

COMPOSITION AND BIOLOGICAL ACTIVITY OF ESSENTIAL OIL FROM *Peucedanum coreanum*

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Peucedanum coreanum Nakai (Apiaceae, Umbelliferae) (syn. *P. elegans* Kom.) is a far-eastern endemic perennial monocarpic plant that grows in mountains on rocky screes at elevations up to 1500 m above sea level, on gravel bars of mountain streams, and among large rocks under the canopy of mixed forests. *P. elegans* is distributed in the southern part of Primorsky Krai, in northeastern China, and the northern part of the Korean peninsula [1–3]. It differs from other species of the genus *Peucedanum* by leaves with linear segments of descending order that end at the apex as transparent threadlike spikes. This species is separated into the special section *Elegans* Gorovoi [1] in the genus *Peucedanum*.

In continuation of research on essential oils of little studied plants of the Far East [4, 5], we studied the composition and biological activity of essential oil from *P. coreanum* that was collected in the middle of August in Primorsky Krai, Shkotovskii District, in the vicinity of Anisimovka village on gravel bars in the upper reaches of Berezovyi creek. Specimens of the plant are preserved in the herbarium of the Laboratory of Chemotaxonomy, G. B. Elyakov Institute of Bioorganic Chemistry, FEB, RAS (Vladivostok); herbarium code 103594.

Essential oil was obtained from the dried and ground aerial plant part by steam distillation in a Clevenger apparatus for 2 h [6]. The yield was 0.1%. GC-MS analysis of *P. coreanum* essential oil used conditions analogous to those in the literature [7].

The volatile composition of *P. coreanum* contained the major constituents spathulenol (12.1%), limonene (11.7%), sabinene (10.1%), geranyl acetate (9.1%), *E*-nerolidol (7.3%), α -cadinol (4.1%), cyclogreenal (3.7%), β -pinene (3.5%), and unidentified constituents with contents of 6.6% and 3.2% (Table 1).

The antimicrobial and antimalarial activity of *P. coreanum* essential oil was studied using published methods, respectively [8, 9]. The experiments revealed low antimicrobial activity of *P. coreanum* essential oil (Table 2). The activity of the essential oil against *Plasmodium falciparum* D6 was comparable to that of chloroquine. The data showed $24 \pm 2\%$ inhibition.

Statistical processing used GraphPad Prism 9.5 programs (GraphPad Software, USA). The experiments were performed in triplicate ($n = 3$).

Essential oil of *P. coreanum* was tested for cytotoxic activity against *Artemia salina* larvae by the literature method [7]. The results were given as average \pm standard deviation ($n = 3$). Statistical processing used the one-factor ANOVA method followed by Dunnett's test. Results were considered statistically significant for $p < 0.05$ vs. the control. The experiments found acute lethal toxicity of *P. coreanum* essential oil at all tested concentrations. All *A. salina* larvae died.

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TABLE 1. Constituent Composition of Essential Oil from *P. coreanum*

Constituent	RI	%	Constituent	RI	%
α -Pinene	815	2.9	Spathulenol	1265	12.1
Sabinene	836	10.1	Caryophyllenol oxide	1267	2.1
β -Pinene	839	3.5	Unident.	1271	1.1
β -Myrcene	848	0.7	Salvial-4(14)-en-1-one	1276	0.6
<i>p</i> -Cymene	870	1.0	Oplophenone	1285	0.7
Limonene	872	11.7	Cyclogreenal	1288	3.7
Terpinen-4-ol	989	0.5	β -Selinene	1296	0.3
<i>trans</i> -Sabinyl acetate	1069	0.9	Palmityl acetate	1299	0.5
Citronellyl acetate	1113	2.2	α -Cadinol	1314	4.1
Unident.	1128	3.2	Torreol	1318	1.0
Geranyl acetate	1133	9.1	Unident.	1324	6.6
α -Humulene	1175	0.3	Eudesma-4,11-dien-2-ol	1349	0.4
<i>trans</i> - β -Farnesene	1180	1.6	Hexahydrofarnesyl acetone	1466	0.2
Geranyl butyrate	1185	0.7	1,2-Benzenedicarboxylic acid	1475	0.8
β -Cadinene	1190	0.4	bis-2-methylpropyl ester		
6-Pentyl-5,6-dihydro-2 <i>H</i> -pyran-2-one	1198	0.5	7,8-Epoxy- α -ionone	1506	0.3
2,4-Dimethyl-1,3-oxazole	1200	1.6	Osthol	1585	0.5
Cubedol	1220	0.7	Total		93.9
<i>E</i> -Nerolidol	1260	7.3			

TABLE 2. Antimicrobial and Antifungal Activity of Essential Oil from *P. coreanum*

Microorganism**	Amphotericin B*	<i>P. coreanum</i>	Microorganism**	Ciprofloxacin*	<i>P. coreanum</i>
<i>C. albicans</i>	100	0 ± 0.2	<i>S. aureus</i>	89	0 ± 0.1
<i>C. glabrata</i>	99	3 ± 0.1	MRS	96	0 ± 0.1
<i>C. krusei</i>	100	2 ± 0.3	<i>E. coli</i>	98	2 ± 0.2
<i>A. fumigatus</i>	99	1 ± 0.3	<i>P. aeruginosa</i>	97	7 ± 0.3
<i>C. neoformans</i>	100	0 ± 0.2	<i>M. intracellulare</i>	85	7 ± 0.2

*Reference drug; **test concentration: amphotericin B, 5 µg/mL; ciprofloxacin, 1 µg/mL.

ACKNOWLEDGMENT

We thank Dr. M. Jacob for assistance with antimicrobial activity studies and Dr. Sh. Khan (University of Mississippi, USA) for assistance with antimalarial activity studies. The research was financed by the Committee for Science, Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant BR24992761). The work was performed in the framework of a State Task for G. B. Elyakov Pacific Institute of Bioorganic Chemistry, Far Eastern Branch, Russian Academy of Sciences (Contract No. 075-03-2025-231).

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