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The constituents of volatile oils from *Thymus altaicus*

Abstract. The volatile oil constituents were extracted from the aerial parts of *Thymus altaicus* by water steam distillation were analyzed by GC-MS method. Fifty six compounds were separated. Their relative contents were determined by area normalization in which 47 volatiles were identified. The major volatile oils of *T. altaicus* are 3-cyclohexene-1-methanol, α,α -4-trimethyl- (35.84%), benzene, 1-methyl-2-(1-methylethyl)- (15.24%), β -myrcene (10.30%), thymol (7.94%), 1,4-cyclohexadiene, 1-methyl-4-(1-methylethyl)- (5.34%), caryophyllene (5.26%), 1,6-octadien-3-ol,3,7-dimethyl (4.78%), 2,6-octadien-1-ol,3,7-dimethyl-, (E)- (2.06%), 2,6-octadien-1-ol, 3,7-dimethyl-, acetate, (E)- (1.31%), caryophyllene oxide (1.23%).

Key words: *Thymus altaicus*; Altay region; Volatile oils; GC-MS;

Introduction

The traditionally natural products have played an important role in developing of natural product chemistry which continues to expand to exciting new frontiers of great importance in medicine. In Kazakhstan 49 genera, 247 species of plants are growing that belong to family Lamiaceae and genus *Thymus* have around 27 species [1]. *Thymus altaicus* has efficiently been used in the treatments of cold and cough with the properties of immunostimulant, expectorant, diuretic and detumescence in Kazakh traditional medicine [2].

Essential oils (EO) are also known as volatile oils, which is a concentrated hydrophobic liquid containing volatile aroma compounds and internationally defined as the product obtained by hydrodistillation, steam distillation or dry distillation or by a suitable mechanical process without heating (for Citrus fruits) of a plant or of some parts of it [3-5]. Essential oils of aromatic plants and spices are used in industries for production of bath products, cosmetics, soap, perfumes and toiletries. Many of

them are also used in traditional medicine for various purposes such as aromatherapy for the purpose of altering one's mood, cognitive, psychological and physical well-being [5].

In this study an attempt has been made to investigate the chemical constituents of volatile oils from Kazakh traditional medicinal plants of *Thymus altaicus* grown in Altay region of Kazakhstan for the first time.

Materials and Methods

Plant material: *Thymus altaicus* was collected in Altay region of east Kazakhstan, in July 2012 and identified by Prof. Shen Guan Min from the Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences. The oils were isolated by water-distillation for 4 hrs and then dried over anhydrous sodium sulphate.

GC-MS analysis: the aerial part of *Thymus altaicus* were analyzed by Electron Impact Ionization (EI) method on Perkin-Elmer Autosystem XL –TurboMass (Gas Chromatograph coupled to

Mass Spectrometer) fused silica capillary column (30m x 2.5mm; 0.25 μ m film thickness), coated with PE-5 ms were utilized. The carrier gas was helium (99.999%). The column temperature was programmed from 60°C (held for 5min), at 2°C/min to 180°C, at 3.5°C/min to 290°C.

The latter temperature maintained for 40min (Acquisition parameters full scan; scan range 40-350 amu). The injector temperature was 310°C. Injection: with a 0.1 μ l: detector ion source (EI-70eV). Samples were injected by splitting with the split ratio 1:60.

Identification of the compounds: Identification of compounds was done by comparing the NIST and Wiley library data of the peaks and mass spectra of the peaks with those reported in literature. Percentage composition was computed from GC peak areas on PE-5 ms column without applying correction factors.

Results and discussion

Volatile oils from the aerial parts of *Thymus altaicus* were analyzed by GC-MS. Fifty six compounds were separated. Their relative contents were determined by area normalization. Obtained data are presented in Table 1. The yield from whole herbs of *Thymus altaicus* was found to be 5.53 %. Table 1 report the composition of the volatiles of the aerial parts of *T. altaicus*. Forty seven components

have been identified in the volatiles of *T. altaicus* which the major constituents are 3-cyclohexene-1-methanol, $\alpha,\alpha,4$ -trimethyl- (35.84%), benzene, 1-mehtyl-2-(1- methylethyl)- (15.24%), β -myrcene (10.30%), thymol (7.94%), 1,4-cyclohexadiene,1-methyl- 4-(1-methylethyl)- (5.34%), caryophyllene (5.26%), 1,6-octadien- 3-ol,3,7-dimethyl- (4.78%), 2,6-octadien- 1-,3,7-dimethyl-, (E)- (2.06%) 2,6-oc-tadien-1-ol, 3,7-dimethyl-, acetate, (E)- (1.31%), caryophyllene oxide (1.23%). According to the report 3-cyclohexene-1-methanol, $\alpha,\alpha,4$ -trimethyl- (α -terpineol) (35.84%) shows antioxidant effects and antiseptic is present in many extracted oils of various plant species, acts as an antihypernociception and anti-inflammatory [7]. And second major volatile constituent benzene, 1-mehtyl-2-(1- methylethyl)- (15.24%) showed antimicrobial and antibacterial activates [8, 9]. β -myrcene (10.30%) and essential oils containing this terpenoid compound are widely used as a fragrance in cosmetics, as a scent in household products, and as a flavoring additive in food and alcoholic beverages [10]. Furthermore, it was reported that β -myrcene is an analgesic substance and the active principle of lemongrass (*Cymbopogon citratus* Stapf) 'abafado', an infusion made with the pan covered in order to prevent the loss of volatile constituents [11]. Lemongrass 'abafado' is widely used in Brazilian folk medicine as a sedative and as a remedy for gastrointestinal disorders [12].

Table 1 – The volatile constituents of aerial parts of *Thymus altaicus*

Peak No.	Constituents	t _R (min)	Molecular Formula	MW	Content (%)
1	l-R, α	16.03	C ₁₀ H ₁₆	136	0.72
2	Bicyclo[3.1.0]hex-2-ene, 2-methyl-5-(1-methylethyl)	16.17	C ₁₀ H ₁₆	136	0.32
3	Camphene	18.46	C ₁₀ H ₁₆	136	0.77
4	β -Pinene	20.96	C ₁₀ H ₁₆	136	0.20
5	Bicyclo[3.1.0]hexene, 4-methylene-1-(1-methylethyl)	21.81	C ₁₀ H ₁₆	136	0.60
6	β -Myrcene	24.92	C ₁₀ H ₁₆	136	10.30
7	Cyclohexene, 1-methyl-4-(1-methylethylidene)	26.10	C ₁₀ H ₁₆	136	0.45
8	2,3-Dehydro-1,8-cineole	26.93	C ₁₀ H ₁₆ O	152	0.09
9	Limonene	27.56	C ₁₀ H ₁₆	136	0.42
10	Eucalyptol	28.43	C ₁₀ H ₁₈ O	154	0.66
11	1,4-Cyclohexadiene,1-methyl-4-(1-methylethyl)-	31.66	C ₁₀ H ₁₆	136	5.34
12	Benzene, 1-methyl-2-(1-methylethyl)-	34.10	C ₁₀ H ₁₄	134	15.24
13	Bicyclo[4.1.0]hepta-2-ene, 3,7,7-trimethyl	34.63	C ₁₀ H ₁₆	136	0.05
14	1-Octen-3-ol	48.93	C ₈ H ₁₆ O	128	0.31
15	Terpineol, Z-, beta-	50.54	C ₁₀ H ₁₈ O	154	0.05

Peak No.	Constituents	t _R (min)	Molecular Formula	MW	Content (%)
16	Camphor	56.01	C ₁₀ H ₁₆ O	152	0.58
17	1,6-Octadien-3-ol, 3,7-dimethyl	57.82	C ₁₀ H ₁₈ O	154	4.78
18	1,6-Octadien-3-ol, 3,7-dimethyl-, acetate	58.84	C ₁₂ H ₂₀ O	196	0.91
19	Germacrene d	60.75	C ₁₅ H ₂₄	204	0.03
20	Bornyl acetate-	61.27	C ₁₂ H ₂₀ O ₂	196	0.16
21	Benzene, 2-methoxy-4-methyl-1-(1-methylethyl)-	62.14	C ₁₁ H ₁₆ O	164	0.10
22	Caryophyllene	63.13	C ₁₅ H ₂₄	204	5.26
23	2-Methyl-6-methylene-oct-3,7-dien-2-ol	64.16	C ₁₀ H ₁₆ O	152	0.04
24	Pulegone	67.17	C ₁₀ H ₁₆ O	152	0.16
25	α	69.10	C ₁₅ H ₂₄	204	0.29
26	2-Octadienal, 3,7-dimethyl-, (Z)-	69.89	C ₁₀ H ₁₆ O	152	0.22
27	3-Cyclohexene-1-methanol-α	71.40	C ₁₀ H ₁₈ O	154	35.84
28	Naphthalene, 1,2,3,4,5,6,8A-octahydro-7-methyl	72.74	C ₁₅ H ₂₄	204	0.11
29	2,6-Octadien-1-ol, 3,7-dimethyl-, acetate, (Z)-	73.14	C ₁₂ H ₂₀ O ₂	196	0.10
30	2,6-Octadienal, 3,7-dimethyl-, (E)-	74.06	C ₁₀ H ₁₆ O	152	2.06
31	2,6-Octadien-1-ol, 3,7-dimethyl-, acetate, (E)-	75.57	C ₁₂ H ₂₀ O ₂	196	1.31
32	2,6-Octadienal, 3,7-dimethyl-, (Z)-	78.86	C ₁₀ H ₁₆ O	152	0.80
33	2,6-Octadien-1-ol, 3,7-dimethyl-, (E)-	82.50	C ₁₀ H ₁₈ O	154	0.91
34	Benzenemethanol, α	82.87	C ₁₀ H ₁₄ O	150	0.12
35	Cis-Z-α	89.47	C ₁₅ H ₂₄ O	220	0.32
36	Trans-Z-α	89.76	C ₁₅ H ₂₄ O	220	0.12
37	Caryophyllene oxide	94.18	C ₁₅ H ₂₄ O	220	1.23
38	12-Oxabicyclo[9.1.0]dodeca-3,7-diene, 1,5,5,8-tetramethyl	98.20	C ₁₅ H ₂₄ O	220	0.05
39	Cuminol	101.6	C ₁₅ H ₁₄ O	150	0.71
40	Thymol	107.0	C ₁₀ H ₁₄ O	150	0.62
41	Tau-muurolol	107.8	C ₁₅ H ₂₆ O	222	0.15
42	α	108.4	C ₁₅ H ₂₄	204	0.02
43	Phenol, 2-methyl-5-(1-methylethyl)-	109.0	C ₁₀ H ₁₄ O	150	0.27
44	α	110.8	C ₁₅ H ₂₆ O	222	0.39
45	Tetracyclo[6.3.2.0(2,5).0(1,8)]tridecan-9-ol, 4,4-dimethyl	115.3	C ₁₅ H ₂₄ O	220	0.21
46	1H-3A,7-methanoazulene, octahydro-1,4,9,9-tetramethyl	117.6	C ₁₅ H ₂₆	206	0.08
47	Aromadendrene oxide-(2)	120.2	C ₁₅ H ₂₄ O	220	0.23

Conclusion

The volatile oils constituents were extracted from the aerial parts of *Thymus altaicus* by water steam distillation which analyzed by GC-MS method. Fifty six compounds were separated. Their relative contents were determined by area normalization in which 47 volatiles were identified. Active principles of the Kazakh traditional medicinal plant (*T. altaicus*) that responsible for the activity were determined.

While the major volatile constituents are 3- cyclohexene-1-methanol, α,α, 4-trimethyl- (35.84%), benzene, 1-mehtyl-2-(1- methylethyl)- (15.24%), and β-myrcene (10.30%) which possessing antihypertension, anti-inflammatory, antimicrobial, antibacterial and analgesic activities separately.

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