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Chemical Composition of the Essential Oil of Fumitory Plant (*Fumaria parviflora* Lam) (Fineleaf fumitory) Grown in Ahwaz, Iran

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Hydrodistillation of 100 g of powdered *Fumitory parviflora* Lam plant grown in the city of Ahwaz, Iran, resulted in the formation of 1.2 mL of an essential oil. Gas chromatography-mass spectrometry analysis of the volatile oil was carried on a DB-1 capillary column. On the basis of the results obtained it was concluded that the essential oil is consisted of 8 major components (72.7 %), 11 minor components (19.9 %) and 10 components with smaller amounts (4.5 %).

Key Words: Fumitory, *Fumitory parviflora*, Fineleaf fumitory, Essential oil, GC-MS analysis.

INTRODUCTION

Fumaria is a genus of annual herbaceous flowering plants in the family Fumariaceae, native to temperate Europe and Asia. It is closely allied to Corydalis and some botanists combine the two genera. The common name is fumitory[1]. There are various species of this plant; some of the most important ones are listed in Fig. 1[2]. Fumitory takes its name from the plant's blue-green colour, which is reminiscent of smoke rising from the earth. The name fumitory and the scientific name Fumaria derive from the Latin fumus terrae, meaning earth smoke. This is believed to stem from an early botanist who described the appearance of fumitory"as if the ground were all of a smoke[3]. Some of the various species of Fumaria plant are: *Fumaria bastardii, Fumaria officinalis, Fumaria purpurea, Fumaria capreolata, Fumaria parviflora, Fumaria densiflora, Fumaria schleicheri, Fumaria martinii, Fumaria vaillantii, Fumaria muralis* and *Fumaria occidentalis.*

Fumitory plant is in flower from April to September and the seeds ripen from June to October. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees and flies. The plant is self-fertile. The plant prefers light (sandy) and medium (loamy) soils. The

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plant prefers acid, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil.

Seed: Sow spring *in situ*. There is normally very little need to sow this seed, the plant normally self-sows freely and should manage quite nicely by itself.

Cultivation details: Prefers a light well-drained soil in a sunny position[5,6,9]. This plant can be a common weed in some gardens, self-sowing freely, though it is fairly easy to control by hand weeding. The flowers are seldom visited by insects, but they are self-fertile and usually set every seed[4].

The scientific classification of the plant used in present studies is given in Table-1.

TABLE-1
SCIENTIFIC CLASSIFICATION OF FUMORITY PLANT GROWN IN AHWAZ, IRAN

Kingdom	Plantae (plants)
Subkingdom	*Tracheobionta* (Vasular plants)
Superdivision	*Spermatogphyta* (Seed plants)
Division	*Magnoliophyta* (flowering plants
Class	*Magnoliopsida* (Dicotyledons)
Order	*Papaverales*
Family	*Fumariaceae* (Fumitory family)
Genus	*Fumaria* L. (Fumitory)
Species	*Fumaria parviflora* Lam. (Fineleaf fumitory)

Medicinal uses: The plant's healing properties have been used by physicians and writers from the ancient Greek Dioscorides to Chaucer. In the early 20th century it was still regarded as an excellent blood purifier. Fumitory's medicinal value lies in the above-ground parts of the plant. Fumitory has been highly valued since at least Roman times for its tonic and blood cleansing effect upon the body[11]. It is particularly valuable in the treatment of all visceral obstructions, particularly those of the liver, in scorbutic affections and in troublesome eruptive diseases of the skin, especially eczema (for which it can be taken internally and externally)[4,5,9]. It relieves spasms in the gallbladder, bile ducts and gastrointestinal tract. It also stimulates the flow of bile. The herb is antispasmodic, aperient, cholagogue, slightly diaphoretic, mildly diuretic, laxative and weakly tonic[4,5,7,8,10]. It is also used for the treatment of leprsoy and is effective against some cancerous tumors. It is antivomitting, pectoral, depurative and is used for the treatment of digestive disorders. The plant is harvested as flowering

begins in the summer and can be used fresh or can be dried for later use[5,9]. Some caution should be exercised in the use of this herb since excess doses cause hypnotic and sedative effects, especially if it is taken for more than 8 d[10,12].

In folk medicine, fumitory has also been used for skin diseases, bladder inflammation, clogged arteries, arthritis, low blood sugar and infections. Its effectiveness for these problems has not, however, been verified.

EXPERIMENTAL

The fumitory plant was supplied in the city of Ahwaz, south west of Iran. The plant was identified as *Fumaria parviflora* by the Faculty of Agriculture of Shahid Chamran University of Ahwaz and also by the Research Institute of Medicinal Plants of Tehran University, Tehran, Iran. The plant was dried under the sunshine, then the aerial parts were separated and powdered by using a porcelain mortar and pestle and finally by an electrical mill.

Hydrodistillation of 100 g of the powdered plant resulted in a colourless oil (1.2 mL), which was then dried over anhydrous sodium sulphate and kept in a refrigerator (4°C).

The crude essential oil obtained from the aerial parts of the plant was analyzed by gas chromatography and gas chromatography-mass spectrometry techniques.

GC analysis of the oil was conducted using a thermoquest-finnigan instrument equipped with a DB-1 fused silica column (30 m × 0.32 mm i.d., film thickness 0.25 μm). Nitrogen was used as the carrier gas at the constant flow of 1.1 mL/min. The oven temperature was held at 60°C for 1 min, then, programmed to 250°C at a rate of 4°C/min and then held for 10 min. The injector and detector (FID) temperatures were kept at 250 and 280°C, respectively. GC-MS analysis was carried out on a thermoquest-finnigan trace GC-MS instrument equipped with a DB-1 fused silica column (60 m × 0.25 mm i.d., film thickness 0.25 μm). The oven temperature was raised from 60 to 250°C at a rate of 5°C/min, held at 250°C for 10 min; transfer line temperature, 250°C. Helium was used as the carrier gas at a flow rate of 1.1 mL/min; split ratio, 1/50. The quadrupole mass spectrometer was scanned over the 45-465 amu with an ionizing voltage of 70 eV and an ionization current of 150 mA. The constituents of the volatile oil were identified by calculation of their retention indices under temperature programmed conditions for *n*-alkanes (C_6-C_{24}) and the oil on a DB-1 column under the same conditions. Quantitative data was obtained from FID area percentages without the use of correction factors (Table-2).

TABLE-2
COMPOSITION OF THE ESSENTIAL OIL OBTAINED FROM THE AERIAL PARTS OF FUMITORY PARVIFLORA PLANT GROWN AROUND THE CITY OF AHWAZ, IRAN

S. No.	Compound	Retention time (RT)	Retention index (RI)	%
1	Fenchol	13.52	1116	0.2
2	Estragol	15.31	1181	1.3
3	*trans*-Dihydrocarvone	16.00	1207	Trace
4	Cuminyl aldehyde	16.43	1223	0.2
5	Pulegone	16.51	1225	0.7
6	Piperitone	16.54	1237	2.4
7	*trans*-Anetole	17.67	1268	0.5
8	Thymol	17.77	1272	0.7
9	Carvacrol	18.04	1282	1.9
10	α-terpinenyl acetate	19.53	1339	0.8
11	Geranyl acetate	21.94	1370	0.4
12	β-Elemene	20.50	1376	1.8
13	Geranyl acetone	21.94	1433	1.2
14	β-Ionene	22.90	1472	2.5
15	Butylhydroxytoluene	23.58	1500	0.3
16	Gloubol	25.28	1572	2.5
17	*trans*-Nerolidol	25.51	1581	2.4
18	Hexadecane	25.92	1599	0.7
19	α-Cadinol	25.65	1636	7.7
20	3-Isothujopsanone	27.37	1663	5.0
21	Tetradecanoic acid (myristic acid)	29.08	1742	1.4
22	Octadecane	30.91	1802	13.2
23	Farnesyl acetate	32.25	1897	8.0
24	Methyl hexadecanoate	32.47	1908	4.0
25	Hexadecanoic acid	33.14	1942	23.2
26	Methyl-9,12-octadeca-dionate	35.57	2076	7.5
27	Methyl-9,12,15-octadeca-treionate	35.66	2081	4.1
28	Phytol	36.07	2151	1.3
29	Tricosane	39.56	2302	1.2

RESULTS AND DISCUSSION

GC-MS analysis of the volatile oil was carried out on a DB-1 capillary column. Identification of the components of the oil was based on retention indices relative to *n*-alkanes and computer matching with the reference library, as well as by comparison of the fragmentation patterns of the mass spectra with those reported in the literature[12,13]. On the basis of the results obtained it was concluded that the essential oil obtained from the aerial parts of *Fumitory parviflora* Lam grown around the city of Ahwaz, Iran, is consisted of 29 components (Table-2). By considering Table-2, it can be concluded that the essential oil of fumitory is consisted of 8 major components (totally 72.7 %), 11 minor components (totally 19.9 %) and 10 components with tiny amounts.

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