

## ESSENTIAL OIL OF *Filipendula hexapetala*

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Extracts of *Filipendula* species (Rosaceae) have been used in traditional medicines of Europe and other countries as anti-inflammatory, analgesic, antirheumatic, diuretic, astringent, and diaphoretic agents [1–3]. Previous phytochemical studies have identified salicylic acid and derivatives, flavonoids, ascorbic acid, phenolcarboxylic acids, hydrolyzable tannins, and procyanidins in plants of the genus *Filipendula* [3–6].

*Filipendula hexapetala* Gilib. (*F. vulgaris* Moench) is a perennial, rhizomatous herb, 30–80 cm high, growing in dry grasslands, widespread in Serbia [7, 8]. Previous studies on *Filipendulae hexapetalae flores* proved the existence of analgesic activity and presence of flavonoids, phenolic acids, salicylates, ascorbic acid, tannins, fatty acids, non-alkaloid nitrogen-containing compounds, polysaccharides, and traces of coumarin [9–11].

The aim of this work was to analyze the essential oil from the aerial parts *F. hexapetala*, which has not been investigated until now.

The aerial parts of *F. hexapetala* yielded 0.1% (w/w) of yellowish oil. The results of GC and GC/MS analyses of the investigated oil are summarized in Table 1. Thirty-one compounds were identified, representing 90.8% of the total oil. The main constituent was identified as hydrocarbon *n*-tricosane (17.9%). The oil was characterized by a high content of salicylic acid derivatives: salicylaldehyde (13.7%), benzyl salicylate (6.8%), and methyl salicylate (6.7%). Besides, *n*-nonanal (11.9%), 2-heptadecanone (6.2%), and linalool (5.2%) were present in significant amounts, while other constituents were in less than 5%.

The high content of salicylaldehyde (36.0%) and methyl salicylate (19.0%) was also found in the essential oil from aerial parts of *Filipendula ulmaria* [2].

**Apparatus.** GC: Hewlett Packard 5890 II gas chromatograph, equipped with HP-5 fused silica capillary column (25 m × 0.32 mm, 0.52 μm film thickness) and FID.

**GC/MS:** Hewlett Packard, GCD series II model G 1800 C, operating in the EI mode at 70 eV, equipped with a fused silica 30 m × 0.25 mm, HP-5MS capillary column, with a film thickness 0.25 μm.

**Plant Material.** The aerial parts of *F. hexapetala* were collected during the full flowering period, in June 2002, from a meadow in the vicinity of Tresnjica village, Western Serbia. A voucher specimen has been deposited in the Department of Pharmacognosy, Faculty of Pharmacy, University of Belgrade.

**Isolation of Essential Oil.** The essential oil was isolated by hydrodistillation, according to the European Pharmacopoeia 4 procedure [12], using *n*-hexane as collecting solvent. Hexane was evaporated under reduced pressure and the oil yield was measured.

**Analysis of Essential Oil.** The composition of the oil and relations between constituents were revealed using GC and GC/MS. The operating conditions for GC analysis were: temperature program 40–280°C at a rate of 4°C/min, injector temperature of 250°C, detector temperature of 280°C and carrier gas H<sub>2</sub> (1 mL/min). GC/MS analysis was performed using He as carrier gas (1 mL/min) with temperature program 40–280°C at a rate of 4°C/min, injector temperature of 250°C, and interface temperature of 280°C. The components of the oil were identified by comparison of their retention indices (RI) and mass spectra to those from Wiley, NIST/NBS libraries and literature [13].

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TABLE 1. Composition of the Essential Oil from Aerial Parts of *F. hexapetala*

Compound	RI*	RI**	Content, %	Compound	RI*	RI**	Content, %
Limonene	1025.9	1029	1.7	Tetradecanoic acid	1762.4	N.a.	0.2
Salicylaldehyde	1039.9	1045	13.7	Hexadecanal	1814.6	N.a.	0.4
Benzene acetaldehyde	1042.2	1042	0.6	Benzyl salicylate	1865.9	1866	6.8
Linalool	1099.4	1097	5.2	2-Heptadecanone	1899.0	N.a.	6.2
<i>n</i> -Nonanal	1103.7	1101	11.9	Heptadecanal	1903.3	N.a.	0.3
$\alpha$ -Terpineol	1189.5	1189	1.3	Hexadecanoic acid	1965.4	N.a.	0.4
Methyl salicylate	1192.0	1192	6.7	<i>o</i> -Benzoyloxyphenol <sup>T</sup>	2036.8	N.a.	1.9
Carvone	1243.3	1243	0.6	<i>n</i> -Heneicosane	2099.1	2100	1.8
Nonanoic acid	1277.5	1271	2.0	2-Nonadecanone	2103.5	N.a.	1.0
Phenyl ethyl 3-methyl butanoate	1490.3	1487	0.7	<i>n</i> -Docosane	2197.5	2200	0.6
Tridecanal	1508.9	1510	1.1	<i>n</i> -Tricosane	2300.8	2300	17.9
Dodecanoic acid	1564.4	1567	0.3	<i>n</i> -Tetracosane	2397.2	2400	0.5
Tetradecanal	1608.9	1613	1.0	<i>n</i> -Pentacosane	2497.9	2500	2.3
$\alpha$ -Bisabolol oxide B	1652.1	1658	0.8	<i>n</i> -Hexacosane	2592.8	2600	0.2
Bornyl butyrate	1660.8	N.a.	0.2	<i>n</i> -Heptacosane	2685.0	2700	1.9
Pentadecanal	1711.4	N.a.	0.6	Total identified			90.8

RI\*: retention indices relative to C<sub>9</sub>-C<sub>30</sub> *n*-alkanes on HP-5MS column; RI\*\*: retention indices [13]; <sup>T</sup>: tentatively identified; N.a.: nonavailable.

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