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DETERMINATION OF VOLATILE COMPONENTS IN IRANIAN *Rosa hemisphaerica*

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The Rosaceae family includes about 100 genera that grow almost widespread globally. One of these genera is *Rosa* that includes about 150 species [1]. Among them, the genus *Rosa hemisphaerica* Herrm., known as *Sulpher Rosa*, is native to Asia Minor and Southwest Asia [2–6]. *Rosa hemisphaerica* Herrm. was introduced from Persia into Europe by a French scientist in 1807 [7]. Some of the species of *Rosa* have been used in traditional medicine as an anxiolytic [2–5]. The essential oil of *Rosa damascena* Mill. is one of the most valuable and important base material in the flavor and fragrance industry, and several therapeutic effects, including antispasmodic, relaxant, and stomachic, have been described for its flowers [7]. The essential oil of *Rosa moschata* has antimicrobial properties [8, 9]. In Iran, *Rosa hemisphaerica* Herrm. grows in Azarbayejan, Kordestan, Mazandaran, Semnan, Lorestan, and Isfahan provinces [10]. The flowers of this plant have an unpleasant smell. A literature survey revealed that the essential oil of the aerial part of this plant in Central Iran has not been chemically studied to date. The present paper deals with a detailed analysis of the oil by capillary GC and GC-MS with determination of the percentage composition.

The flowering parts of *R. hemisphaerica* yielded 0.1% v/w of a colorless oil which was determined by a gravimetric method and calculated as a percentage of the mass of starting dry plant material. In this oil, 27 compounds, which represent about 99.4% of the total composition, were identified and are listed in Table 1 with their percentage. Constituents are listed in order of their elution from a DB-1 column. The major constituents are heneicosane (32%), nonadecane (30%), 9-nonadecene (10.5%), and tricosane (8.3%).

We made a comparison of this species of rose with the closely related *Rosa damascena* Mill. The major components of *R. hemisphaerica* and several *R. damascena* from China [11], Turkey [12], Bulgaria [13], and the Himalayas [14] are listed in Table 2. As can be seen in Table 2, the essential oils of *R. damascena* contain large amounts of citronellol, nerol, or geraniol, which cause this species to be odorous.

Except nonadecane, the amount of other normal hydrocarbons in *R. damascena* oils was small. *R. hemisphaerica* essential oil contains only 2% of geraniol; instead this oil is rich in normal hydrocarbons such as nonadecane, nonadecene, heneicosane, and eicosane.

GC analysis of oil was conducted using a Thermoquest-Finnigan Trace GC instrument equipped with a DB-1 fused silica column (60 m × 0.25 mm, film thickness 0.25 μm). Nitrogen was used as the carrier gas at the constant flow of 1.1 mL/min. Oven temperature was held at 60°C for 3 min and then programmed to 250°C at a rate of 5°C/min, and then held at 250°C for 10 min. The injector and detector (FID) temperatures were kept at 250°C and 280°C, respectively. GC-MS analysis was carried out on a Thermoquest-Finnigan Trace GC-MS instrument equipped with a DB-1 fused silica column (60 m × 0.25 mm, film thickness 0.25 μm) and operating under the same conditions as described above. The quadrupole mass spectrometer was scanned over the 45–465 amu with an ionizing voltage of 70 eV and an ionizing current of 150 μA.

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TABLE 1. Chemical Composition of the Essential Oil of *Rosa hemisphaerica* from Iran [15-17]

Compound[a]	%[b]	RI[c]	Compound[a]	%[b]	RI[c]
Heptanal	0.1	879	8-Pentadecanone	0.6	1857
Z-Citral	0.5	1210	*Z*-6-Pentadecanol	0.1	1861
Geraniol	2.0	1238	9-Nonadecene	10.5	1876
2,4-Decadien-1-ol	0.4	1302	Nonadecane	30.0	1901
Methyleugenol	0.3	1373	5-Nonadecen-1-ol	2	1918
α-Bergamotene	0.1	1436	Eicosane	1.4	1997
1-Pentadecene	0.1	1477	1-Heneicosyl formate	1.9	2074
Pentadecane	0.3	1497	Heneicosane	32.0	2107
α-Cadinol	0.1	1647	Docosane	0.5	2196
8-Hexadecyne	0.2	1663	Tricosane	8.3	2308
8-Heptadecene	1.8	1675	Tetracosane	0.2	2393
Heptadecane	1.5	1698	Octadecanal	0.2	2408
trans-Farnesol	0.4	1703	Pentacosane	2.4	2503
3-Octadecyne	1.5	1714	Total	99.4	

[a]Compounds listed in order of their RI.
[b]%, Relative percentage obtained from peak area.
[c]RI (retention index) measured relative to *n*-alkanes (C_6-C_{24}) on the non-polar DB-1 column.

TABLE 2. Comparison of Major Components of *R. hemisphaerica* and Several *R. damascena*

Compound	Percentage of Major Components in *Rosa* species				
	Iranian *R. hemisphaerica*	*R. damascena*			
		Chinese	Turkish	Bulgarian	Himalayan
Geraniol	2	16.1	36.22	-	-
Citronellol	-	30.7	30.54	26	35
Nerol	-	7.6	11.2	10.4	-
Phenyl ethanol	-	1.32	1.9	-	4.3
9-Nonadecane	10.5	-	-	-	-
Nonadecane	30	16.9	0.5	10	15.4
Heneicosane	32	7	0.3	-	-
Tricosane	8	0.5	-	1.1	-

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