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short communication

Composition of volatile compounds of extract of *Ammi majus* from Iran by GC-MS

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Abstract

Abderaz The composition of the essential oil obtained from the seeds of *Ammi majus* L. which collected from province of Khozestan in the southwest area of Iran.The oils was analyzed by gas chromatography mass spectrometry (GC-MS). Twenty - eight components have been identified in the extract of *A. majus* L. with Toluene (3.766%), Thymol (12.811%), Carvacrol (37.811%) as major components, respectively. The seeds extract was rich in monoterpenes. The various functions of terpenoide compounds have been widely studied. They have diverse activity including antibacterial, antifungal, antinociceptive, anti-inflammatory relieving digestive and anticancer.

Keywords: *Ammi majus*; Volatile compounds; GC/MS, Terpenoides

Introduction

Nowdays 50% of all drugs are extracted from plants [1]. Herbal derivatires aren't only useful for defensive mechanism in plants, but they are also used in treatment of human diseases [2]. *Ammi majus* is an upright annual herb which grows up to 1 meter or more [3]. It is a member of the Apiaceae family. The common name of *A. majus* is Bishopsweed [4]. *A. majus* is one of the best medicinal plants that was first found in Mediterranean and Egypt [5]. In Europe, the growth of *A. majus* is poor due to climate conditions. Attempts to acclimatize *A. majus* in cool climate were not successful: the fruits failed to ripen and plants were highly susceptible to infection [4].

Two of the dominant substances were linear coumarin and furanocoumarin (FCs): umbelliferone, psoralen, xanthotoxin, bergapten and imperatorine [1, 4, 6, 7]. The fruit of *A. majus* has widespread therapeutically properties, xanthotoxin which is the most important economic drugs used in treatment of skin disorders [5, 8]. The highest content of xanthotoxin has seen in plantlet with immature green fruits [1].

A.majus can't be used to feed sheep and cattle due to its coumarin content [8]. The amount of bergapten, xanthotoxin and isopimpinellin in callus, cell suspension and hairy root has been investigated but the productivity was not satisfactory [4, 9]. Gas chromatography–mass spectrometry (GC-MS) is a method that combines the features of gas

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chromatography and mass spectrometry to identify different substances. Nowadays the application of gas chromatography coupled with mass spectrometry in the electron impact mode has been considered for the routine analysis of essential oils. This technique can give more additional information by mass spectra. GC–MS is a very useful tool for the analysis of complex mixtures [10].

The aim of our present study of *A. majus* was due to it carrying out a large number of worthwhile pharmalogical properties and has not been reported in Iran in this field yet. This paper describes the seeds extract composition of *A. majus* L.

Materials and Methods

Plant materialand Gas chromatography/ mass spectrometry

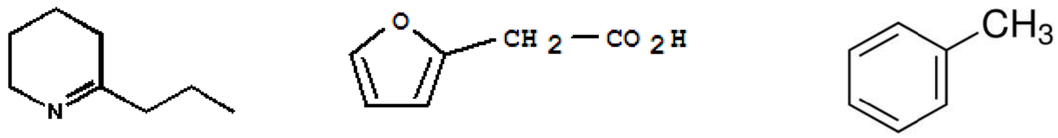
The Iranian ecotype of *A. majus* materials for this study, collected from province of Khozestan in the southwest area of Iran.Ground dry seeds material (100g) were accurately weighed and extracted with *n*-hexane.The extractwas analyzed by capillary GC on an Agilent 6890 gas chromatograph (Agilent Technologies, Inc, DE) equipped with a HP- 5M5 5% phenyl methyl silo hexane capillary column (0.25 µm film thicknesses, 30 m × 0.25 mm i.d) and an Agilent 5973 Network Mass Selective Detector. The oven temperature was programmed at 1 main 60 °C, 60 to 190 °C at 3 °C per min, 190 to 235 °C at 20 °C per min, 235 to 300 °C at 30 °C per min and a final time of 4 min. Helium was used as a carrier gas. The metabolites were identified by comparing the mass spectra and retention indices with those of Wiley 275 library or with mass spectra from literature**.**

Results and Discusion

Identification of the components of *A. majus* seeds extract was revealed by GC-MS analysis. Twenty-eight components were identified in the extract of *A. majus* representing 67.83% of the oil [Table.1]. Carvacrol (37.811%), Thymol (12.811%), Toluene (3.766%), [figure.1], Gamma- Coniceine with molecular weight 161.67 [g/mol] (1.412%), [Figure.1], 2-furanglycolic acid with MW 142.10944 [g/mol] (1.304%), [Figure.1] and Bis [2-ethylhexyl] phthalate (1.086%) were the major components in the extract of *A. majus* [Table. 1].The extracts contained *n*-alkanes, carboxilic acid,

Table 1. Percent and chemical composition of the extract of *A. majus*

No.	Retention time	Composition	Percent
1	3.71	Toluene	3.766
2	4.4	Ethene- tetrachloro	0.233
3	8.97	α-terpinene	0.301
4	9.16	p- cymene	0.863
5	9.34	1,8- cineole	0.126
6	10	Gamma- terpinene	3.062
7	12.19	Camphor	0.022
8	12.69	Isoborneol	0.168
9	12.81	Longipinane	0.128
10	15.60	Thymol	12.811
11	15.84	Carvacrol	37.811
12	18.54	Trans Caryophyllene	0.137
13	18.95	Aromandrene	0.071
14	20.31	Beta Bisabolene	0.260
15	21.76	Dehydro isolongifolene	0.483
16	21.88	Gamma- cadinene	0.241
17	23.87	Gamma- Coniceine	1.412
18	24.97	Benzyl Benzoate	0.632
19	25.98	Beta- Citronellol	0.205
20	26.53	Isobuthyl Phtalate	0.643
21	27.29	Hexadecanoic acid methyl ester	0.209
22	28.22	Furfuryl alcohol	0.556
23	28.33	3-decen- 5-one- 2- methyl	0.443
24	28.66	Bis [2-ethylhexyl] phtalate	1.086
25	28.78	2-furanglycolic acid	1.304
26	30.7	eicosane	0.186
27	31.01	nonadecane	0.331
28	32.55	Octadecane	0.334



Gamma- Conicein 2-furanglycolic acid Tuloene

Figure 1. The structure of Gamma- Coniceine, 2-furanglycolic acid and tuloene

terpenoids, esers, cycloalkanealcohol, ketone, aldehyde, alkeneand alkylhalids.Terpenoides are the major group of secondary metabolites that has been identified in the extract of *A. majus* seed growing in Iran.The extract consists of five monoterpenes include Carvacrol (37.811%), p-cymene (0.863%), 1,8- cineole (0.126%) Thymol (12.811%), Beta- Citronellol (0.205%) and two sesquiterpenes Beta Bisabolene (0.260%), Aromandrene (0.071%) [Table. 1]. Terpenoides are the most structurally varied class of plant natural products [11].

The uses of natural compounds in medicinal plant as antimicrobial agents decrease the risk of development of microbial resistance [12]. Thymol (2-isopropyl-5-methylphenol) and Carvacrol (2-methyl-5-isopropylphenol) are the active component found in essential oils or extract produced by numerous aromatic plants [13, 14]. Carvacrol has been reported as a very potent inhibitor of cell growth in a human non-small cell lung cancer [14]. The essential oil of Lippia gracilis leaves possesses anti-nociceptive and anti-inflammatory actions due to the presence of thymol [15, 12]. Oregano leaves was rich in carvacrol and thymol, has been widely used as a dietary supplement for combating infections, relieving digestive and skin disorders [14]. Carvacrol and thymol are able to inhibit both Geram-positive and Gram-negative bacteria [13]. Coniceine is the precursor of the Conium alkaloids which has been used as a sedative, antispasmodic, It was also used for a variety of problems, such as arthritis. There are also other species of *Ammi* which aren't as popular as *majus*, *Ammi visnaga* is a commercial medicinal plant mainly grown in Mediterranean areas [16]. Khellin, visnagin and visnadin are the main principle compounds of *A. visnaga* fruits. They are derivatives of furanochromones (khellin, visnagin) and pyranocoumarins (visnadin) respectively [18]. The extract of *A. visnaga* fruits has been used as medicine in the treatment of coronary diseases, bronchial asthma and kidney stones [17, 19]. Some compounds which identified in *Ammi majus* have been shown in some species of *Artemisia* including thymol, carvacrol, camphor, 1,8- cineole, p- cymene, α-terpinene.

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