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Original Research Article

Composition of Essential Oil of *Artemisia indica*

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ABSTRACT

The hydrodistillation essential oil from *Artemisia indica* growing in Iran was analyzed by GC/MS. In all 20 compounds were identified; a-pinene (3%), camphene (2.12%), b-pinene (2.01%), a-phellandrene(1.05%), p-cymene (1.15%), limonene (0.5%), 1,8-cineole (0.65%), artemisia ketone (21.34%), a-thujone (0.7%), a-thujone (1%), myrtenol (%0.56), camphor (6.54%), borneol (8.07%), terpinen-4-ol (2.76%), nerol (1.45%), carvone (0.67%), chrysanthenyl acetate (10.6%), (e)-caryophyllene (1.45%), b-himachalene (1%) and germacrene-B (10%) were the main components of the oil.

Key Words: Essential oil composition, *Artemisia indica*, Artemisia ketone, Borneol , Germacrene-B

INTRODUCTION

Aromatic plants are frequently used in traditional medicine as antimicrobial agents and their essential oils have been known since antiquity to possess antibacterial and antioxidant activities. The genus *Artemisia* is one of the largest and most widely distributed genera of the family Asteraceae. *Artemisia* genus includes 15 perennial aromatic herbs and shrubs that grow wild in Iran. Numerous reports on essential oils composition of different *Artemisia* species, specially on those used in flavour industry and in medication, have been published (Gilemeister and Hoffmann, 1961). *Artemisia indica* is a perennial herb found in the western Himalayas. The leaves and flowering stems of *A. indica* have been reported to have antihelminthic, antiseptic and antispasmodic activity (Rashid *et al.*, 2013). The main objectives of the present study were to evaluate of the essential oil from *Artemisia indica* aerial part.

MATERIALS AND METHODS

Plant material and oil isolation

The aerial part of *Artemisia indica* purchased from of Tehran-Iran in 2012- 2013. The aerial part were ground and the resulting powder was subjected to hydrodistillation for 3 hours in an all glass Clevenger-type apparatus according to the method recommended by the European Pharmacopoeia (1975). The obtained essential oils were dried over anhydrous sodium sulphate and after filtration, stored at +4 ºC until tested and analysed.

Essential oil analysis

The GC/MS analyses were executed on a Hewlett–Packard 5973N gas chromatograph equipped with a column HP-5MS (30 m length × 0.25 mm i.d., film thickness 0.25 lm) coupled with a Hewlett–Packard 5973N mass spectrometer. The column temperature was programmed at 50 ºC as an initial temperature, holding for 6 min, with 3 ºC increases per minute to the temperature of 240 ºC, followed by a temperature enhancement of 15 ºC per minute up to 300 ºC, holding at the mentioned temperature for 3 min. Injector port temperature was 290 ºC and helium used as carrier gas at a flow rate 1.5 ml/min. Ionization voltage of mass spectrometer in the EI-mode was equal to 70 eV and ionization source temperature was 250 ºC. Linear retention indices for all components were determined by coinjection of the samples with a solution containing homologous series of C8-C22 *n*-alkanes and comparing them and their mass spectra with those of authentic samples or with available library data of the GC/MS system (WILEY 2001 data software) and Adams libraries spectra (Adams, 2001).

RESULTS AND DISCUSSION

Chemical composition of essential oil

The chemical compositions of *Artemisia indica* essential oil are shown in Table 1. 20 compounds representing 76.62 % of *A.indica* essential oil were identified. The major organic compounds detected in the aerial part oils, were a-pinene (3%), camphene (2.12%), b-pinene (2.01%), a-phellandrene(1.05%), p-cymene (1.15%), limonene

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(0.5%), 1,8-cineole (0.65%), artemisia ketone (21.34%), a-thujone (0.7%), a-thujone (1%), myrtenol (%0.56), camphor (6.54%), borneol (8.07%), terpinen-4-ol (2.76%), nerol (1.45%), carvone (0.67%), chrysanthenyl acetate (10.6%), (e)-caryophyllene (1.45%), b-himachalene (1%) and germacrene-B (10%). Rashid *et al.* (2) reported artemisia ketone (42.1%), germacrene B (8.6%), borneol (6.1%), chrysanthenyl acetate (4.8%), p-cymene (2.7%), a-thujone (2.7%) and b-pinene (2.4%). as the main constituent of the *A.indica* essential oil. Analysis of the chemical composition of *Artemisia absinthium* oils extracted from plants grown in USA showed *b*-thujone (17.5–42.3%) and C-sabinyl acetate (15.1-53.4%) as the main components (Lawrence, 1992). Previous research showed that *a*-pinene (10.2%), 1,8-cineole (10.1%), artemisia ketone (11.4%) and camphor (24.6%) were the main components of the essential oil of *Artemisia biennis* grown in Iran (Nematollahi *et al.*, 2006). Previous research showed that bornane derivatives (camphor, borneol and bornyl acetate) and 1,8-cineole are major characteristic components of many species of Artemisia genus, such as: *Artemisia annua*, *Artemisia vulgares*, *Artemisia diffusa*, *Artemisia santonicum*, *Artemisia spicigera*, *Artemisia afra*, *Artemisia asiatica*, *Artemisia austriaca* and *Artemisia pedemontana* (. Perez-Alonso *et al.*, 2003; Kordali *et al.*, 2005). In the case of *A. incana*, previous research showed that monoterpenses made up the higher contribution (78.3%) with oxygenated dominating (41.6%) while the content of sesquiterpenes amounted to 6.3%. Among these compounds, the main ones were camphor (20.4%), 1,8- cineol (10.3%), Z-verbenol (8.7%), β-thujone (8.3%) and α-thujone (5.6%) (Mojarrab *et al.*, 2013). α-Thujone (28.7%), 1,8-cineol (20.0%) and camphor (10.0%) were reported as main components in the essential oil of the aerial parts of *A. incana* collected in the east Azarbaijan province, Iran (Rustaiyan *et al.*, 2007). These findings showed that the genus *Artemisia* had a considerable variation in volatile oil composition. However, there were significant differences among the rates of those reported components. In conclusion, it is worthwhile to screen the commonly used plants from the local flora for different biological activities because they might present a new alternative source for possible bioactive substances.

Table 1. Chemical compositions of *A. indica* essential oil.

	Components	**%**	**Retention Index** ^{a}	**Identification Methods**
1	*a*-Pinene	3	932	MS, RI
2	Camphene	2.12	945	MS, RI, CoI
3	b-Pinene	2.01	970	MS, RI, CoI
4	a-Phellandrene	1.05	1000	MS, RI, CoI
5	p-Cymene	1.15	1015	MS, RI
6	Limonene	0.5	1027	MS, RI
7	1,8-Cineole	0.65	1032	MS, RI
8	Artemisia ketone	21.34	1056	MS, RI, CoI
9	a-Thujone	0.7	1104	MS, RI
10	b-Thujone	1	1116	MS, RI, CoI
11	Myrtenol	0.56	1130	MS, RI
12	Camphor	6.56	1141	MS, RI
13	Borneol	8.05	1165	MS, RI
14	Terpinen-4-ol	2.76	1175	MS, RI, CoI
15	Nerol	1.45	1227	MS, RI
16	Carvone	0.67	1242	MS, RI
17	Chrysanthenyl acetate	10.6	1268	MS, RI
18	(E)-Caryophyllene	1.45	1420	MS, RI
19	b-Himachalene	1	1499	MS, RI
20	Germacrene-B	10	1560	MS, RI
Total		**76.62**		

^{a} The retention Kovats indices were determined on DB-5 capillary column. MS= Mass Spectroscopy, RI= Retention Index, CoI= Co injection with authentic compounds

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