Ketones	Diterpene	Alcohol	Tetra-Terpene
Area %	23.8	8.8	7.8	7.3	5.8	5.2	4.5	2.1

In comparison to similar studies were carried out on the same plant in Jordan, France, Italy, Turkey and Spain[10-13], the composition of essential oil extracted from Syrian *Inula viscosa*(l.) showed some similarities with those from Jordan , France and Turkey specially concerning the content of Caryophyllene Oxide whereas the compound of Gama-Selinene showed similarities with the those from Jordan , France , and Italy .On contrary there were dissimilarities of the content of Nerolidol between Jordan and Syria .Meanwhile the compound of Phytol was only revealed in essential oil of *Inula viscosa*(l.) of Syria.**Table [3]**

Table 3: Major Components of Essential Oil extracted from *Inula Viscose* (*L.*) obtained from different Locations

Compound	Area% Syria	Area% Jordan	Area % France	Area % Italy	Area % Turkey	Area % Spain
Nerolidol	1.1	19.75	8.6	1.9	1.5	7.1
3.5-Octadien-2-one	0.9	-	-	-	-	-
Caryophyllene oxide	1.9	2.57	2.5	8.0	1.5	0.4
Beta-Damascenone	2.1	5.64	6.2	-	0.8	-
Cedren-13-ol	1.3	2.0	-	-	-	-
Ethyl palmitate	1.2	-	-	-	-	-
Gama-selinene	1.4	2.18	1.6	1.8	-	-
Copaene	0.8	1.15	0.2	-	0.1	0.2
Phytol	3.9	-	-	-	-	-

CONCLUSION

The results presented in this study showed that Sesquiterpenes are the major fraction amounted to about 23.8% of the essential oil extracted from aerial parts of the Syrian *Inula. Viscosa* ,On the other hand some contents matched the same results of studies carried out in Jordan and Turkey but the others showed dissimilarities .

Acknowledgements
The authors are grateful for Prof. Emad AL-Kady, Faculty of science at the Damascus University , Damascus ,Syria , for identification of the plant.

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