Chemistry of Natural Compounds, Vol. 44, No. 2, 2008

COMPONENT COMPOSITION AND ANTIMICROBIAL ACTIVITY OF ESSENTIAL OIL FROM *Artemisia kasakorum*

E. M. Suleimenov,[1] T. Ozek,[2] F. Demirci,[2] B. Demirci,[2] K. H. C. Baser,[2] and S. M. Adekenov[3]

UDC 547.913

Artemisia kasakorum (Krasch.) Pavlov is a rhizomous grayish-green perennial of up to 80 cm height with a few thick and strong generative runners. The endemic Turanian species is ecologically confined to strongly saline tertiary clays and soft, moist, and wet alkaline soils. This species is similar to the Siberian steppe species *A. nitrosa* Web. [1]. Pavlov considered *A. kasakorum* to be a separated species. Natural surveys and herbarium collections of recent years have helped to define its ecological and geographical confines, which enabled it to be assigned as a paleoendemic species with the northern Turanian type of distribution [2].

Air-dried raw material of *A. kasakorum* was collected near the village Dogalan of Semipalatinsk Oblast′ at the beginning of August 1994. The identified specimen (No. 1989.07.11.05.16) is stored in the herbarium collection of AO NPTs Fitokhimiya. Essential oil was produced by steam distillation for 2 h in a Clevenger apparatus from the aerial part of *A. kasakorum* ground to particle size 3-5 mm. The yield of essential oil was 0.12% based on air-dried raw material.

GC—MS analysis of essential oil was performed under conditions analogous to those previously reported [3].

A total of 52 components constituting 66.2% of all observed components was identified. The main components of *A. kasakorum* essential oil were sabinylacetate, 12.9%; *trans*-sabinol, 4.6; 1,8-cineol, 4.3; camphor, 3.7; *p*-cymene, 3.4; and β-thujone, 3.0. The contents of hydrocarbons and oxygenated compounds were 13.9% and 47.1%, respectively. The main (44.3%) part of the essential oil consisted of monoterpenoids and only 3.1% of sesquiterpenoids.

Table 1 lists the component composition of *A. kasakorum* essential oil.

Unidentified (unident.) 1: EIMS, 70 eV, *m*/*z* (% rel. int.): 189 (0.3), 134 (6), 119 (9), 108 (4), 92 (49), 91 (100), 71 (11), 59 (9), 43 (30).

Unident. 2: EIMS, 70 eV, *m*/*z* (% rel. int.): 224 (0.7), 193 (0.4), 134 (5), 119 (8), 108 (10), 92 (48), 91 (100), 57 (23), 41 (5).

Unident. 3: EIMS, 70 eV, *m*/*z* (% rel. int.): 253 (0.6), 197 (5), 183 (5), 169 (2), 155 (3), 141 (4), 127 (12), 113 (12), 99 (12), 85 (42), 71 (84), 57 (100), 43 (47).

Unident. 4: EIMS, 70 eV, *m*/*z* (% rel. int.): 220 (0.4), 177 (0.3), 165 (0.4), 153 (0.4), 134 (7), 119 (10), 105 (3), 92 (5), 91 (100), 85 (6), 57 (24), 41 (13).

Unident. 5: EIMS, 70 eV, *m*/*z* (% rel. int.): 221 (0.3), 193 (0.1), 165 (0.4), 152 (0.4), 134 (8), 119 (10), 108 (7), 92 (51), 91 (100), 85 (10), 57 (16), 43 (12).

Unident. 6: EIMS, 70 eV, *m*/*z* (% rel. int.): 250 (1), 211 (3), 183 (7), 153 (9), 141 (10), 113 (12), 99 (17), 85 (41), 71 (76), 57 (100), 43 (70).

Unident. 7: EIMS, 70 eV, *m*/*z* (% rel. int.): 264 (1), 217 (1), 134 (29), 111 (36), 93 (100), 91 (72), 69 (14), 55 (43), 43 (30).

Unident. 8: EIMS, 70 eV, *m*/*z* (% rel. int.): 172 (1), 134 (9), 119 (12), 92 (49), 91 (100), 83 (22), 55 (8), 39 (3).

1) L. N. Gumilev Eurasian National University, 010008, Astana, Munaitpasova, 5, tel: 7(7172) 35 38 06, e-mail: syerlan75@yandex.ru; 2) Pharmaceutical Faculty, Anadolu University, 26470 Eskisehir, Turkey; 3) AO NPTs Fitokhimiya, 100019, Karaganda, Gazalieva, 5, fax: 8(3212) 43 37 73, tel: 8(3212) 43 31 27, email: arglabin@phyto.kz. Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 207-208, March-April, 2008. Original article submitted February 12, 2008.

0009-3130/08/4402-0263

TABLE 1. Component Composition of Essential Oil from *A. kasakorum*

Ret. index	Component	Content, %	Ret. index	Component	Content, %
1032	α-Pinene	0.1	1625	4,4-Dimethylbutyl-2-enolide	1.7
1035	α-Thujene	0.1	1638	*cis-p*-Menth-2-en-1-ol	0.6
1076	Camphene	0.3	1642	Thuj-3-en-10-al	0.7
1100	Undecane	0.1	1648	Myrtenal	0.1
1118	β-Pinene	0.1	**1658**	**Sabinylacetate**	**12.9**
1132	Sabinene	0.1	**1670**	**2,6,10,14-Tetramethylpentadecane****	**3.0**
1188	α-Terpinene	0.3	1685	Ethylbenzoate	0.5
1195	Dehydro-1,8-cineol	0.2	1700	Heptadecane	1.1
1213	**1,8-Cineol***	**4.3**	1703	Unident. 1	2.4
1244	Amylfuran	0.3	1717	Unident. 2	2.4
1255	γ-Terpinene	0.9	**1720**	***trans*-Sabinol**	**4.6**
1280	***p*-Cymene**	**3.4**	1773	δ-Cadinene	0.2
1294	1,2,4-Trimethylbenzene	1.1	1778	Unident. 3	2.2
1300	Tridecane	0.3	1792	Unident. 4	2.0
1355	1,2,3-Trimethylbenzene	0.7	1802	Cuminic aldehyde	2.4
1400	Tetradecane	0.6	1821	Unident. 5	2.4
1437	α-Thujone	2.7	1838	(*E*)-β-Damascenone	0.3
1443	2,5-Dimethylstyrene	0.2	1858	Unident. 6	2.5
1445	Filifolone	0.1	1900	Nonadecane	1.1
1451	β-Thujone	3.0	1943	Unident. 7	1.4
1474	*trans*-Sabinene hydrate	0.2	2000	Eicosane	1.8
1480	Nerol oxide	0.1	2037	Unident. 8	2.8
1500	Pentadecane	1.3	2050	(*E*)-Nerolidol	0.8
1506	Decanal	0.1	2131	Hexahydrofarnesylacetone	Tr
1532	**Camphor**	**3.7**	2144	Spatulenol	1.7
1553	Linalool	0.2	2753	Anthracene	0.7
1573	*trans-p*-Metha-2-en-1-ol	0.4	2858	Unident. 9	0.4
1582	*cis*-Chrysanthenylacetate	0.9	2869	Unident. 10	0.8
1586	Pinocarvone	0.3	2919	Unident. 11	0.1
1597	Bornylacetate	0.1	2923	Unident. 12	0.4
1600	Hexadecane	0.5	2931	Hexadecanoic acid	2.3
1611	Terpinen-4-ol	2.5		Total	86.1
1616	Hotrienol	0.5			

*Principal components are in bold.

**Determined from retention index and Wiley library.

TABLE 2. Antimicrobial Activity of Essential Oil from *A. kasakorum*

Microorganism	Source	MIC	Std.
Escherichia coli, Gr(-)	ATCC 25922	62.5	62.5
Staphylococcus aureus, Gr(+)	ATCC 6538	125	7.81
Pseudomonas aeruginosa, Gr(-)	ATCC 27853	250	250
Enterobacter aerogenes, Gr(-)	NRRL 3567	250	62.5
Proteus vulgaris, Gr(-)	NRRL 123	125	31.25
Salmonella typhimirium, Gr(-)	NRRL 4420	125	62.5
Candida albicans, yeast	O.G.U.Tip Fac.	125	125-keto

Microdilutions were used to estimate preliminarily the activity of *A. kasakorum* essential oil [4]. Essential oil was dissolved in DMSO. A series of dilutions was made in sterile distilled water in a 96-well microtitre dish up to 0.97 μg/mL. Freshly grown bacterial suspensions of Mueller—Hinton broth of doubled concentration and yeast suspension of *Candida albicans* were adjusted to concentrations of 10^8 CFU/mL (MacFarland No. 0.5). The control for growth was sterile distilled water. Each well was charged with 100 μL of microbial suspension. The last series, which contained only serial dilutions of antimicrobial agent without microorganism, were used as negative controls. After incubation at 37°C for 24 h, the first well without growth was defined as the minimal inhibiting concentration (MIC). According to Table 2, the activity of *A. kasakorum* essential oil is comparable with the activity of reference preparations of chloramphenicol succinate (for bacteria) and ketoconasol (for yeast) against strains *Escherichia coli*, *Pseudomonas aeruginosa*, and *Candida albicans*.

The MIC is the minimal inhibiting concentration of essential oil of *A. kasakorum*;

Std. is the MIC of standard reference preparations, chloramphenicol succinate (for bacteria) and ketoconasol (for yeast).

Thus, the investigations determined the component composition of *A. kasakorum* essential oil, the main component of which was sabinylacetate.

The study of the antimicrobial activity of *A. kasakorum* essential oil showed its moderately good activity against gram-negative strains.

REFERENCES

1. *Flora of Kazakhstan* [in Russian], Vol. 8, N. V. Pavlov, ed., Alma-Ata (1965).
2. N. S. Filatova, in: *Botanical Materials of the Herbarium of the Institute of Botany, Academy of Sciences of the Kazakh SSSR* [in Russian], No. 10, (1977), pp. 62-68.
3. Y. M. Suleimenov, G. A. Atazhanova, T. Ozek, B. Demirchi, S. M. Adekenov, and K. H. C. Basher, *Khim. Prir. Soedin.*, 381 (2001).
4. E. W. Koneman, S. D. Koneman, W. M. Janda, P. C. Schreckenberger, and W. C. Winn, *Color Atlas and Textbook of Diagnostic Microbiology*, Philidelphia (1997), pp. 785-856.