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CHEMICAL COMPOSITION OF THE ESSENTIAL OIL OF *Haplophyllum virgatum* var. *virgatum* FROM IRAN

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The genus *Haplophyllum* A. Juss. (Rutaceae) consists of 70 species found mainly in warm, temperate, and subtropical regions of the northern hemisphere of the Old World [1, 2]. This genus, with the local name of "Sodabi," is represented in the flora of Iran by 30 species, of which 14 are endemic [3]. Various members of the genus are used in traditional medicine for the treatment of gynecological disorders, malaria, rheumatoid arthritis, herpes, warts, erysipelas, toothache, stomachache, skin diseases, and in the treatment of testicular cancer [4–6]. In the earliest scientific sources, such as the *Canon Medicinae* by Avicenna, it is indicated that *Haplophyllum* species can be used for treating different diseases [7, 8].

TABLE 1. Essential Oil Composition of *Haplophyllum virgatum* var. *virgatum*

Compound	RI	%	Compound	RI	%
α-Thujene	928	0.1	β-Elemene	1402	Tr.
α-Pinene	938	3.9	Aromadendrene	1440	8.1
Camphene	954	0.5	Spirolepechinene	1465	0.2
Sabinene	976	0.8	α-Humulene	1472	1.0
β-Pinene	984	13.1	Xanthostemone	1485	0.2
β-Myrcene	988	1.3	β-Selinene	1500	3.0
α-Phellandrene	1008	0.3	Valencene	1514	14.6
δ-3-Carene	1015	8.2	*cis*-Dihydroagarofuran	1524	0.3
α-Terpinene	1020	0.2	7-epi-α-Selinene	1539	5.1
p-Cymene	1027	0.1	epi-Longipinanol	1597	0.1
Limonene	1034	8.8	Caryophyllene oxide	1604	0.7
1,8-Cineole	1037	3.0	γ-Eudesmol	1649	Tr.
(*E*)-β-Ocimene	1046	4.3	Selin-11-en-4α-ol	1659	0.1
γ-Terpinene	1061	0.2	α-Cadinol	1670	0.3
Terpinolene	1093	6.6	Pogostol	1677	1.0
Linalool	1099	0.2	Intermedeol	1681	0.4
Terpinen-4-ol	1184	0.4	Monoterpene hydrocarbons		48.4
α-Terpineol	1196	Tr.	Oxygenated monoterpenes		11.8
Isobornyl formate	1237	0.9	Sesquiterpene hydrocarbons		32.7
Piperitone	1263	6.8	Oxygenated Sesquiterpene		2.6
Bornyl acetate	1292	0.5	Aliphatic hydrocarbones		0.4
(2*Z*)-Hexenyl valerate	1300	0.4	Total identified		95.9
β-Bourbonene	1400	0.2			

RI: retention indices relative to C_6–C_{24} *n*-alkanes on a DB-5 column; MS, mass spectroscopy; CoI, co-injection with authentic compounds; Tr.: trace, less than 0.1%.

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The present study describes the chemical composition of the essential oil, from the aerial parts of *Haplophyllum virgatum* var. *virgatum*, which have not been studied previously.

The essential oil yield (w/w%) was 0.3% based on the dry weight of the plant. Qualitative and quantitative analytical results are listed in Table 1. In total, 39 constituents were identified and quantified in the essential oil, representing 95.9% of the total oil. The major constituents of the oil were valencene (14.6 %), β-pinene (13.1%), limonene (8.8%), δ-3-carene (8.2%), aromadendrene (8.1%), piperitone (6.8%), and terpinolene (6.6%). The oil was characterized by a high concentration of monoterpene hydrocarbons (48.4%).

The aerial parts of *H. virgatum* var. *virgatum* were collected at the full flowering stage in April from Geno Mountain (27° 26′ 45″ N, 56° 18′ 12″ E at an altitude of 329 m), Bandar Abbas, Hormozgan Province, Iran. A Voucher specimen (HAPH-90121) has been deposited at the Herbarium of the Biology Department, Hormozgan University, Bandar Abbas, Iran.

Dried aerial parts (250 g) of the plant were ground, and the essential oil isolation and analysis of the oil components were carried out as described previously by Hadian et al. [9].

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