COMPOSITION OF THE VOLATILE OIL OF ARTEMISIA DESERTI KRASCH. AND ARTEMISIA OLIVERIANA J. GAYEX DC. FROM IRAN

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Abstract

The composition of the volatile oils obtained from the aerial parts of Artemisia deserti Krasch. and A. oliveriana J. Gayex DC. was analyzed by GC and GC/MS. While the oil of A. deserti contained camphor (45.5%), 1,8-cineole (16.7%), piperitone (8.6%), β-pinene (5.7%) and isoborneol (3.2%), the oil of A. oliveriana contained α-thujone (65.4%), camphor (11.5%), 1,8-cineole (9.2%) and pinocarveol (8.8%) as the main components. The structure of α-thujone, camphor and 1,8-cineole were confirmed by the interpretation of the 400 MHz 1H-NMR spectrum of each of the two total oils.

Introduction

The genus Artemisia (Compositae tribe Anthemideae) belongs to the useful aromatic and medicinal plants comprising about 300 species found in the northern hemisphere [1]. Some species are used in folk medicine, A. annua (Qinghaosu) is a traditional medicinal herb of China. It is presently being cultivated on a commercial scale in China and Vietnam for its antimalarial activity [2,3]. In addition, A. annua is valued for its essential oil. Although the commercial significance of the oil is limited [4], it is sometimes used as a fragrance in perfume and cosmetic products [5-7]. The essential oil of A. vestita has been reported to be active against dermatophytes [8].

Chemical investigation of some Artemisia species has shown them to contain monoterpenes, sesquiterpene lactones, flavanoids and other constituents [9-12]. The Et2O-MeOH-petroleum ether (1:1:1) extract of the aerial parts of A. deserti and A. oliveriana has already been investigated [13-15].

The composition of the essential oils of different Artemisia species has been studied by several authors [16-19]. This paper reports on the results of GC/MS analysis of the volatile oils of A. deserti and A. oliveriana.

Keywords: Artemisia deserti Krasch.; Artemisia oliveriana J. Gayex DC.; Compositae; Essential oil; α-thujone; Camphor; 1,8-Cineole; sesquiterpene lactone artemisinin [2,3]. In addition, A. annua is valued for its essential oil. Although the commercial significance of the oil is limited [4], it is sometimes used as a fragrance in perfume and cosmetic products [5-7]. The essential oil of A. vestita has been reported to be active against dermatophytes [8].

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of the water-distilled essential oils of *A. deserti* and *A. oliveriana*, which are endemic to Iran.

**Experimental Section**

**Plant Material**

Fresh leaves, stems and flowers of two *Artemisia* species were collected at the following locations: *A. deserti* Krasch. growing wild in the North of Iran, Province of Mazandaran, Firoozkooh area in July 1996; *A. oliveriana* J. Gayex DC. was collected in Robat-Tork, Province of Isfahan, Delijan area in July 1996. Voucher specimens were deposited at the Department of Botany, Shahid Beheshti University, Tehran, Iran.

**Isolation of the Volatile Oils**

Dried aerial parts of both plants were hydrodistilled in a Clevenger-type apparatus for 3 h. the oils were dried over anhydrous sodium sulphate.

**Gas Chromatography (GC)**

GC analyses of volatile oils were performed using a Packard 439 chromatograph equipped with a CP Sil 5CB column (25m×0.25mm i.d., film thickness 0.39 μm); nitrogen was used as carrier gas at a flow rate of 0.8 ml/min; injector and detector temperatures were 270°C. Oven temperature was held at 60°C for 5 min, then programmed to 220°C at 5°C/min.

**Gas Chromatography-Mass Spectrometry (GC/MS)**

The GC/MS analysis was recorded on a Varian 3700 chromatograph with a CP Sil 5CB column, (25m×0.25mm i.d.) combined with Varian MAT 44S. Oven temperature was held at 60°C for 5 min, programmed from 60°C to 220°C at 5°C/min, and held isothermal at 220°C for 20 min. Injector temperature, 270°C; carrier gas, helium; ionization energy, 70 eV.

**Results and Discussion**

The hydrodistillation of the aerial parts of *Artemisia deserti* and *Artemisia oliveriana* gave yellowish oils with a yield of 0.24% (W/W) and 0.15% (W/W), respectively. The identification of the compounds was carried out by comparison of their MS spectra and relative retention indices (RRI). However, the structure of the main compounds was confirmed by interpretation of the $^1$H-NMR spectrum of each of the two total oils (Table 1). The identified compounds and their percentages are listed according to their elution on the CP Sil 5CB column given in Table 1.

<table>
<thead>
<tr>
<th>Compound</th>
<th>RRI</th>
<th><em>A. deserti</em> (%)</th>
<th><em>A. oliveriana</em> (%)</th>
<th>Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>α-Thujone</td>
<td>927</td>
<td>0.3</td>
<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Camphene</td>
<td>950</td>
<td>–</td>
<td>0.7</td>
<td>GC/MS</td>
</tr>
<tr>
<td>α-Pinene</td>
<td>936</td>
<td>1.9</td>
<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>β-Pinene</td>
<td>974</td>
<td>5.7</td>
<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Car-3-ene</td>
<td>1006</td>
<td>0.3</td>
<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>P-Cymene</td>
<td>1016</td>
<td>–</td>
<td>0.7</td>
<td>GC/MS</td>
</tr>
<tr>
<td>1,8-Cineole</td>
<td>1025</td>
<td>16.7</td>
<td>9.2</td>
<td>GC/MS, $^1$H-NMR</td>
</tr>
<tr>
<td>Filifolone</td>
<td>1083</td>
<td>0.2</td>
<td>–</td>
<td>GC/MS</td>
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<tr>
<td>α-Thujone</td>
<td>1091</td>
<td>–</td>
<td>65.4</td>
<td>GC/MS, $^1$H-NMR</td>
</tr>
<tr>
<td>Camphor</td>
<td>1126</td>
<td>45.5</td>
<td>11.5</td>
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<tr>
<td>Pinocarvone</td>
<td>1144</td>
<td>–</td>
<td>8.8</td>
<td>GC/MS</td>
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<tr>
<td>Isoborneol</td>
<td>1148</td>
<td>3.2</td>
<td>0.2</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Terpinen-4-ol</td>
<td>1168</td>
<td>0.3</td>
<td>0.1</td>
<td>GC/MS</td>
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<tr>
<td>Myrtenal</td>
<td>1174</td>
<td>0.5</td>
<td>0.3</td>
<td>GC/MS</td>
</tr>
<tr>
<td>α-Terpineol</td>
<td>1178</td>
<td>0.5</td>
<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Iso-bornyl formate</td>
<td>1222</td>
<td>–</td>
<td>0.2</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Piperitone</td>
<td>1232</td>
<td>8.6</td>
<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Cis-Chrysanthyl acetate</td>
<td>1250</td>
<td>0.3</td>
<td>–</td>
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<tr>
<td>Thymol</td>
<td>1273</td>
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<tr>
<td>Iso-bornyl acetate</td>
<td>1276</td>
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<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Davanone</td>
<td>1561</td>
<td>0.5</td>
<td>–</td>
<td>GC/MS</td>
</tr>
<tr>
<td>Viridiflorol</td>
<td>1588</td>
<td>0.4</td>
<td>–</td>
<td>GC/MS</td>
</tr>
</tbody>
</table>

Sixteen components were identified in the oil of *A. deserti*, which represented about 85.0% of the total composition of the oil. Camphor (45.5%), 1,8-cineole...
(16.7%), piperiton (8.6%), β-pinene (5.7%) and isoborneol (3.2%) were the major components in the volatile oil of *A. deserti*. Eleven components were identified in the oil of *A. oliveriana*, making up 97.2% of total composition.

α-thujone (65.4%) was the major component in this oil, followed by camphor (11.5%), 1,8-cineole (9.2%) and pinocarvone (8.8%). Thus the oil of *A. oliveriana* consists of five monoterpene hydrocarbons (8.4%), nine oxygenated monoterpenes (75.7%) and two sesquiterpenoids. In the oil of *A. deserti* consists of two monoterpene hydrocarbons (1.4%) and nine oxygenated monoterpenes (95.8%).

As can be seen from the above information, the volatile oils are different in their chemical composition. The variation of the oil components may be due to differences in climate and geographic situation. Both volatile oils are different in their chemical composition.

The authors are grateful to Professor P. Weyerstahl, Institute of Organic Chemistry, Technical University of Berlin for the GC, GC/MS and 1H-NMR spectra and Mr. V. Mozafarian for his sincerely helpful assistance in collecting plant specimens and botanical identification.

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### References


