



ORIGINAL ARTICLE

Chemical Composition and Essential Oils of *Pelargonium graveolens* (Geraniaceae) By Gas Chromatography – Mass Spectrometry (GC/MS)

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ABSTRACT

The volatile constituents of the essential oil of *Pelargonium graveolens* growing in Tehran -Iran was investigated by using the GC and GC/MS techniques. Eleven compounds were identified. The main constituents were: citronellol (48.44%), 0-octen-1-ol (18.61%), geraniol (9.70%), p-menthone (6.96%), β -Caryophyllene (3.13%), Germacrene-D (2.92%), Caryophyllene oxide (2.52%), Geraniol (2.00%), cyclofencheh (1.99%), phenyl ethyl tiglate (1.90%), Geranyl tiglate (1.84%)

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INTRODUCTION

Pelargonium graveolens (Geraniaceae) is shown by over 300 species of annual, biennial, and perennial taxa mostly in cool-temperate region in the world. This genus belongs to *Geraniaceae* family. Many taxa are recognized ornamental plants because of their beautiful flowers/leaves [1]. One species of this genus is medicinal plants, and extracts from some *Geranium* spp. are used in traditional medicine, tanning, and dyeing [2]. Recently, many investigations about the composition, biological effects, medicine food-flavoring, perfumery, and cosmetics of the essential oils have been studied [3]. Essential oils are applied in a large variety of consumer goods such as detergents, soaps, toilet products, cosmetics, pharmaceuticals, perfumes, confectionery food products, soft drinks, distilled alcoholic beverages and insecticides. Changes in the essential oils compounds of this plant were obtained by Verma due to the transplanting [4].

Essential oils in plants are complex mixtures of volatile substances available in low concentrations. Various extractions have been applied in order to gain essential oils of the plants. Newly, a microwave distillation has been extended for volatile products extraction.

This study was carrying out to determinate essential oil of *Pelargonium graveolens* (Table 1) by using the GC and GC/MS techniques [5].

MATERIALS AND METHODS

Plant Material

The aerial parts of *Pelargonium graveolens* were collected during the growering period from cultured plants around Tehran centre of Iran in March 2014.

The species were identified in Science and Research Branch, Tehran Islamic Azad University, Tehran, Iran by Dr. Kambiz Larijani.

Isolation and analyses of essential oil

GC-MS. GC/MS analysis was conducted on GC detector coupled with a Hewlett Packard 6890 gas chromatograph, equipped with a cross-linked 5% Phenyl di methyl siloxane HP-5MS capillary column (30m × 0.25 mm, film thickness 0.32 μ m). The GC operating conditions were as follows:

Carrier gas, helium with a flow rate of 1 mL/min; column temperature, 60°-220°C at 3°C/min; injector and detector temperatures, 250°C; volume injected, 0.1 µL of the oil; split ratio, 1:20.

The HP- 5973 MS operating parameters were as follows:

Ionization potential, 70 eV; ion source temperature, 230°C. Each object and interpretation constituent of essential oils were identified by GC retention indices relative to *n*-alkenes' and KI computer matching with the library [6,7].

RESULT AND DISCUSSION

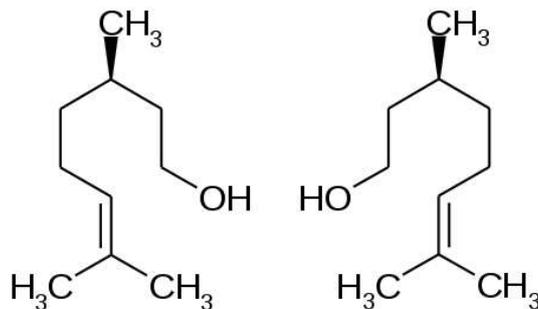
The chemical composition of the essential oils of *Pelargonium graveolens* extracted is shown in Table 1. 11 different components were recognized by GC-MS with the HP-5 column (Table 1). The major identified components and the relative amounts based on peak area were citronellol (48.44%), 0-octen-1-ol (18.61%), geraniol (9.70%), p-menthone (6.96%), α-Pinene (22.47%), β-Caryophyllene (3.13%), Germacrene-D (2.92%), Caryophyllene oxide (2.52%), Geranio11 (2.00%), cyclofencheh (1.99%), phenyl ethyl tiglate (1.90%), Genaryl tiglate (1.84%). The significant components of the oil were citronellol (48.44%) and, 0-octen-1-ol (18.61%). This sample was poor in Genaryl tiglate (1.84%). Results of the of the Retention time oil are shown in Table 1. Cyclocitral is monoterpene hydrocarbons. Geraniol Oxygenated monoterpenes. Caryophyllene oxide Oxygenated sesquiterpenes.

The major components of the oil were citronellol (48.44%). Our study was agree with Rajeswara Rao *et al* [8] demonstrated that concentration citronellol increased in summer as a mechanism to adjust thermal stress. The main components detected in our essential are similar with Ghannadi *et al* obtain same [9]. There are variations in the composition of these volatile oils in comparison to the volatile oils of other countries. These differences seem to depend on climate changes and conditions and types and methods of distillation [10-12].

According to result minimum observed in Genaryl tiglate (1.84%). This is accordance to [4].

It seems that the essential oils of *P. graveolens* cultivated in Iran were characterized as citronellol and caryophyllene oxide chemotypes, respectively. Ghannadi *et al*. [9] Comparison of *Geranium* volatiles with those mentioned in the Literature 3-8 indicates that identified compounds are in most cases similar in the essential oil.

β-Caryophyllene or *trans*-Caryophyllene is one of the chemical compounds that contribute to the spiciness of black pepper. β-Caryophyllene, is a natural bicyclic sesquiterpene that is a constituent of many essential oils, especially clove oil, the oil from the stems and flowers of *Syzygium aromaticum* (cloves), the essential oil of hemp *Cannabis sativa*, and rosemary *Rosmarinus officinalis*. It is usually found as a mixture with isocaryophyllene and α-humulene, a ring-opened isomer. Caryophyllene is notable for having a cyclobutane ring, a rarity in nature [12, 13].



Structure of citronellol

Table 1. Identified components in the essential oils of *Pelargonium graveolens* extracted

	Compounds	Retention time	KI	%
1	cyclofencheh	14.47	354	1.99
2	p-menthone	16.23	2842	6.96
3	citronellol	17.35	25304	48.44
4	geraniol	17.92	1121	9.70
5	0-octen-1-ol	18.33	1197	18.61
6	Geranio 11	18.90	1601	2.00
7	β caryophyllene	21.77	1500	3.13
8	Germacrene-D	22.90	1187	2.92
9	phenyl ethyl tiglate	24.49	902	1.90
10	Caryophyllene oxide	24.86	1208	2.52
11	Genaryl tiglate	26.22	274	1.84

CONCLUSION

Medicinal plants are important for pharmacological research and drug development. The leaves of *Pelargonium graveolens* is widely used as a spice due to its distinct odor of essential oils. Our result revealed that major chemical composition are citronellol.

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