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The Essential Oil Composition of *Levisticum officinalis* from Iran

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Abstract: The composition of the essential oil from the aerial parts of *Levisticum officinalis* obtained by hydro distillation, was analyzed by GC and GC-MS. The main components of the oil were β-phellandrene (42.5%), α-terpineol (27.9%), cis-ocimene (7.5%) and dehydro-1,8-cineol (6.8%). Dehydro-1,8-cineol and α-terpineol were two compounds that have not been reported in previous studies.

Key words: Essential oil, *Levisticum officinalis*, Hydro distillation, β-Phellandrene

Introduction

Levisticum officinalis (Apiacea), lovage, is a glabrous, perennial herbaceous plant, with a characteristic earthy, celery-like flavour and smell. All parts of the plant being strongly aromatic, this plant is cultivated for its seeds, leaves, roots and essential oil, which are used in the perfuming, food, beverage and tobacco industries (Bylaite *et al*., 2000). As a medicinal plant, it has been used for diaphoretic, expectorant, stomachic and stimulant activities (Venskutonis, 1995; Daukssšas *et al*., 1998). Lovage root has also been known for centuries as a medicine possessing spasmolytic, diuretic and carminative activities (Szebeni-Galambosi, 1992). A few studies have been published on the volatiles of lovage, some of which concern the essential oil from the plant roots (Stahl-Biskup *et al*., 1991; Cu *et al*., 1990; Hogg *et al*., 2001).

As a part of our ongoing research on the chemical analysis of oils obtained from wild plants of Iran, we investigated the oil of *Levisticum officinalis* growing in Iran.

Materials and Methods

Plant Material

The aerial parts of *Levisticum officinalis* were harvested at the flowering stage in the Southeast of Iran in June 2003. A voucher specimen has been deposited at the Herbarium of the Faculty of Pharmacy, Tehran University of Medical Sciences.

Isolation of Essential Oil

The air dried aerial parts of the plant (100 g) were subjected to hydro distillation using a Clevenger type apparatus for 3 h with distilled n-pentane as organic solvent. The oil was dried with anhydrous sodium sulphate and stored at 4-6°C during the time before analysis.

Gas Chromatography

GC analysis was performed on a Shimadzu ISA gas chromatograph, equipped with a split/split less injector (250°C) and a flame ionization detector (250°C). Helium was used as carrier gas (1 mL min^{-1}) and the capillary column used was DB-1 (50 in x 0.2 mm, film thickness 0.32 μn). The column temperature was kept at 60°C for 3 min and then heated to 220°C with a 5°C/min rate and kept constant at 220°C for 5 min.

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Gas Chromatography-Mass Spectrometry

GC/MS analysis was performed using a Hewlett-Packard 5973 with a HP-5MS column (30 m x 0.25 mm, film thickness 0.25 μm). The column temperature was kept at 60°C for 3 min and programmed to 220°C at a rate of 5°C min^{-1} and kept constant at 220°C for 5 min. The flow rate of helium as carrier gas was 1 mL min^{-1}. MS were taken at 70 eV.

Identification of the constituents of each oil was made by comparison of their mass spectra and Retention Indices (RI) with those given in the literature and those authentic samples (Adams, 1995). Relative percentage amounts were calculated from FID peak areas using a Shimadzu C-R4A chromatopac without the use of correction factors.

Results and Discussion

The essential oil was light green with distinct sharp odour and the total yield of 1.4% (Table 1). As it is shown in Table 1, the essential oil from *Levisticum officinalis* was characterized by large amounts of monoterpens (98.3%). The main components in the oil were β-Phellandrene (42.5%) and α-terpineol (27.9%). Other notable constituents were cis-β-ocimene (7.5%) and dehydro-1,8-cineol (6.8%). It is noted that the content of β-Phellandrene in the essential oil of *Levisticum officinalis* obtained in this study was higher than other studies. It perhaps is related to the climate and growth condition or other related parameters. Dehydro-1,8-cineol and α-terpineol were detected in the oil, which were not reported in any of previously investigated *Levisticum officinalis* (Stahl-Biskup and Wichtmann, 1991; Cu *et al*., 1990; Hogg *et al*., 2001). By contrast, α-phellandrene, citonellal and limonene were not detected in this study.

Table 1: Essential oil composition of the aerial parts of *Levisticum officinalis*

Compounds	RT	MW	KI	Percent
α-Thujene	03:51	136	931	1.2
α-Pinene	03:51	136	939	1.2
Camphene	03:56	136	953	0.6
β-Pinene	03:56	136	980	0.6
dehydro-1,8-Cineol	04:03	152	991	6.8
α-Terpinene	04:34	136	1018	1.0
ortho-Cymene	04:38	134	1022	1.6
β-Phellandrene	04:50	136	1031	42.5
cis-β-ocimene	04:53	136	1050	7.5
γ-Terpinene	05:24	136	1062	4.9
trans-Verbenol	07:55	152	1144	0.8
Unknown	08:02	-	-	1.3
α-Terpineol	08:55	154	1182	27.9
α-Terpinenyl acetate	14:41	196	1364	1.6
Neryl acetate	24:50	196	1365	0.5
Ethyl hydroquinone	25:17	138	1413	0.4

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