

EXPERIMENTAL PAPER

Chemical composition of *Scaligeria meifolia* Boiss. essential oil from Iran

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Summary

Scaligeria meifolia Boiss., belonging to the *Apiaceae* family, grows wild in Iran. The essential oil from aerial parts of *S. meifolia* were obtained by hydrodistillation and analyzed by GC and GC/MS. Thirty-one constituents representing 99.98% of total oil components were identified. The main constituents of the essential oil were germacrene-D, (24.2%), germacrene-B (14.8%), limonene (14.2%), γ -elemene (11.6 %) and β -elemene (5.2%).

Key words: *Scaligeria meifolia*, *Apiaceae*, essential oil, GC/MS

INTRODUCTION

The genus *Scaligeria* DC. belongs to the family *Apiaceae* and is represented in Mediterranean and Asian areas by 25 species and seven species of them grow in the flora of Iran [1]. *Scaligeria* includes perennial herbaceous plants with straight stem and simple alternate leaves or divided lamina. The inflorescence is umbrella-composed with small white quintuplet flowers. The fruits are di-achene. *Scaligeria* genus is outspread in different parts of Iran [2-4]. The literature survey revealed that the phytochemical constituents and the medicinal attributes of *S. meifolia*

have not been investigated previously, although, the essential oil chemical composition as well as antimicrobial and antifungal activities of several *Scaligeria* species have been reported [4-8]. In the essential oil isolated from the leaf and fruit of *Scaligeria assyriaca* germacrene-D was recorded as a major component [4]. Essential oils rich in germacrene-D and in *in vitro* exhibited anti-mycobacterial activity [9]. Herbal parts of *Scaligeria lazica* have a strong smell characteristic of anise due to the presence of E-anethol with (49.67 %) in its oil. After the removal of the oil, the aqueous distillate of the herb was extracted with hexane. The extract contained 2-hydroxy-5-methoxy-benzaldehyde (22%) and phenylacetaldehyde (14%) as main constituents [5]. Fruit oil of the same species was found as a rich source of (Z)- β -farnesene (89%) [6].

Here, to the best of our knowledge, the chemical composition of the essential oil of *S. meifolia* was studied for the first time.

MATERIALS AND METHODS

Plant material

The aerial parts of *Scaligeria meifolia* Boiss. were collected at the flowering stage from Post-e Chenar, near Sarvestan, Fars Province, Iran in June 2011. The plant material was identified by staff at the herbarium of Fars Research Center for Agriculture and Natural Resources, Shiraz, Iran. A voucher specimen was deposited in the herbarium of the Research Center for Agriculture and Natural Resources, Shiraz, Iran.

Isolation of the essential oils

Air dried aerial parts of the plants (50 g) were subjected to hydrodistillation for 3 hours, using a Clevenger-type apparatus. The obtained oils were dried over anhydrous sodium sulfate and stored in sealed vials at +4°C in dark until analyzed by GC/MS.

Identification of the oil components

The GC analysis was carried out using an Agilent-technology chromatograph with a HP-5 column (30 m \times 0.32 mm i.d. \times 0.25 μ m). The oven temperature was from 60°C to 210°C at 3°/min; then 210°C to 240°C at 20°C/min, and held for 8.5 min, injector temperature 280°C; detector temperature 290°C; carrier gas, N₂ (1 mL/min); split ratio of 1:50. GC-MS analysis was carried out using an Agilent 7890 operating at 70 eV ionization energy, equipped with a HP-5 MS capillary column (phenyl methyl siloxane, 30 m \times 0.25 mm i.d. \times 25 μ m) with He as a carrier

gas, and a split ratio of 1:50. Retention indices were determined using retention times of n-alkanes that were injected after the essential oil under the same chromatographic conditions. The retention indices for all components were determined according to the method using n-alkanes as a standard. The compounds were identified by comparison of retention indices (RI, HP-5) with those reported in the literature and by comparison of their mass spectra with the Adams library and stored in NIST and Wiley libraries [10-12].

RESULTS AND DISCUSSION

Thirty one chemical constituents were detected by GC/MS analysis of *S. meifolia* essential oil, representing 99.98% of total oil components. The identified constituents with their percentages and RIs are summarized in table 1. Main constituents of the essential oil were germacrene-D (24.2%), germacrene-B (14.8%), limonene (14.2%), γ -elemene (11.6 %) and β -elemene (5.22%). It was the first study over the essential oil of *S. meifolia* and except few studies on the genus *Scaligeria*, there were no former results for comparison. In accordance with our result, the fruit and leaf essential oil analysis of *S. assyriaca*, resulted in germacrene–D as a main essential oil constituent [4]. On the contrary, the essential oil of *S. tripartite* and *S. lazica* contains germacrene-D as minor compounds [5]. The second major component observed in our study (germacrene-B) a was also recorded by Masoudi et al. as a main compound, among 24 identified chemical compositions of essential oil of *Scaligeria falcarioides* [7]. Thirty-eight compounds were identified in the oil of *Scaligeria tripartite* and geijerene, which was not exhibited in the analysed essential oil of *S. meifolia*, was the main chemical composition of the oil [8]. Other our major compounds which were never reported before as the major components of the essential oils of *Scaligeria* DC, are limonene, β -elemene and γ -elemene. Limonene was found as a dominant compound in *Carum carvi* and *Anethum graveolens* (*Apiaceae*) oil that exhibited a moderate antibacterial activity [13, 14].

Table 1.

Chemical components (%) identified in essential oils from aerial parts of *Scaligeria meifolia*

| No. | Compounds | RI | GC-MS |
|-----|------------------------|------|-------|
| 1 | α -Pinene | 929 | 2.31 |
| 2 | Camphene | 943 | 1.52 |
| 3 | Sabinene | 968 | 0.40 |
| 4 | β -Pinene | 972 | 0.08 |
| 5 | Myrcene | 985 | 0.82 |
| 6 | α -Phellandrene | 1001 | 0.13 |
| 7 | p-Cymene | 1020 | 0.26 |

| No. | Compounds | RI | GC-MS |
|-------|---------------------------|------|-------|
| 8 | Limonene | 1024 | 14.22 |
| 9 | Cis- β -ocimene | 1032 | 0.28 |
| 10 | Trans- β -ocimene | 1042 | 2.95 |
| 11 | γ -Terpinene | 1053 | 0.52 |
| 12 | Linalool | 1095 | 0.23 |
| 13 | Amylbenzene | 1152 | 2.96 |
| 14 | Cis-chrysanthenyl acetate | 1256 | 1.16 |
| 15 | Bornyl acetate | 1281 | 7.40 |
| 16 | α -Copaene | 1370 | 1.05 |
| 17 | Daucene | 1380 | 0.34 |
| 18 | β -Elemene | 1387 | 5.22 |
| 19 | (E)-Caryophyllene | 1414 | 1.10 |
| 20 | p-2,5-Dimethoxy-cymene | 1419 | 1.20 |
| 21 | β -Copaene | 1423 | 0.26 |
| 22 | γ -Elemene | 1428 | 11.65 |
| 23 | Germacrene-D | 1476 | 24.23 |
| 24 | Bicyclogermacrene | 1491 | 0.52 |
| 25 | β -Bisabolene | 1503 | 0.80 |
| 26 | γ -Cadinene | 1509 | 0.52 |
| 27 | Cubebol | 1518 | 0.34 |
| 28 | Germacrene-B | 1551 | 14.79 |
| 29 | Caryophyllene oxide | 1577 | 0.54 |
| 30 | Longifolol | 1711 | 0.63 |
| 31 | (Z)-Lanceol | 1761 | 1.55 |
| Total | – | – | 99.98 |

RI – retention indices

CONCLUSION

This was the first study concerning the essential oil of *S. meifolia* and the high quantity of important chemical components exhibited by GC/MS analysis such as germacrene-D, β -elemene and limonene. It clearly shows that further researches on domesticating and extensive evaluations concerning biological activities of the volatiles oils for medicinal purposes, this species would be strongly suggested.

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SKŁAD CHEMICZNY OLEJKU ETERYCZNEGO *SCALIGERIA MEIFOLIA* BOISS. ROSNĄCEGO W IRANIEVAHID ROWSHAN¹, AMENEH TARAKEMEH^{2*}

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Streszczenie

Scaligeria meifolia Boiss. należąca do rodziny *Apiaceae*, rośnie dziko w Iranie. Olejek eteryczny z nadziemnych części *S. meifolia* uzyskano i analizowano za pomocą GC i GC/MS. Zidentyfikowano 31 składników, co stanowi 99,98% wszystkich składników olejku. Najważniejszymi składnikami olejku eterycznego były: germakren-D (24,2%), germakren-B (14,8%), limonen (14,2%), γ -elemen (11,6%) i β -elemen (5,2%).

Słowa kluczowe: *Scaligeria meifolia*, *Apiaceae*, olejek eteryczny, GC/MS