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 pinocavone (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 ^{1}H-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 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].

Keywords: *Artemisia deserti* Krasch.; *Artemisia oliveriana* J. Gayex DC.; Compositae; Essential oil; α-thujone; Camphor; 1,8-Cineole

Chemical investigation of some *Artemisia* species has shown them to contain monoterpenes, sesquiterpene lactones, flavanoids and other constituents [9-12]. The Et_2O-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

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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 s 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 1. Composition of the essential oils from *Artemisia deserti* Krasch. and *A. oliveriana* J. Gayex DC. (column: 25m CP Sil 5CB)

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

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. deserti* consists of five monoterpene hydrocarbons (8.4%), nine oxygenated monoterpenes (75.7%) and two sesquiterpenes (0.9%). The volatile oil of *A. oliveriana* 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 oils are rich in regard to oxygenated monoterpenes (75.5% and 95.8%, respectively), small amount of monoterpene hydrocarbons and very few sesquiterpenoids. In the oil of *A. oliveriana* we were not able to identify any sesquiterpene. In the oils isolated from some *Artemisia* species, e.g., *A. hololeuca* [20], *A. sieberi* [21] and *A. lobelli* [22], camphor and 1,8-cineole were also found to be the major components. α-Thujone was the predominant compound in the oil of *A. gmelinii* [20] and *A. verlotiorum* [23].

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