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THE COMPOSITION OF HYSSOPUS ZERAVSHANICUS ESSENTIAL OIL OBTAINED IN TAJIKISTAN

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The essential oil from the overground parts of *Hyssopus zeravshanicus* Dub. (Pazij) (*H. zeravshanicus*) collected from Varzob region of Tajikistan have been obtained by hydrodistillation and analyzed by GC-MS. In all thirty nine compounds have been identified. The major components of *H. zeravshanicus* oil were isopinocampone (55.44%), β -pinene (10.55%), pinocampone (7.0%), myrtenyl acetate (4.11%), Eucalyptol (2.9%), α -Phellandrene (2.6%), and *m*-Cymene (1.98%).

The genus *Hyssopus* belongs to the family *Labiatae* and consists over 15 species worldwide. This plant distributed in Central Asia, south Europe and North Africa [1]. *H. zeravshanicus*, locally tojiki name ushnondoru grows in northwestern part of Tajikistan. The biological activity of *Hyssopus*'s oil [8] against the human immunodeficiency virus (HIV) [4], herpes simplex virus type-1, (HSV-1) [10] and antifungal activities against *Pyrenophora avenae* and *Pyricularia oryzae* strains and *Phytopathogenic fungi* have been reported [2, 5, 6].

In 1974, Zotov *et al.* reported [13] that an oil of *H. zeravshanicus* essential oil was found to contain the following compounds: β -pinene, sabinene, myrcene, α -terpinene, limonene, γ -terpinene, *p*-cymene, terpinolene, fenchone, menthone, *l*-pinocampone, *l*-isopinocampone, verbenone, *l*-pinocampheol, *l*-isopinocampheol.

A number of years later (1987), Schantz *et al.* reported [9] that the major components of *H. officinalis* essential oil were isopinocampone (32,9-54,3%), β -pinene (13,9-18,5%), pinocarvone (9,0-16,3%) and pinocampone (7,9-12,6%). The following year, Ramaswami *et al.* (1988) determined [7] that the major sesquiterpene hydrocarbon components of hyssop oil were aromadendrene, germacrene D and bicyclogermacrene. In 1991, Shah identified [12] that the major components in the oil were isopinocampone (38,1%), pinocarvone (20,3%), 1,8-cineole (12,2%) and β -pinene (10,2%). Also in this year, Shultz and Stahl-Biskup compared [11] the chemical composition of oils produced from flowers, leaves, stems and roots that the main constituents

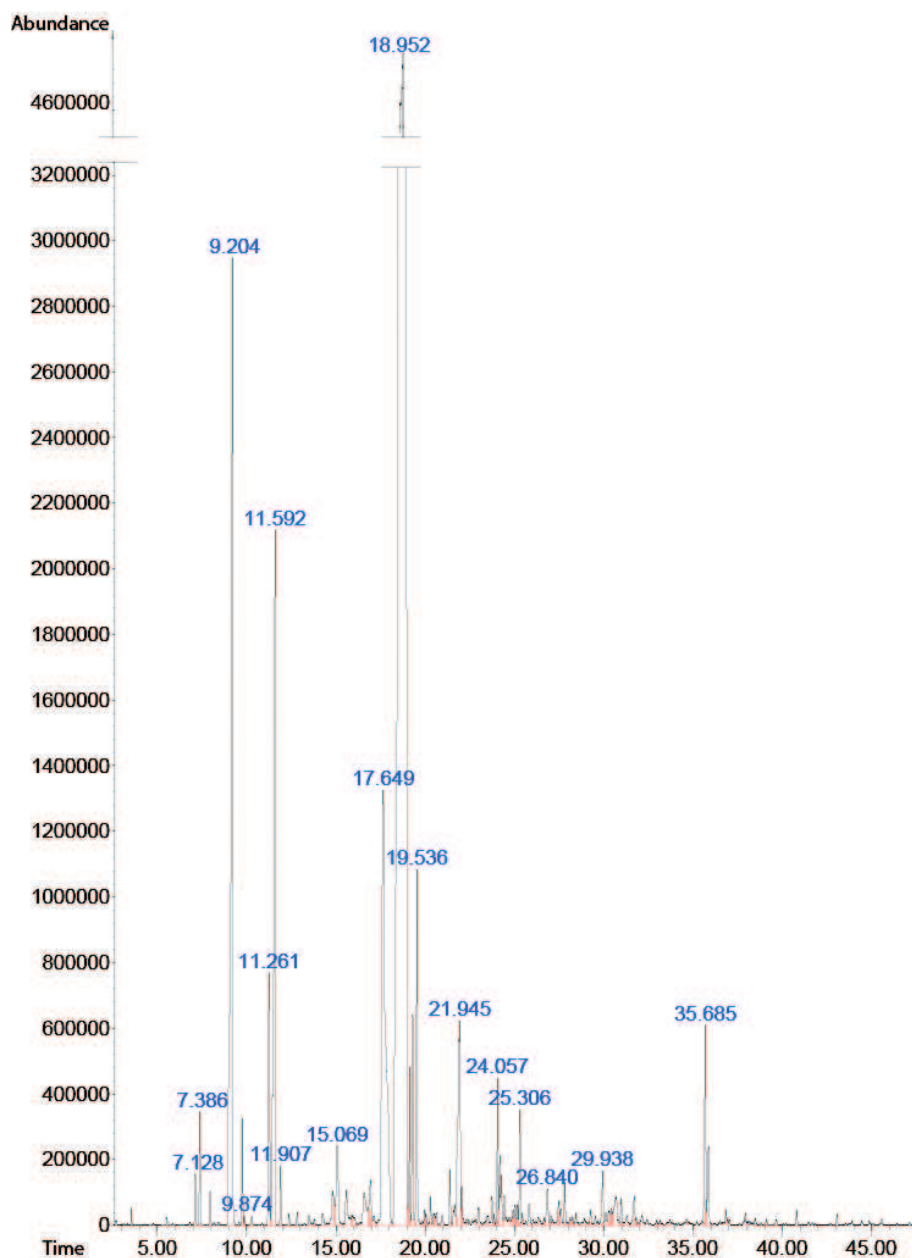
were pinocampone (31,8-60,2%), β -pinene (10,0-13,9%) and camphor (3,4-20,6%). Lawrence (1992) reported the results of study on the composition of the oils of different seed sources of *H. officinalis*, the major components were pinocampone, isopinocampone, β -pinene, 1,8-cineol. Galambosi *et al.* (1993) have found [3] that the major components of hyssop oil were pinocampone, isopinocampone, pinocarvone and germacrene D. P. Ablizl *et al.* (2009 identified) [1] a total 36 compounds of the essential oil of *H. cuspidatus*. There major components of oil were germacrene D (18,67%), hexadecanoic acid (17,53%), germacrene B (15,61%), caryophyllene (8,04%).

Experimental

Plant Material: Aerial parts of *H. zeravshanicus* Dub. (Pazij) were collected in Ziddeh village, Varzob region, Tajikistan (39,0285 N, 68.7867 E, 2000 m above sea level). The plant was identified by F.S. Sharopov. A voucher specimen has been deposited in the herbarium of the Chemistry Institute of the Tajikistan Academy of Sciences herbarium (voucher number TJ2010-088). The plant was air dried and the dried samples were crushed and hydrodistilled for 3 h to give a yellow essential oil in 0,6-1% yield.

Gas Chromatographic-Mass Spectral Analysis: GC/MS analysis of the oil was performed on a Finnigan Trace DSQ GC/MS, equipped with a AL 3000 autoinjector (Thermo Fisher Scientific Inc., MA, USA) and a capillary column (Thermo TR-5MS, crosslined 5% Phenyl polysilphenylene-siloxane, 30 m x 0,25 mm i. d., 0,25 mm film thickness). MS conditions: Ionization voltage (EI) was 70 eV. Ion source and interface temperature was 250°C. Scan mass range was 50-450 m/z. Solvent delay time was 2 min. The flow rate for the helium carrier gas was 1,0 mL/min.

GC conditions: The column was coupled directly to the MS, and the flow rate for the helium carrier gas was 1,0 mL/min. The injector temperature was 250°C. A 0,4 mL sample was injected in the split mode with a split ratio of 60:1. The temperature program was: initial temperature 50°C, from 50 to 230°C at a rate of 10°C/min,

Fig. Chromatogram of essential oil of *Hyssopus Zeravshanicus*.

Table

Chemical composition of *Hyssopus Zeravshanicus* volatile oil obtained from Tajikistan

Peak	Retention time	Formula	Compound	Content (%)
1	2	3	4	5
1	4,90	$C_{10}H_{16}$	α -Thujene	0,41
2	5,05	$C_{10}H_{16}$	α -Pinene	0,68
3	5,33	$C_{10}H_{16}$	Camphene	0,19
4	5,63	$C_{10}H_{16}$	α -Phellandrene	2,60
5	5,75	$C_{10}H_{16}$	β -Pinene	10,55
6	6,43	$C_{10}H_{14}$	<i>m</i> -Cymene	1,98
7	6,48	$C_{10}H_{16}$	Limonene	1,19
8	6,57	$C_{10}H_{18}O$	Eucalyptol	2,90
9	7,13	$C_{10}H_{18}O$	γ -Terpineol	1,49

Continuation of the table

1	2	3	4	5
10	7,41	C ₁₀ H ₁₈ O	α -Pinene epoxide	0,05
11	7,49	C ₁₀ H ₁₈ O	Linalool	0,35
12	7,62	C ₁₀ H ₁₈ O	β -Terpineol	0,16
13	7,82	C ₁₀ H ₁₆ O	Thujone	0,32
14	7,99	C ₁₀ H ₁₈ O	2-Menthenol	0,14
15	8,32	C ₁₀ H ₁₆ O	Pinocarveol	0,65
16	8,43	C ₁₂ H ₁₈ O ₂	Myrtenyl acetate	4,11
17	8,63	C ₁₀ H ₁₆ O	Pinocamphone	7,0
18	8,77	C ₁₀ H ₁₈ O	α -Terpineol	0,11
19	8,93	C ₁₀ H ₁₆ O	Isopinocamphone	55,44
20	9,09	C ₁₀ H ₁₂ O	Estragole	1,10
21	9,16	C ₁₀ H ₁₄ O	Myrtenal	0,58
22	9,36	C ₁₀ H ₂₀ O	β -Citronellol	0,39
23	9,72	C ₁₀ H ₁₆ O	Pulegone	0,31
24	9,83	C ₁₀ H ₁₂ O	Cuminaldehyde	0,06
25	9,91	C ₁₀ H ₁₆ O	Carvotanacetone	0,96
26	10,02	C ₁₀ H ₁₈ O ₂	Pinanediol	1,22
27	10,35	C ₁₀ H ₁₄ O	Thymol	0,22
28	10,49	C ₁₀ H ₁₄ O	Carvacrol	1,76
29	10,70	C ₁₀ H ₁₄ O	<i>D</i> -Verbenone	0,05
30	10,83	C ₁₂ H ₁₈ O ₂	Pinocarvyl acetate	0,22
31	11,73	C ₁₅ H ₂₄	β -Bourbonene	0,36
32	12,78	C ₁₅ H ₂₄	Aromadendrene	0,09
33	13,23	C ₁₅ H ₂₄	β -Bisabolene	0,07
34	13,41	C ₁₅ H ₂₄	γ -Cadinene	0,05
35	14,27	C ₁₅ H ₂₄ O	Spathulenol	0,60
36	14,37	C ₁₅ H ₂₄ O	Caryophyllene oxide	0,38
37	15,01	C ₁₅ H ₂₆ O	Torreyol	0,09
38	15,41	C ₁₅ H ₁₈	Cadalene	0,13
39	22,30	C ₁₅ H ₂₄ O	Shyobunone	0,07

then from 230 to 280 °C at a rate of 20 °C/min and subsequently held isothermal for 10 min.

Results and discussion

The essential oil from the aerial parts of *H. zeravshanicus*, collected from Varzob region of Tajikistan, were obtained by hydrodistillation and analyzed by GC-MS. The chemical compositions of the *H. zeravshanicus* oils are summarized in Table and Fig. A total of thirty nine compounds were identified. The major components of *H. zeravshanicus* oil were isopinocamphone (55,44%), β -pinene (10,55%), pinocamphone (7,0%), myrtenyl acetate (4,11%), eucalyptol (2,9%), α -phellandrene (2,6%),

and *m*-cymene (1,98%). The essential oil was dominated by oxygenated monoterpenoids, chiefly isopinocamphone and pinocamphone, respectively. The *H. zeravshanicus* essential oils from Tajikistan, as revealed in this study, clearly belong to a isopinocamphone-rich chemotype.

CONCLUSIONS

1. The essential oil from the aerial parts of *Hyssopus zeravshanicus* Dub. (Pazij).

2. As major components of *Hyssopus zeravshanicus* oil were identified isopinocamphone, β -pinene, pinocamphone, myrtenyl acetate, eucalyptol, α -Phellandrene, and *m*-Cymene.

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СОСТАВ ЭФИРНОГО МАСЛА HYSSOPUS ZERAVSHANICUS, ПОЛУЧЕННОГО В ТАДЖИКИСТАНЕ

Ф.Шаропов, М.Куканиев, И.Гулмуродов, Е.Гладух, Ци Тао Яанг
 Методом гидродистилляции получено эфирное масло из надземной части Иссопа заравшанского (*Hyssopus zeravshanicus* Dub. (Pazij)), собранного в Варзобском районе Таджикистана, которое было проанализировано методом GC-MS. В общей сложности были идентифицированы тридцать девять соединений. Основными компонентами эфирного масла *H. zeravshanicus* были изопинокамфон (55,44%), β -пинен (10,55%), пинокамфон (7,0%), миртенила ацетат (4,11%), эвкалиптол (2,9%), α -феландрен (2,6%) и *m*-цимен (1,98%).

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СКЛАД ЕФІРНОЇ ОЛІЇ HYSSOPUS ZERAVSHANICUS, ОДЕРЖАНОЇ В ТАДЖИКИСТАНІ

Ф.Шаропов, М.Куканієв, І.Гулмуродов, С.Гладух, Ци Тао Яанг
 Методом гідродистиляції одержана ефірна олія з надземної частини Гісопу заравшанського (*Hyssopus zeravshanicus* Dub. (Pazij)), зібраного у Варзобському районі Таджикистану, яка була проаналізована методом GC-MS. Всього було ідентифіковано тридцять дев'ять сполук. Основними компонентами ефірної олії *H. zeravshanicus* були ізопінокамфон (55,44%), β -пінен (10,55%), пінокамфон (7,0%), м'ртенілу ацетат (4,11%), евкаліптол (2,9%), α -феландрен (2,6%) та *m*-цимен (1,98%).