

ESSENTIAL OILS OF SOME ARTEMISIA SPECIES FROM CENTRAL ASIA*

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Water distilled essential oils from aerial parts of the following *Artemisia* species (Compositae) were analyzed by GC/MS. The major component of the oils were as follows: 1,8-cineole in *A. balchanorum* (29.9%), camphor in *A. leucodes* (58.4%), and *A. rhodantha* (35.5%) and methyl eugenol in *A. scoparia* (27.5%).

Artemisia, one of the largest of Asteraceae (Compositae) with 606 taxa existing in the world is mostly found as a shrubby herb. Most of *Artemisia* genera are aromatic and yield essential oils which are used in perfumery and medicine. We have analyzed the essential oils of four species occurring in different regions of Central Asia. The essential oils were analyzed by GC/MS and results are given in Table 1.

Artemisia balchanorum Krasch. (A) grown in Uzbekistan from seed of Turkmenistan origin yielded 1.2% oil with 60 components with 1,8-cineole (29.9%), α -thujone (11.7%), camphor (11.2%), β -thujone (9.3%), and cis-2,7-dimethyl-4-octen-2,7-diol (5.2%) as major constituents. There is no previous report on the essential oil of *A. balchanorum* Krasch.

Artemisia leucodes Shrenk. (B) material was obtained from Kazakhstan. The herbal parts of this species yielded 0.28% oil by hydrodistillation. Camphor (58.4%) and 1,8-cineole (4.3%) were the major constituents of this oil with 76 components.

A similar composition was encountered in the oil of *Artemisia rhodantha* Rupr. (C) from Tadjikistan. The oil obtained with 0.75% yield contained 38 components and the major constituents were characterized as camphor (35.5%) and 1,8-cineole (22.9%).

The oil of *Artemisia scoparia* Waldst. et Kit. (D) collected in Kazakhstan was obtained in 0.72% yield. Methyl eugenol (27.5%), β -pinene (13.6%), (E)- β -ocimene (10.3%), and spathulenol (8.8%) were identified as the major constituents in the oil with 36 components. Previously, the oil of *Artemisia scoparia* collected in the Western Himalayas was reported to yield 0.5% oil with 30% eugenol as the main constituent [1].

EXPERIMENTAL

The aerial parts of the plants were hydrodistilled for 3 h using a Clevenger type apparatus to produce essential oils. Percentage yields of the oils were calculated on a moisture free basis.

The essential oils were analyzed by GC/MS using a Hewlett-Packard GCD system. An Innovax FSC column (60 m \times 0.25 mm) was used with helium as carrier gas. GC oven temperature was kept at 60°C for 10 min and programmed to 220°C at a rate of 4°C/min and then kept constant at 220°C for 10 min. Split ratio was adjusted at 50:1. The injector temperature was 250°C. MS were taken at 70 eV. Mass range was from m/z 10 to 425. Library search was carried out using

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TABLE 1. Composition of the Essential Oils of Four Artemisia Species

Compounds	A	B	C	D	Compounds	A	B	C	D
	amounts, %					amounts, %			
tricyclene	-	0.10	-	-	cis-2,7-dimethyl-4-octen-2,7-diol	5.17	-	-	-
α -pinene	0.01	-	1.99	4.17	perillen	-	-	-	0.01
α -thujene	0.01	-	0.23	-	α -thujone	11.7	-	-	-
camphene	0.63	1.31	4.54	-	α -p-dimethylstyrene	-	0.09	-	-
β -pinene	0.01	-	0.82	13.6	β -thujone	9.28	-	-	-
sabinene	0.09	-	0.14	0.41	eucarvone	-	0.16	-	-
myrcene	0.14	-	-	5.96	trans-sabinene hydrate	0.11	-	0.32	-
α -phellandrene	-	-	0.16	-	camphenilone	-	0.52	-	-
α -terpinene	0.20	-	0.65	-	neroloxide	-	0.20	0.60	-
limonene	-	-	0.39	9.64	cis-3-hexenylisovalerate	-	-	-	0.14
1,8-cineole	29.9	4.26	22.9	-	pentadecane	-	0.13	-	-
β -phellandrene	-	-	0.21	0.09	artemisia alcohol	1.24	-	-	-
(Z)- β -ocimene	-	-	-	3.54	chrysanthenone	-	0.03	-	-
γ -terpinene	0.42	0.04	1.21	0.37	camphor	11.2	58.4	35.5	0.15
(E)- β -ocimene	-	-	-	10.3	benzaldehyde	-	-	-	0.23
p-cymene	2.43	0.52	1.98	0.91	linalool	0.50	0.21	1.92	-
terpinolene	0.09	-	0.20	-	cis-sabinene hydrate	0.17	-	0.42	-
6-methyl-5-hepten-2-one	-	0.08	-	-	isopinocampnone	-	0.66	-	-
nonanal	-	0.06	-	-	1-methyl-4-acetyl-cyclo-hex-1-ene	-	-	0.41	-
yomogi alcohol	0.94	-	-	-	trans-p-menth-2-en-1-ol	0.40	0.17	1.93	-
burnsol	0.49	0.94	2.67	-	trans-chrysanthenyl acetate	0.07	0.34	-	-
verbenone	-	0.12	-	-	pinocarvone	0.30	0.18	-	0.36
neryl acetate	-	0.70	0.82	-	bornyl acetate	0.11	1.02	0.17	-
trans-p-menth-2-en-1,8-diol	0.07	-	-	0.11	6-methyl-3,5-heptadiene-2-one	-	0.08	-	0.09
geranial	0.43	0.36	-	-	β -caryophyllene	-	-	-	0.55
piperitone	-	-	0.26	-	terpinen-4-ol	2.12	0.83	3.53	0.26
bicyclogermacrene	-	-	-	0.54	4-terpinenyl acetate	0.30	0.03	-	-
carvone	0.43	1.73	-	0.20	cis-p-menth-2-en-1-ol	0.30	0.16	1.34	-
ar-curcumene	-	-	-	0.10	dehydrosabinaketone	0.09	-	-	-
cis-piperitol	0.20	0.01	1.06	-	myrtenal	0.18	-	-	0.41
cis-chrysanthenol	0.07	0.43	-	-	sabinaketone	0.24	-	-	-
geranyl acetate	0.31	0.25	0.78	-	trans-pinocarvylacetate	-	0.17	-	-
citronellol	-	0.60	-	-	cis-verbenol	-	0.02	-	-
neryl propionate	-	0.07	0.19	-	trans-pinocarveol	0.42	0.16	-	0.79
cis-p-menth-2-en-1,8-diol	0.10	-	-	-	(E,E)-2,4-decdienal	-	0.12	-	-
p-methyl acetobenzene	-	0.16	-	-	β -damascenone	-	0.08	-	-
cuminaldehyde	0.13	0.21	-	-	trans-carveol	-	0.39	-	0.20
nerol	-	2.22	1.69	-	geraniol	0.29	1.09	0.32	-
myrtenol	0.15	-	-	0.55	p-cymen-8-ol	0.38	1.00	-	-
nerylisobutyrate	-	0.06	-	-	α -bisabolol	0.11	1.05	0.90	-
(E)-geranyl acetone	-	0.33	-	-	carvacrol	0.67	1.05	-	-
hexanoic acid	-	0.33	-	-	p-isopropyl phenol	0.11	-	-	-
cis-carveol	-	0.21	-	-	trans- α -bergamotol	-	-	-	0.93
geranyl	-	0.12	-	-					

TABLE 1 (continued)

Compounds	A	B	C	D	Compounds	A	B	C	D
	amounts, %					amounts, %			
isovalerone	-	0.08	-	-	α -cadinol	-	-	-	0.10
piperitenone	1.08	0.05	-	-	β -eudesmol	0.08	-	-	-
cis-jasmone	-	0.09	-	-	decanoic acid	0.08	0.68	0.25	-
heptanoic acid	0.25	-	-	-	δ -terpineol	0.46	0.17	-	-
chrysanthenyl tiglate	0.19	0.25	0.21	1.30	lavandulol	0.46	0.16	1.80	-
caryophyllene oxide	-	0.08	-	0.17	trans-verbenol	-	0.21	-	0.17
perilla alcohol	-	-	-	27.5	trans-piperitol	0.25	-	0.48	-
methyl eugenol	0.17	-	-	-	neral	0.16	0.10	-	-
4- α -hydroxy-achipendol	-	0.06	-	-	heptadecane	-	0.11	-	-
p-mentha-1,4-dien-7-ol	-	0.69	-	-	α -terpineol	0.54	0.38	3.36	0.42
octanoic acid	0.14	0.21	-	-	farnesyl acetone	-	0.06	-	-
cuminalcohol	-	0.27	-	-	pentacosane	-	0.07	-	-
hexahydrofarnesyl acetone	0.67	0.85	0.22	8.76	dodecanoic acid	-	0.21	-	-
spathulenol	-	0.05	-	-	tridecanoic acid	-	0.06	-	-
α -bisabolol oxide	-	-	-	0.85	octacosane	-	0.06	-	-
T-cadinol	0.29	2.72	-	-	teradecanoic acid	-	0.46	-	-
nonanoic acid	-	-	-	0.19	hexadecanoic acid	-	1.55	-	-
trans-methyl-isoeugenol	0.13	0.15	-	-					
thymol									

the Wiley GC/MS Library and the TBAM Library of Essential Oil Constituents [1-6]. Relative percentage amounts of the separated compounds were calculated from total ion chromatograms by the computerized integrator.

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