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Original Article

Composition of the Essential Oil of *Rosa damascena* Mill. from South of Iran

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Abstract

The essential oil obtained by hydrodistillation of the aerial parts of *Rosa damascena* Mill. (Rosaceae) was analyzed by gas chromatography/mass spectrometry (GC/MS). The yield of the oil was 0.16% (v/w). Among 25 components, eight components, representing 99.98% of the oil, were characterized. Nonadecane (39.73%), heneicosane (32.38%), docosane (7.34%), citronellol (6.14%) and 9-nonadecene (5.69%), were found to be major constituents.

Keywords: Citronellol; Docosane; Heneicosane; Nonadecane; *Rosa damascena*.
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1. Introduction:

Oil of *Rose* is a volatile oil obtained by distillation from the fresh flowers of *Rosa damascena*. The chief producing countries are Bulgaria, Turkey and Morocco but smaller quantities are prepared elsewhere. The oil is prepared in copper alembic stills by the peasant or in large factories under careful scientific control. Some 3000 parts of flowers yields only one part of oil. The oil is very expensive and very liable to adulteration. The oil is a pale yellow semisolid. The portion which is solid at ordinary temperatures forms about 15-20% and consists of odourless stearoptene containing principally saturated aliphatic hydrocarbons (C_{14}-C_{23} normal paraffins) [1].

Rosa genus, belonging to the Rosaceae family, includes 200 species and more than 18,000 cultivars [2]. One of the most important *Rosa* species is *Rosa damascena* Mill. which is known as "Gol-e-Mohammadi" in Persian. This plant is called damask rose because it was originally brought to Europe from Damascus [3, 4].

Iran has been mentioned as one of its origins [5] and in this country, cultivation and consumption of *R. damascena* has a long history. Iran was the main producer of rose oil until the 16th century and exported it to all over the world [6, 7]. The essential oils of *R. damascena* are known for their fine perfumery applications and the use in cosmetic preparation [8]. *R. damascena* is also cultivated for its medicinal properties and this aspect is steadily increasing in the world. In recent years, the anti-HIV, antibacterial and antioxidant activities of *R. damascena* essential oil have been demonstrated [9-11]. Among a

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number of lines of callus derived from the leaf bud of *R. damascena* a few have been shown to produce 2-phenylethanol. From *R. rugosa* var. *plena* growing in central China some 108 compounds have been identified in the flower oil; these include citronellol (60%), citronellyl acetate (2.7%), geraniol (8.6%), nerol (2.8%) and E-E farensol (2.5%) [1].

Analysis of essential oil of *R. damascena* Mill from other part of Iran has been reported. The most distribution of *R. damascena* is located around Darab and Meymand in Fars province, respectively. Since, Kamfiroz has a different climate from two mentioned region and is located at 120 km far away form Shiraz, we decided to work on analysis of essential oil from this area.

2. Materials and methods

In this work, the plant material was collected from Kamfiroz near to Shiraz, Fars Province, Iran in May 2008. A voucher specimen has been deposited in the herbarium of the Faculty of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran (no. 1518). The aerial parts were air-dried at ambient temperature and hydroditilled using a Clevenger-type apparatus for 4 h. The yield of the oil was 0.16% (v/w) and with slightly yellow in colour. It was dried over anhydrous sodium sulphate and stored at 4-6 °C.

Gas chromatography/mass spectrometry (GC/MS) analysis was carried out using a Hewlett-Packard 6890/5973 operating at 70.1 eV ionization energy, equipped with a HP-5 capillary column (phenyl methyl siloxane, 25 m×0.25 mm i.d) with He as the carrier gas and split ratio, 1:20. Oven temperature was performed as follows: 60 °C (3 min.) to 260 °C at 3 °C/min.; detector temperature, 260 °C; carrier gas, He (0.9 ml/min). Retention indices were determined by using retention times of *n*-alkanes that were injected after the essential oil under the same chromatographic conditions. The components of the oil were identified by comparison of their mass spectra and retention indices (RI) with those given in literature and by comparison of their mass spectra with the Wiley library or with the published mass spectra [12, 13].

3. Results and discussion

Eight components were identified in the essential oil of *R. damascena* and presented in Table 1. Nonadecane (39.73%), heneicosane (32.38%), docosane (7.34%), citronellol (6.14%) and 9-nonadecene (5.69%) were the main constituents of the oil. The sample studied by us is different from the other Iranian samples [14, 15]. According to Mirza, citronellol (59.5%), geraniol (13.2%) and phenyl ethyl alcohol (5.6%) were among the main components of *R. damascenea*. In this report nonadecane and heptadecane were identified (2.2%) and (1.4%), respectively. The other Iranian sample [15] was characterized by high amounts of eicosane (29.88%), β-citronellol (25.59%), docosane (14.07%), 1-nonadecene (6.54%), which were different in our sample.

Table 1. Composition of essential oil of *Rosa damascena* Mill.

Peak no.	Components	% in oil	KI (HP-5)	Identification
1	Citronellol	6.14	1232	MS, KI
2	Germacrene-D	1.78	1483	MS, KI
3	Heptadecane	2.40	1707	MS, KI
4	9-Nonadecene	5.69	1893	MS, KI
5	Nonadecane	39.73	1900	MS, KI
6	Eicosane	4.52	2000	MS, KI
7	Heneicosane	32.38	2100	MS, KI
8	Docosane	7.34	2200	MS, KI
	Identification (%)	99.98		

The compounds have been sorted according to retention indices on HP-5 MS capillary column.

In another report from Iran, essential oil of *R. damascena* was extracted obtained in acidic solutions. In this report yield of essential oil was 10% v/v [16]. Analyses of essential oil of *R. damascena* in different countries have been done, too. For example analysis of essential oil of *Rosa* have been done in different pressures and temperatures in Himalaya region. This article show stearoptene content was found to be higher in the oil distilled under high pressure, as compared to oil produced under atmospheric pressure [17]. In three region of Hindustan, α-pinene (7.1%) [18], terpinene-4-ol (3.1%) [19] and linalool (6.7%) have identified as major compounds [20].

In the present work, our result is different from other reports. The first difference is the yield of essential oil, that in this condition, here yield of essential oil was higher than other reports. Secondly, the percentage of stearoptene contents was higher than alcolic compounds. For example the percentage of heneicosane, nonadecane and eicosane was higher than pervious reports. On the other hand, phenyl ethyl alcohol has been reported in most of the pervious works which has not been presented in our study. Therefore these differences can be distributed due to ecological factors or genetic variations.

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