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GC-MS CHARACTERIZATION OF ANGELICA VOLATILE OIL

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Abstract
Qualitative determination of volatile and semivolatile compounds of *Angelica archangelica* volatile oil by using a gas chromatography-mass-spectrometric technique (GC/MS) is presented. The extraction procedure was by steam distillation. Chromatography was performed on a 5% phenyl methylpolysiloxane column 30 m x 0.25 mm I.D., 0.25 μm film thickness) temperature program from 50 to 310^{o}C, with 8^{o}C/min. Helium carrier gas was of 1ml/min. Ionization was by electron impact (EI) in scan mode or selected ion monitoring (SIM) mode. The monoterpen hydrocarbons and coumarin contents are responsible for the therapeutic properties of angelica oil
Keywords: volatile oil, *Angelica archangelica* , GC-MS.

1.Introduction

Studies of the isolation and chromatographic behavior of compounds from Angelica (*Angelica archangelica*) roots paid the main attention to the coumarins which are of interest from the pharmacologically point of view. Many solvents were tested in the extraction of compounds from the roots of angelica: petroleum ether, n-penthane, n-hexane, diethyl ether, acetone, methanol, chloroform, or mixtures of solvents. 15 coumarins were isolated using medium pressure liquid chromatography (MPLC) with a normal phase from the chloroform extract of angelica, and further separated using subsequently reversed (RP) or normal phase (NP) as stationary phases. Coumarins are important for their biological activities as anticarcinogenic, antibiotic, diuretic and antihypertensive. Angelica root contains 0.001-0.008% coumarins and angelica fruits up to 3,5% [3,4].

The aim of this article was to identify the volatile and semivolatile compounds of *Angelica archangelica* volatile oil by using a gas chromatography-mass-spectrometric technique (GC/MS).

2. Method and samples

The volatile oil was extracted from the roots of the herb by using a steam distillation extraction procedure. Benzene was selected as a solvent for the volatile oil compounds. *Apparatus*: A Trace DSQ ThermoFinnigan quadruple mass spectrometer coupled with a Trace GC was used. A Rtx-5MS capillary column, 30 m length x 0.25 mm, 0.25µm film thickness, by using a temperature program from: 50^{o}C(1min), 8^{o}C/min to 310^{o}C. *Identification* The essential oil compounds were identified by GC-MS by using NIST library.

3. Results and Discussions

The identified compounds in the studied volatile extract are presented in Table 1.

Table 1. Characterization of the compound extracted from roots of ***Angelica archangelica***

RT	Name	Area %	M
4.31	hexanal	0.1	100
6.10	heptanal	0.1	114
6.60	3-thujene	0.0	136
6.79	α -Pinene	23.8	136
7.06	Camphene	1.7	136
7.54	β-phellandrene	0.9	136
7.63	β -pinene	0.9	136
7.84	β-myrcene	1.6	136
8.16	α -phellandrene	6.5	136
8.30	delta3-Carene	7.4	136
8.57	p-cymene	7.4	134
8.70	Limonene	34.5	136
8.97	Cis-ocymene	2.8	136
10.96	Cis-verbenol-	1.6	152
11.79	crypton	0.7	138
12.03	Thujenol acetate	0.8	194
12.73	Benzaldehyde-isopropyl	0.3	148
13.50	Bornyl acetate	2.0	196
15.09	copaene	0.9	204
16.39	α -Caryophyllene	1.2	204
17.69	copaenol	0.5	220
18.81	Caryophyllene oxide	0.4	220
19.08	oxacyclotetradecanone	0.6	212
21.83	Cyclopentadecanone-2-hydroxy	0.6	240
25.49	Osthole (coumarinic compound)	0.5	244
27	Octyl-benzoate	0.1	234
32.64	2,4 cholestadiene	0.2	368
32.7	cholestadienol	0.3	384
32.9	3,5 cholestadiene	0.9	368
34.31	Cholestenone	0.2	384
34.79	cholesterol	0.4	386
35.67	3,5cholestadien-7-one	0.1	382

The main compounds identified were: limonene, α –pinene, delta3-carene, p-cymene, α –phalndrene, cis-ocymene, bornyl acetate, camphene, β-myrcen, osthole (coumainic compound).

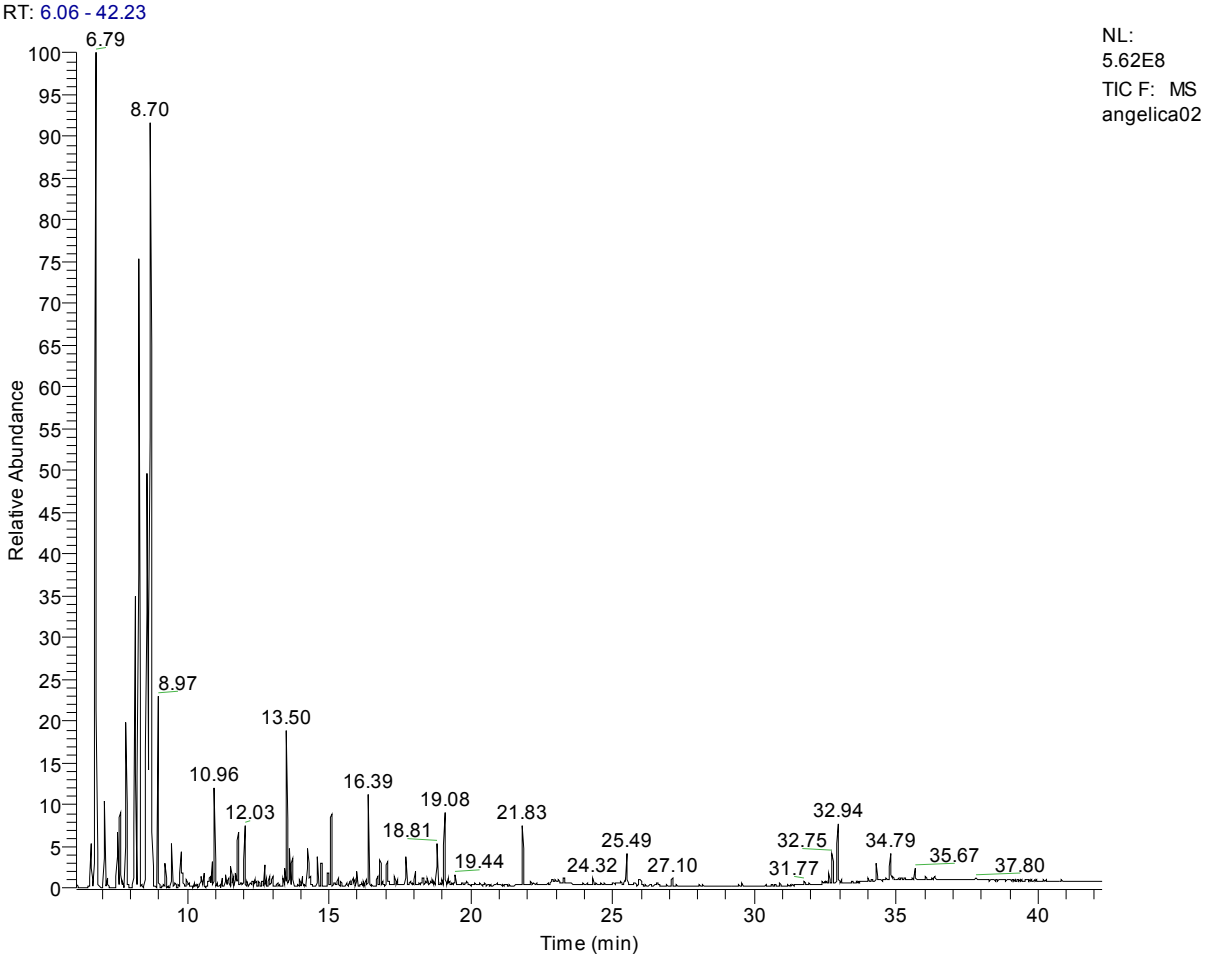

Fig. 1 Separation chromatogram of the extracted compounds from angelica roots

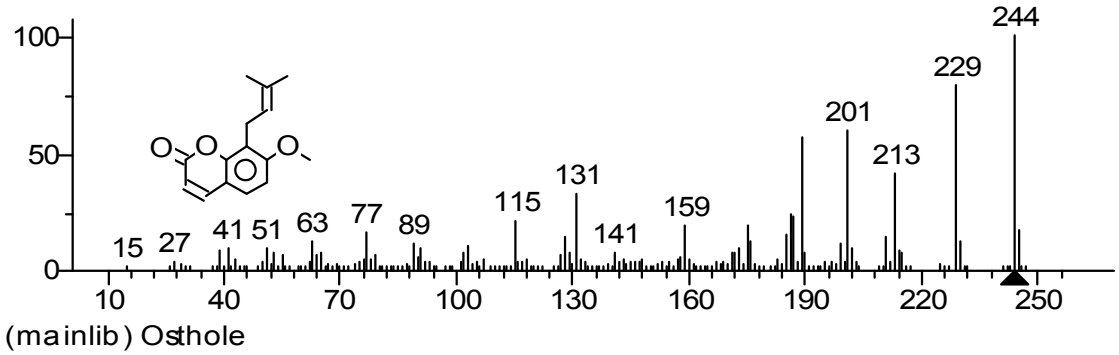

Fig. 2 The mass spectrum of osthol (coumarinic compound)

4. Conclusions

The results showed higher concentration of the volatile compounds as limonene, α –pinene, delta3-carene, p-cymene, α –phalndrene, cis-ocymene, bornyl acetate, camphene, β-myrcen. Only one coumarinic compound was identified, osthole. The extracture procedure used is favorable for the volatile compounds. The semivolatile compounds, as coumarins, were of low quantities. Also, the coumarins could depend of variety of plant. The main attention paid to the coumarins is due to their biological activities: anticarcinogenic, antibiotic Anticoagulant, phototoxic activity, plasmolytic, vasodilatoric, diuretic, antihypertensive calcium antagonistic activity.

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