Investigation of the different chemical composition of Damask rose (*Rosa damascena* Mill.) essential oil

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Abstract: *Rosa damascenais one of the most important aromatic plants over the world, typically cultivated in Iran. The major products of damask rose in Iran are rose water, rose oil and rose bud. It grows naturally in many parts of Iran as it is very resistant to drought environments. Damask rose is used as an ornamental plant in gardens and parks, but it is mainly applied for extracting essential oils from petals and buds. Harvesting is done mostly by hand in May. Rose oil is exported for use in the perfume and pharmaceutical industry. The aim of this study was to determinethe chemical composition of Damask rose essential oil harvested in kashan, Iran. The results of this investigation indicated that over 80 percent of the essential oil related to five chemical composition. The oil was analyzed by GC and GC-MS. Chemical composition of oil revealed the presence of β-citronellol (42.3 %), geraniol (16.6 %), nonadecane (8.7%), phenyl ethyl alcohol (5.8 %) and β-phenylethyl benzoate (4.9 %) as the main components.*

1. INTRODUCTION:

Rosa damascena is widely cultivated in Asia and Europe but it is found particularly in Iran, Bulgaria and Turkey (Ginova et al., 2012; Sharma and Kumar, 2016). In these three countries, there are specific zones where Damask rose is cultivated. In Iran the regions comprise Kashan, Shiraz, Fars, Mashhad, and Azerbaijan provinces (Kovacheva et al., 2010; Ginova et al., 2012). *R.* ×*damascena*, which is industrially cultivated for rose oil, is an erect shrub that can exceed 2.5 m in height and bloom once per year (May-June). During this period, a fully developed plant (4 years old and above) can produce around 500-600 flowers. The flowers of this plant are large, bright and colourful (pink or pink-red) with around thirty petals (Tsanaktsidis et al., 2012). The Damask rose (*Rosa damascena* Mill.), commonly known as oil rose, is the most important Rosa species cultivated for production of rose oil and rose water (Widrlechner, 1981). The genus *Rosa* includes 200 species and 18000 cultivars (Gudin, 2000). Apart from the floricultural purposes, roses also have an economic importance for their essential oils as a source of natural fragrances and flavorings (Kovats, 1987). There are mainly four species of roses for essential oil production. These are *Rosa damascena*Mill.,*Rosa gallica*L., *Rosa moschata*Herrm. and*Rosa centifolia*L. (Tucker and Maciarello, 1988). As one of the most expensive base materials in flavor and fragrance industry, rose oil is characterized by high percentage of the monoterpene alcohols including citronellol, nerol, geraniol, linalool, and phenyl ethyl alcohol. These components contribute mainly to the perfumery values of rose oil (Baydar and Baydar, 2005). However, some minor components such as damascenon and rose oxides are considered for adding value of more than 90% to the total aroma impression in the essential oil of *R. damascena* (Baldermann et al., 2009). This fact along with the poor rose oil yields have led to find strategies to improve the production of this species. Some techniques have been developed to achieve high multiplication rate of healthy and disease-free plants with a genetic stability, as well as good methods of separation of essential oils (Margina et al., 1999; Kornova et al., 2000; Pati et al., 2001; Dobreva et al., 2011; Ginova et al., 2012; Tintchev et al., 2012; Gul et al., 2015). According to international standard of rose oil (ISO 9842, 2003); rose oil requires Citronellol 20–34%, geraniol 15–22% and nonadecane 8–15% of the oil as the major compounds (Anonymous, 2003). Moreover, the ratio of citronellol/geraniol (C/G) is considered as a typical char-Modified atmosphere (MA) technology along with proper temperature and relative humidity management, has been widely used for extending the postharvest life and maintaining quality of fresh products, in which manipulation of CO2 and O inside the packages atmosphere leads to decrease in respiration rate in many fresh products (Artés et al., 2002; Farber et al., 2003; Singh et al., 2009). Rose oil is mainly used in the perfumery and cosmetics industry as a base component of the many of the modern perfumes but it also finds the application in the food industry as a flavor additive. Roses have been used since the earliest times in rituals, cosmetics, perfumes, medicines and aromatherapy. The rose essential oil comprises of a number of different types of complex constituents (Aslam Khan *et al*., 2005). Different methods of extraction have been reported to be used for extracting rose oil from rose petals. The methods reported are such as hydrodistillation using Clevenger's apparatus (Koksal*et al*., 2015; Verma*et al*., 2011;Halawani, 2014).

2. MATERIALS AND METHODS:

The petals of *Rosa damascena*Mill. were handpicked from the rose gardens located in Kashan, Iran (latitude 33.9850° N, Langitude51.4100° E). The petals were handpicked from flowering period and were distilled without waiting in order to determine the essential oil chemical composition. The rose flowers are handpicked from Kashan

gardens in the early hours of the day at 6:00 to 9:00 a.m., during the main period of flowering in May 2017. The essential oils extract from picking petals, which were hydro distilled instantly after harvest, were considered as the reference materials to on the oil yield and components. The essential oil of *Rosa damascena*Mill. wasanalyzed by GC-MS. Gas chromatography-mass spectrometry GC-MS analysis was carried out on a Thermo mass spectrometer, coupled with a Thermo gas chromatograph.

3. RESULTS AND DISCUSSION:

The essential oil composition of *Rosa damascena*is summarized in Table1.The oil was analyzed by GC-MS, and five major compounds were identified, which represented over 80% of the total oil. On the other hand, considerably amount of greaniol was identified in both storage conditions especially in 25°C (approximately 10%) as a major component. 18 compounds were identified based on fresh petals. In the results the percentage of phenylethyl alcohol as a benzenoid compounds were considerably increased. The results revealed that over 80 percent of the essential oil related to five chemical composition. The results of this study showed that β-citronellol (42.3 %), geraniol (16.6 %), nonadecane (8.7%), phenyl ethyl alcohol (5.8 %) and β-phenylethyl benzoate (4.9 %) as the main components. Comparing the chemical composition of the essential oil of the *Rosa damascena*petals with earlier reports, the components showed medium differences even for their major constituents**.**

Table1: Chemical composition of essential oils of *Rosa damascena*Mill.

	Compound	**Relative contents of essential oils extraction (%)**
1	β-citronellol	**42.3**
2	geraniol	**16.6**
3	nonadecane	**8.7**
4	phenyl ethyl alcohol	**5.8**
5	β-phenylethyl benzoate	**4.9**

4. CONCLUSION:

The citronelol/geraniol ratio is significant for the aroma quality. Oils with variation limits of 1.25-1.30 (Baser**,** 1992) are preferred. In this study values for this ratio regarding Rosa damascena is 2.54 and it is not according to international standard of rose oil (ISO 9842, 2003) and has medium quality rose fragrance. The results obtained in this study are considered significant for having shown that *Rosa damascena*contains β-citronellol (42.3 %), geraniol (16.6 %), nonadecane (8.7%), phenyl ethyl alcohol (5.8 %) and β-phenylethyl benzoate (4.9 %)as the main components.

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