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M. F. Tkachenko

National University of Pharmacy

**COMPARATIVE ANALYSIS OF CONTENT AND COMPOSITION OF
VOLATILE COMPOUNDS OF PORTULACA OLERACEA WILD AND
CULTIVATED PLANTS**

RESUME

A comparative analysis of the content and composition of volatile compounds of wild and cultivated plants of *Portulaca oleracea* L. by the chromatographic–mass spectrometric method was carried out. Identified and defined the content of 60 compounds, including 42 compounds in the herb of wild purslane and 39 compounds in the herb of cultivated purslane. Dominant components of volatile fractions of two types of herbal drug were defined.

Keywords: volatile compounds, herb, *Portulaca oleracea*.

Introduction. Purslane or *Portulaca oleracea* L., Portulacaceae family, is annual, herbaceous, succulent, ground cover plant that is a common weed. In many countries, purslane grown as a vegetable. Cultivars of cultivated purslane, determined by vertical growth of sprouts, more large and juicy leaves [3, 5].

Literary data argue that *P. oleracea* contains a number of biologically active compounds. Purslane herb contains proteins, soluble carbohydrates, fructose, organic acids (oxalic acid, cinnamic acid, caffeic acid, malic acid and citric acid), flavonoids, red-purple pigments Olecacin I and II, which belong to betacyanins, coumarins, cardiac glycosides, saponins, glycosides of anthraquinones, alanine, catechins, tannins, vitamins (carotene, tocopherol and phyloquinone, ascorbic acid, nicotinic acid and B vitamins), glutathione, glutamic acid, aspartic acid, resins, elements (Zn, Cu, Mn, Ni, Fe, Ca, Mg, Na, K). The leaves contain 0.42% of mucilage, which consists of acidic and neutral fractions. Acidic fraction contains galacturonic acid. In the structure of the neutral fraction is up to 41% of arabinose. In addition, the entire

plant contains L-norepinephrine (0.25% in fresh herb). The concentration of omega-3-acids in lipophilic fraction of *P. oleracea* is the highest of all the green vegetable cultivars [2, 4, 6-9].

The aim of the work was to study and compare the composition and content of volatile components of herb in cultivated and wild purslane plants.

Research materials and methods. The herb of cultivated and wild purslane plants was purchase during flowering in the botanical garden of National University of pharmacy.

The raw materials drying at STP (in the shade at 20-22 °C) is not possible - it doesn't dried up during 3 months, so drying was carried out in an oven at 30-35 °C and forced ventilation, which of course led to the loss of volatile compounds. When drying materials acquired characteristic unpleasant and very strong smell.

Qualitative composition and content (mg / kg) of volatile compounds were determined by chromatographic-mass spectrometric method using chromatograph "Agilent Technologies 6890" with mass-spectrometric detector 5973. Chromatographic column - capillary DB-5 with an inner diameter of 0.25 mm and a length of 30 m. Speed of the sample was 1.2 ml / min for 0.2 minutes. Speed of carrier gas (helium) - 1.2 ml / min. Temperature of sample heater - 250 °C. Temperature of thermostat was programmed from 50 °C to 320 °C at speed of 4 deg / min. To the sample of air-dried plant material (50 mg) in 2 ml vial was added internal standard (tridecane), at the rate of 50 mg to the sample, followed by calculation of derived concentration of internal standard. Putting samples in chromatographic column was performed using splitless injection. The speed of the sample injection - 1.2 ml / min for 0.2 minutes.

To identify the components, received spectra were examined in base of the general laws of the molecular fragmentation of organic compounds under electron impact and by comparing the results obtained with indicators of mass spectral library database NIST05 and WILEY 2007 with a total of more than 470,000 spectra in conjunction with identification programs AMDIS and NIST. For quantitative calculations, the method of internal standard was used. Retention time was calculated

on the results of control analyzes of volatile components with the addition of a mixture of normal alkanes [1].

Results and discussion. In the result of purslane wild and cultivated plants research were found and identified 58 volatile compounds. Fig.1. Tab. 1. In the wild purslane herb were found and identified 42 compounds. Among them are dominated phenylpropanoid, hexahydro-farnesyl-acetone, triterpene hydrocarbon squalene and acyclic alcohol linalool.

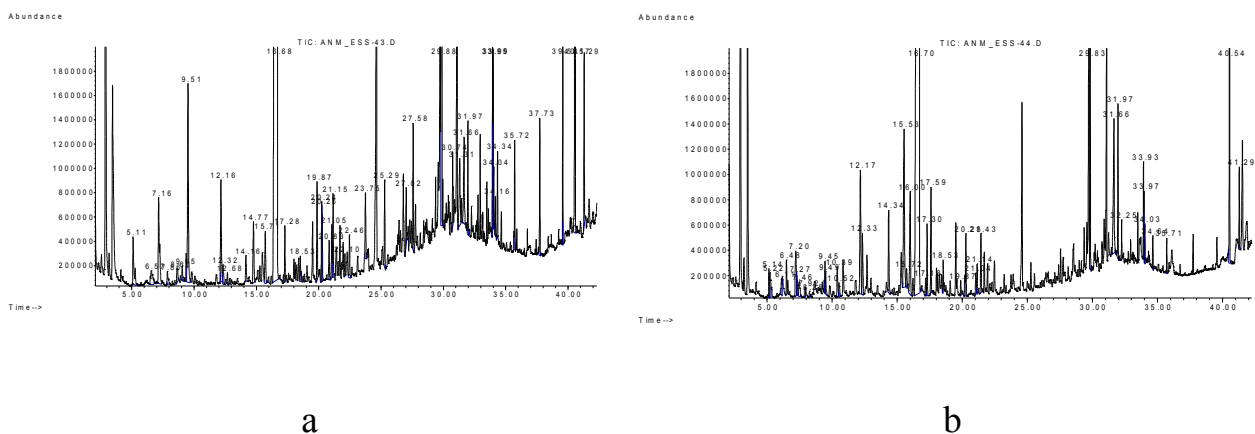


Fig.1. Chromatogram of volatile components of the purslane herb
a - wild, b - cultivated

Tab. 1

Composition and content of volatile compounds of the purslane herb: wild and cultivated

Position number	Retention time, min	Compound	Content, mg / kg	
			herb of wild plants	herb of cultivated plants
1	5.11	benzaldehyde	8.3	3.5
2	5.21	2-heptenal	-	4.1
3	6.1	1-octene-3-ol	-	2.5
4	6.48	2,4-heptadienal	-	3.7
5	6.56	3-octanol	4.7	-
6	7.15	phenylacetaldehyde	16.1	8.5
7	7.26	salicylaldehyde	-	2.6
8	7.46	1,8-cineole	-	3.3
9	7.86	acetophenone	2.0	1.4
10	8.25	3,5-octadien-2-one	-	0.8
11	8.62	trans-linalool oxide	2.6	-
12	9.04	cis-linalool oxide	1.6	-
13	9.44	nonanal	-	3.0

14	9.51	linalool	27.7	2.8
15	10.38	camphora	-	4.2
16	10.52	α -methylene phenylacetaldehyde	-	2.1
17	12.15	α -terpineol	13.5	20.5
18	12.31	verbenone	2.8	8.4
19	12.67	dekanal	1.4	-
20	14.15	α -ethylidene- phenylacetaldehyde	3.2	-
21	14.34	trans-2-decenal	-	10.3
22	14.76	indole	9.1	-
23	15.53	thymol	-	28.5
24	15.71	2-methoxy-4- vinylphenol	7.2	2.9
25	15.99	2,4-decadienal	-	17.0
26	17.18	eugenol	-	2.0
27	17.28	α -terpinilacetat	4,9	-
28	17.59	trans-2-dodecenal	-	10.1
29	18.52	methyleugenol	2.5	2.7
30	19.86	3-phenylpyridine	10.6	1.8
31	20.24	α -bergamotene	5.6	-
32	20.27	geranylacetone	6.3	6.7
33	20.83	β -farnezen	4.1	-
34	21.05	epoxy- β -ionon	5.9	2.4
35	21.15	β -ionon	8.2	3.5
36	21.43	undefined substance	-	6.4
37	22.09	5-methyl-3- phenylpyridin	2.3	-
38	22.46	pentadecane	4.8	-
39	23.74	nerolidol	7.3	-
40	25.29	hexadecane	8.4	-
41	27.01	8-heptadecene	4.6	-
42	27.57	heptadecane	10.5	-
43	29.87	hexahydrofarnesylac etone	79.9	28.9
44	30.74	farnesylacetone	7.0	-
45	31.31	palmitoleic acid	11.2	-
46	31.65	palmitic acid	11.6	21.7
47	31.96	ethyl palmitate	7.9	11.1
48	33.95	ethyl linoleate	12.8	7.0
49	33.99	ethyl linolenate	9.5	4.3
50	34.04	ethyl oleate	3.0	2.7
51	34.16	2,6-diphenyl-3-	2.6	-

		methylpyridine		
52	34.34	2,6-diphenylpyridine	6.7	-
53	34.64	undefined substance	-	2.9
54	35.71	tricosane	7.8	2.4
55	37.73	pentacosane	11.0	-
56	39.57	heptacosane	13.8	-
57	40.56	squalene	66.6	33.3
58	41.28	nonacosane	11.5	5.8

In the herb of cultivated purslane 39 volatile compounds have been found, including 37 identified substances. Dominant is squalene, hexahydrofarnesylacetone, aromatic compound thymol and monoterpeneoid α -terpineol. There are 21 volatile compounds that have been identified in the wild plants and which are absent in cultivated plants: 3-octanol, trans-linalool oxide, cis-linalool oxide, dekanal, α -ethylidene-phenylacetaldehyde, indole, α -terpinilacetat, α -bergamotene, β -farnezen, 5-methyl-3-phenylpyridin, pentadecane, nerolidol, hexadecane, 8-heptadecene, heptadecane, farnesylacetone, palmitoleic acid, 2,6-diphenyl-3-methylpyridine, 2,6-diphenylpyridine, pentacosane, heptacosane. In cultivated plants were identified 14 volatile compounds that are absent in wild plants: 2-heptenal, 1-octene-3-ol, 2,4-heptadienal, salicylaldehyde, 1,8-cineole, 3,5-octadien-2-one, nonanal, camphora, α -methylene phenylacetaldehyde, trans-2-decenal, thymol, 2,4-decadienal, eugenol, trans-2-dodecenal and two substances that were not identified. Considering the conditions of drying, the identification and comparison of the content of volatile compounds can only be approximate, but almost all compounds of wild plants are predominate over their content in cultivated plants by quantitative indicators.

Conclusions.

1. For the first time the determination of volatile compounds of herb of wild and cultivated purslane plants by chromatographic-mass spectrometric method have been done. 58 individual compounds were defined.
2. During the study of a herb of wild purslane plants were discovered and identified 42 compounds, in the herb of cultivated purslane plants - 39 compounds, including 37 identified substances.

3. Dominant volatile compounds of wild purslane herb - hexahydrofarnesylacetone, squalene and linalool and of the cultivated purslane herb - squalene, hexahydrofarnesylacetone, thymol and α -terpineol.
4. Identified the differentiation of volatile compounds in the wild (21) and cultivated (14) plants.
5. The content of volatile compounds in wild plants is much higher than in cultivated plants.

This research is only the first publication of a comprehensive study of a purslane herb, the plant, which has a rich variety of chemical composition and pharmacological properties.

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