# ТЕХНОЛОГІЯ ЛІКАРСЬКИХ ПРЕПАРАТІВ

*Рекомендована д.ф.н., професором Т.Г.Ярних*

UDC 547.913

## THE COMPOSITION OF HYSSOPUS ZERAVSHANICUS ESSENTIAL OIL OBTAINED IN TAJIKISTAN

F.Sharopov, M.Kukaniev, I.Gulmurodov, Ye.Gladukh, Zi Tao Jiang

V.I. Nikitin Institute of Chemistry, Tajikistan Academy of Sciences
National University of Pharmacy, Kharkiv, Ukraine
College of Biotechnology and Food Science, Tianjin University of Commerce, Tianjin, China

**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 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 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 *Hyssop'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*-pinocamphone, *l*-isopinocamphone, 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 isopinocamphone (32,9-54,3%), *β*-pinene (13,9-18,5%), pinocarvone(9,0-16,3%) and pinocamphone (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 isopinocamphone (38,1%), pinocarvone (20,3%), 1,8-cineole (12,2%) and *β*-pinene (10,2%). Also in this year, Shhultz and Stahl-Biskup compared [11] the chemical composition of oils produced from flowers, leaves, stems and roots that the main constituents were pinocamphone (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 pinocamphone, isopinocamphone, *β*-pinene, 1,8-cineol. Galambosi et al (1993) have found [3] that the major components of hyssop oil were pinocamphone, isopinocamphone, 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,

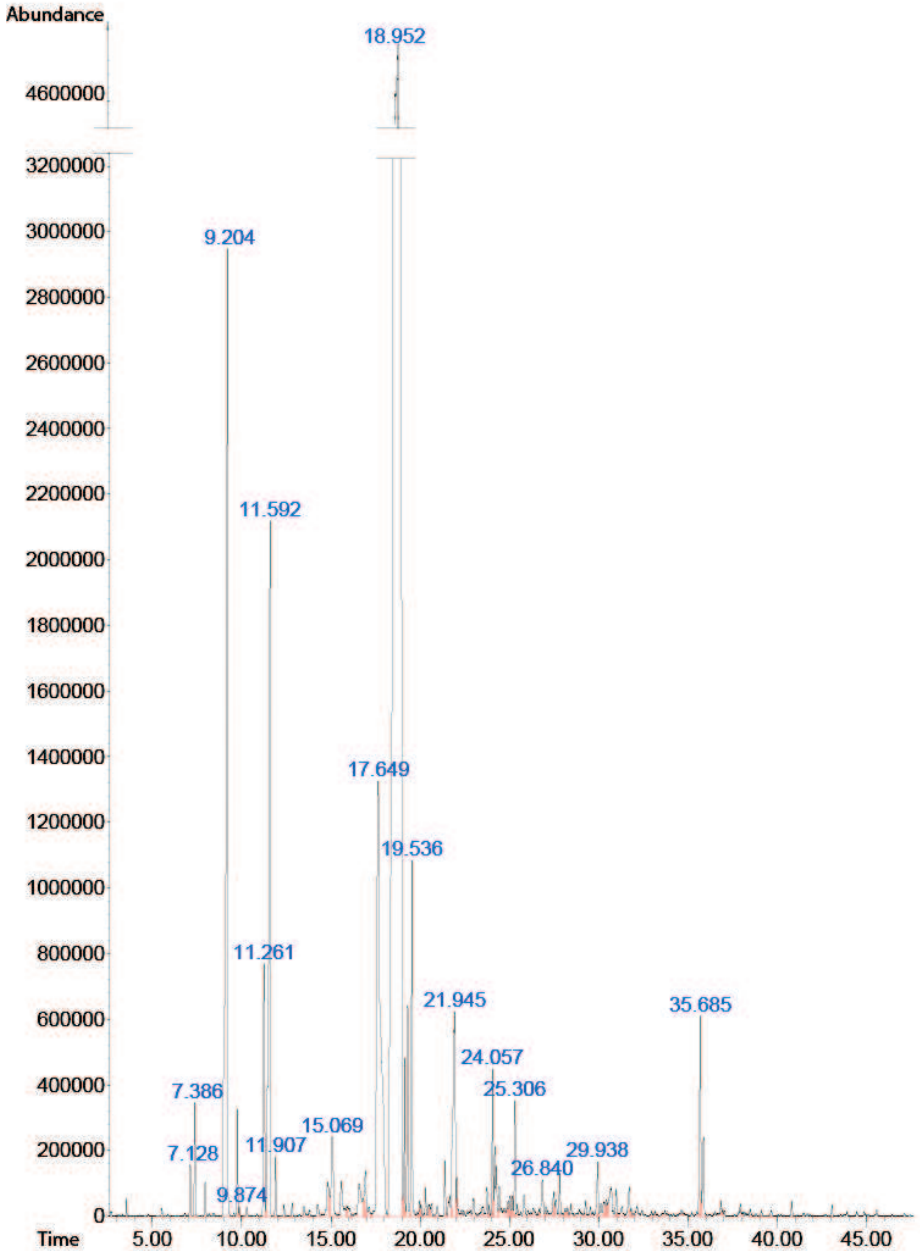


Fig. Chromatogram of essential oil of *Hyssopus Zeravshanicus*.

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 | $C_{10}H_{14}$ | *m*-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 | $C_{10}H_{14}O$ | *D*-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 isopinochamphone-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.

REFERENCES


1. *Ablizl P., Cond Y., Musa M. et al. // Chemistry of Natural Compounds. – 2009. – Vol. 45. – P. 445-449.*
2. *Fraternale D., Ricci D., Epifano F. // J. of Essential Oil Res. – 2004. – Vol. 16. – P. 617-622.*
3. *Galambosi B., Svoboda K.P., Deans S.G., Hethelyi E. // Agric. Sci. Finland. – 1993. – Vol. 2. – P. 293-302.*
4. *Kreis W., Kaplan M.H., Freeman J. // Antiviral Res. – 1990. – Vol. 14. – P. 323-337.*
5. *Letessier M.P., Svoboda K.P., Walters D.R. // J. of Phytopathol.-Phytopathol. Ztsch. – 2001. – Vol. 149. – P. 673-678.*
6. *Ozer H., Sokmen M., Gulluce M. // Italian J. of Food Sci. – 2006. – Vol. 18. – P. 73-83.*
7. *Ramaswami S.K., Briscese P., Gargiullo R.J., Geldern T. // Flavors and Fragrances. – 1988. – Vol. 7. – P. 951-980.*
8. *Renzini G., Scazzocchio F., Lu M. // J. of Essential Oil Res. – 1999. – Vol. 11. – P. 649-654.*
9. *Schantz M., Holm Y., Hiltunen R., Galambosi B. // Deut. Apoth. Ztg. – 1987. – Vol. 127. – P. 2543-2548.*
10. *Schnitzler P., Koch C., Reichling J. // Antimicrobial Agents and Chemotherapy. – 2007. – Vol. 51. – P. 1859-1862.*
11. *Schultz G., Stahl-Biskup E. // Flavors and Fragrances. – 1991. – Vol. 6. – P. 69-73.*
12. *Shah N.C. // Indian Perfum. – 1991. – Vol. 35. – P. 49-52.*
13. *Zotov E.P., Goryaev M.I., Sharipov F.S., Khazanovich R.L. // Chemistry of Natural Compounds. – 1974. – Vol. 1. – P. 101-102.*


УДК 547.913

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%).

УДК 547.913

СКЛАД ЕФІРНОЇ ОЛІЇ HYSSOPUS ZERAVSHANICUS, ОДЕРЖАНОЇ В ТАДЖИКИСТАНІ

Ф.Шаропов, М.Куканієв, І.Гулмуродов, Є.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%), міртенілу ацетат (4,11%), евкаліптол (2,9%), *α*-феландрен (2,6%) та *m*-цимен (1,98%).