

Composition of the Volatile Components Extracted from the Roots of *Scorzonera undulata* ssp *deliciosa* (Guiss) Maire: From Algeria

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ABSTRACT

The chemical composition of the volatile components of the dried roots of *Scorzonera undulata* ssp *deliciosa* collected from Algeria was determined by GC and GC/MS. The obtained results showed that the extracted oil contained nine fatty acids. The major compounds were hexadecanoic acid (42.2%), *n*-tetradecanoic acid (16.1%), 9-octadecenoic acid (7.7%) and 9-hexadecenoic acid (4.5%).

Keywords: Asteraceae; *Scorzonera undulata* ssp *deliciosa*; Essential Oil; Fatty Acids; GC-MS

1. Introduction

The *Scorzonera* is a genus belonging to the Asteraceae sunflower family which it grows mainly in dry areas of Europe and Asia. It consists of about 90 species distributed over Europe, Asia and Africa. In Algeria, it is represented by 8 species: *S. caespitosa* Pomel, *S. coronopifolia* Desf., *S. fasciata* Pomel, *S. laciniata* L., *S. pygmaeae* S., *S. undulata* Vahl, ssp. *Alexandrina* (Boiss.) M. and ssp. *deliciosa* (Guss.) Maire [1]. Some species of *Scorzonera* were used as cooking vegetables and in traditional medicine both in Europe and Asia. In Algeria, is *Scorzonera undulata* ssp *deliciosa* used in traditional medicine mainly against snake bites [2].

Previous phytochemical investigation on *Scorzonera* species showed that the main constituents of the aerial parts of *S. undulata* oil from Tunisia were the aliphatic esters and aliphatic hydrocarbons [3]. The main components of *S. hispanica* from Netherlands were aliphatics acid and aliphatic hydrocarbons [4], while aliphatic hydrocarbons and alcohols were the main constituents of *S. mongolica* oil from China [5].

The aim of this work was to study the chemical composition of the volatile components of the dried roots of *Scorzonera undulata* ssp *deliciosa* (Guiss) growing in Algeria.

2. Material and Methods

2.1. Plant Material

The roots of *S. undulata* were collected in El-aouinet, (Eastern Algeria), during April 2004 and identified by Dr. H. Laouer (Department of Biology, University Ferhat Abbas, Setif, Algeria). The material was air-dried indoors prior to extraction.

2.2. Essential Oil Extraction

Extraction of the volatile compounds of the dried roots (80 g) of *S. undulata* was achieved by hydrodistillation during 3 h using a Clevenger-type apparatus, according of the European Pharmacopoeia.

2.3. Gas Chromatography-Mass Spectrometry

The obtained extract was subjected to GS-MS analysis on an Agilent system consisting of a 6890A gas chromatograph, a 5973 mass selective detector, and an Agilent Technologies data system. The CG column was an HP-5ms fused silica capillary with a (5% phenyl)-methylpolysiloxane stationary phase, (30 m × 0.25 mm i.d, film thickness 0.25 μm). Helium was used as carrier gas with a column head pressure of 9.95 psi and rate of 1.0 ml/min. The GC oven temperature was programmed linearly from 90°C initial temperatures, held for 5 min increased at 5°C/min to 300°C. The mass spectrometric operating

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Table 1. Chemical composition of the volatile components extracted from the roots of *Scorsonera undulata*.

RI ^b	Compounds ^a	Percentage composition
1295	<i>E,E</i> -2,4-Decadienal	tr
1318	<i>trans, trans</i> -2,4-Decadienal	0.1
1363	Docanoic acid	tr
1461	α -Humulene	0.1
1471	Dodecanol	0.2
1487	<i>Ar</i> -Curumene	0.5
1500	Pentadecane	0.1
1506	α -Muuroleone	0.1
1526	δ -Cadinene	0.2
1542	α -Calacorene	tr
1567	<i>n</i> -Dodecanoic acid	2.7
1593	1-Hexadecene	0.4
1600	Hexadecane	0.5
1608	Humulene epoxyde	0.6
1647	α -Muurolol	0.5
1669	Cadalene	0.1
1681	α -Bisabolol	0.1
1700	Heptadecane	0.6
1705	2,6,10,14-Tetramethyl-pentadecane	0.2
1714	Tetradecanal	0.7
1724	Methyl tetradecanoate	0.3
1749	(6 <i>S</i> , 1' <i>R</i>)-6-(1'5'-Dimethylhex-4'-enyl)-3-methylcycl	2.3
1763	<i>n</i> -Tetradecanoic acid	16.1
1792	1-Octadecene	0.2
1800	Octadecane	0.6
1809	2,6,10,14-Tetramethyl-hexadecane	0.2
1844	6, 10, 14-Trimethyl-2-pentadecanone	1.2
1858	Pentadecanoic acid	17
1863	1, 2 Benzenedicarboxylic acid, bis(2-methylpropyl) ester	1.4
1900	Nonadecane	0.5
1905	11-Hexadecenoic acid, methyl ester	0.9
1915	1, 2 Benzenedicarboxylic acid, bis(2-methyl octyl) ester	0.1
1926	Hexadecanoic acid methyl ester	2.3
1940	9-Hexadecenoic acid	4.5
1969	Hexadecanoic acid	42.2
2000	Eicosane	0.2
2060	Heptadecanoic acid	0.1
2094	9,12-Octadecdienoic acid, methyl ester	0.7
2009	9-Octadecenoic acid, methyl ester	1.3
2135	(<i>Z,Z</i>)-9,12-Octadecdienoic acid, methyl ester	1.7
2144	9-Octadecenoic acid (Oleic acid)	7.7
2300	Tricosane	0.1
2500	Pentadecane	0.2
Identified compounds		94.2

^aCompounds listed in order of their RI; ^bRI (retention index) measured relative to *n*-alkanes on the apolar HP5-MS column.

conditions were as follows: MS source temperature 230°C; MS quadrupole, 150°C; electron impact (EI) ionization mode (70 eV); scan mass range, 40 - 600 units.

2.4. Identification of the Components

The identification of the components was based on the comparison of their mass spectra with those of WILEY275.L, NIST98.L [6], CNRS Libraries and those described by Adams [7] or with authentic compounds and confirmed by comparison of their retention indices either with those of authentic compounds or with data published in the literature. The retention indices were calculated for all volatile constituents using a homologous series of n-alkanes.

3. Results and Discussion

The volatile fraction obtained by hydrodistillation of roots of *Scorzonera undulata* ssp *deliciosa* (Guiss) Marie was colorless and possessed a distinct sharp odour.

The results of the chemical analysis of the volatile compounds of *S. undulata* are presented in **Table 1** where 43 compounds were identified (94.2% of total oil). The major compounds were hexadecanoic acid (42.2%) which is mainly used to produce soaps, cosmetics, and release agents. *n*-tetradecanoic acid (16.1%), 9-octadecenoic acid (7.7%) which is the major fatty acid of olive oil and 9-hexadecenoic acid (4.5%). The essential oil from the aerial parts of *S. undulata* collected in western Tunisia [3], yielded an essential oil rich of methyl hexadecanoate (30.4%), linolenate methyl (23.9%), heneicosane (12.2%), octadecane (4.4%), methyl octadecanoate (2.2%), elemol (1.7%), dodecanoic acid (1.2%) and benzyl salicylate (1.3%). The volatile components of cooked *Scorzonera hispanica* [4], contained 8 aliphatic acids (30.6%) and 32 aliphatic hydrocarbons (26.9%). The major component was hexadecanoic acid (22.1%). Finally the content of the essential oil of the aerial parts of *S. mongolica* collected in China [5], revealed the presence of hentriacontane (34.75%), and A'-neogammacer-22(29)-en-3 β -ol (21.47%) as main components.

4. Conclusion

This study showed that the volatile fraction of the roots of *Scorzonera undulata* ssp *deliciosa* growing in Algeria is primarily characterized by the presence of hexadecanoic acid, *n*-tetradecanoic acid, 9-octadecenoic acid which is the principal fatty acid of olive oil and 9-hexadecenoic acid as main compounds.

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