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## INVESTIGATION OF KAZAKHSTANI FLORA. II. GC/MS ANALYSIS OF *FERULA SOONGARICA* PALL. EX SCHULT. ESSENTIAL OIL OBTAINED BY SUPERCRITICAL CO<sub>2</sub> EXTRACTION

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The composition of extracts of *Ferula soongarica* Pall. ex Schult. from two regions of Kazakhstan, obtained by supercritical CO<sub>2</sub> extraction was investigated by GC/MS.

Keywords: *Ferula soongarica*, supercritical fluid extraction (SCFE), GC/MS.

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*Ferula soongarica* Pall. ex Schult. is high plant spread in Central Asia. Phenolic and terpenoid esters were isolated before from roots of *F. soongarica* [1–3]. Composition of essential oils from China and Kazakhstan was investigated as well [4, 5], but it is necessary to note, that research of essential oil of *F. soongarica* obtained by CO<sub>2</sub> extraction method haven't been investigated before.

**Plant material.** Plants were collected by authors in Arshaly district near Astana (A) and in Zhezkazgan botanic garden (B) (Kazakhstan Republic) and deposited in Zhezkazgan Botanic garden (Voucher code is 2009.15.05.01.02).

**SCFE.** Supercritical fluid extraction was done as described in [6]. We collected extracts within an hour. The yield of essential oil is from 3,22 to 2,5% for raw material A and B respectively. The obtained extracts were dissolved in 1 ml of ethanol, cooled overnight at -20 °C, filtered and analyzed by GC/MS.

**GC/MS.** Component composition of essential oil was analyzed by the method of GC/MS and was done as described in [6]. Composition of CO<sub>2</sub> extract of *F. soongarica* given in the table.

Composition of CO<sub>2</sub> extracts of *Ferula soongarica*

RT	Library	Area, %		RT	Library	Area, %	
		A	B			A	B
1	2	3	4	1	2	3	4
6,22	<b>α-Pinene</b>	<b>4,07</b>	0,63	<b>44,07</b>	<b>Hexadecanoic acid</b>	<b>4,72</b>	–
6,92	Camphene	Tr	–	44,85	Hexadecanoic acid, ethyl ester	1,45	–
8,36	β-Pinene	1,40	–	45,87	Calamenene	1,06	–
9,18	Myrcene	0,85	–	45,77	β-Terpineol	–	0,91
9,61	(E,E)-2,4-Heptadienal	Tr	–	47,48	Phytol	Tr	–
11,49	<i>p</i> -Cymene	Tr	–	<b>47,96</b>	<b>Bergapten</b>	–	<b>5,51</b>
11,78	Limonene	Tr	–	48,10	7,10,13-Hexadecatrienoic acid methyl ester	2,01	–
15,02	2-Methoxy-Phenol	Tr	–	48,66	Nopinone	2,49	–
23,43	<i>p</i> -Mentha-1,5,8-triene	0,38	–	48,75	7,10,13-Hexadecatrienoic acid methyl ester	0,73	–
24,01	Bornyl acetate	Tr	–	<b>49,46</b>	<b>1,2,3,4,5,6-Hexahydrochrysene</b>	<b>5,96</b>	–
24,28	Thymol	Tr	–	49,84	Unknown 3	1,15	–
28,58	β-Cedrene	Tr	–	50,00	<i>trans</i> -2,3,3a,4,7,7a-Hexahydro-2,2,4,4,7,7-hexamethyl-1H-indene	0,70	–
28,67	Aristolene	Tr	0,41	50,42	1,4-Dimethyl-2,5-diisopropylbenzene	0,54	–
28,96	α-Selinene	Tr	–	50,93	Berlandin	0,82	–

Continue of the table

1	2	3	4	1	2	3	4
29,07	Calarene	Tr	tr	<b>51,13</b>	<b>Unknown 4</b>	<b>10,53</b>	–
28,54	$\beta$ -Farnesene	–	0,30	51,22	<b>Unknown 5</b>	2,16	–
32,75	$\delta$ -Cadinene	–	0,31	51,96	Heneicosane	0,78	–
33,34	$\beta$ -Cadinene	–	2,78	52,93	Isopinocampnone	Tr	1,55
29,32	Aromadendrene	Tr	0,97	<b>49,63</b>	<b>Edulan I</b>	–	<b>10,90</b>
29,79	Clovene	Tr	–	49,77	<b>Unknown 6</b>	–	0,76
30,78	Curcumene	Tr	–	50,13	n-Octylcyclohexane	–	0,67
32,06	Dihydroactinolide	Tr	–	<b>50,71</b>	<b>p-n-Propylphenol</b>	–	<b>4,66</b>
33,18	Vanillic acid	Tr	–	<b>51,94</b>	<b>2,4-Dimethyl-2-decene</b>	–	<b>19,78</b>
34,04	$\delta$ -Selinene	–	tr	53,38	<b>Unknown 7</b>	0,62	–
34,28	$\beta$ -Guaiene	–	1,77	<b>53,83</b>	<b>trans-7-Oxabicyclo[4.3.0]nonane</b>	<b>35,32</b>	–
35,68	Bis(p-ethylbenzyl) ether	0,80	–	55,00	Tetracosane	Tr	–
38,43	Carvacrol	0,29	–	59,05	Hexacosane	2,32	–
38,55	$\beta$ -Cyclocitral	0,55	–	<b>66,77</b>	<b>Ionene</b>	–	<b>15,03</b>
39,89	1,4-Diisopropyl-2,5-dimethylbenzene	0,52	–	<b>69,46</b>	<b>1,5,7-Trimethyltetralin</b>	–	<b>30,94</b>
40,16	<b>Unknown 1</b>	0,90	–	<b>69,65</b>	<b>Heptacosane</b>	<b>6,47</b>	–
<b>40,83</b>	<b>Unknown 2</b>	<b>3,10</b>	–	71,36	o-octyl-Anisole	2,74	–
41,04	Perhydrofarnesyl acetone	0,60	–	74,05	<b>Unknown 8</b>	1,64	–
43,75	Dibutyl phthalate	Tr	–	75,40	Octacosane	0,91	–
<b>TOTAL</b>						<b>98,58</b>	

A – Essential oil from *F. soongarica* from raw material collected in Arshaly district, near Astana. B – Essential oil from *F. soongarica* from raw material collected in Zhezkazgan (Karaganda region). \*\* – Tr – components less than 0,1%; \*\*\* – basic components in bold; \*\*\*\* – EIMS, 70 eV, m/z (% rel. int.): *Unknown 1*: 234(4), 216(11), 201(15), 191(100), 177(19), 173(15), 159(11), 149(11), 145(17), 134(33), 121(32), 115(8), 107(30), 91(23), 77(13), 69(7), 65(7), 55(11). *Unknown 2*: 236(2), 218(16), 200(15), 193(69), 185(16), 179(33), 157(41), 151(100), 143(27), 133(37), 119(16), 109(24), 105(23), 91(24), 77(16), 65(8), 55(10). *Unknown 3*: 429(1), 355(2), 290(9), 249(1), 232(28), 217(2), 208(13), 189(4), 175(2), 161(4), 149(5), 133(3), 121(8), 107(8), 91(5), 83(100), 79(4), 69(3), 55(3). *Unknown 4*: 291(2), 251(77), 233(14), 219(8), 205(3), 191(26), 177(23), 163(20), 155(12), 149(13), 145(12), 135(31), 119(48), 107(17), 91(20), 83(100), 69(14), 55(60). *Unknown 5*: 275(7), 235(4), 218(7), 200(3), 191(4), 175(100), 157(20), 147(18), 132(72), 126(28), 119(28), 105(17), 91(17), 83(51), 71(14), 55(43). *Unknown 6*: 235(31), 219(22), 200(22), 183(28), 175(45), 165(13), 157(62), 142(30), 132(60), 119(31), 105(26), 100(25), 91(37), 83(42), 71(17), 55(54). *Unknown 7*: 503(2), 429(3), 401(1), 355(2), 341(3), 281(13), 264(5), 252(2), 238(4), 222(4), 206(7), 189(8), 175(3), 165(4), 154(5), 135(5), 126(14), 112(11), 94(15), 82(20), 72(79), 59(100). *Unknown 8*: 345(7), 281(1), 220(3), 202(3), 187(3), 177(47), 164(17), 159(34), 151(100), 134(20), 121(17), 105(12), 93(13), 81(7), 71(5), 55(10).

As shown in table 1, in the essential oil of *F. soongarica* from the raw materials collected in Arshaly district, near Astana (A) 51 components were found, main from them are trans-7-Oxabicyclo[4.3.0]-nonane (35,3%), an unknown compound 7 (10,5%) and Heptacosane (6,5%). In the CO<sub>2</sub> extract obtained from the plant collected in Zhezkazgan where found 19 components, main from them are 1,5,7-Trimethyltetralin (30,9%), 2,4-dimethyl-2-decene (19,8%) and ionene (15,0%).

### Conclusions

Thus, for the first time we investigated the component composition of essential oil of *F. soongarica* from two regions of Kazakhstan obtained by supercritical CO<sub>2</sub> extraction method.

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