Bioscience Discovery, 10(3):108-111, July - 2019

Print & Online, Open Access, Research Journal Available on http://jbsd.in
ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)
Research Article

Chemical composition of the essential oil *Hedera sinensis* (Tobler) Hand. - Mazz.: An important herb species of Vietnam

Van Huong BUI[*1], Ngoc Anh LUU DAM[1], Dam Cu LUU[1], Van Thanh BUI[2], The Cuong NGUYEN[2], Rajesh K. JOSHI[3]

[1]Vietnam National Museum of Nature, Vietnam Academy of Science and Technology, Vietnam
[2]Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, Vietnam
[3]Department of Phytochemistry, ICMR-National Institute of Traditional Medicine, Nehru Nagar, Belagavi, Karnataka-590 010, India
*E-mail: bvhuong90@gmail.com

Article Info

Received: 30-05-2019,
Revised: 28-06-2019,
Accepted: 01-07-2019

Keywords:
Hedera sinensis, Araliaceae, Essential oil, (E)-Asarone, Epizonarene, GC-MS.

Abstract

The hydrodistilled essential oil from aerial parts of *Hedera sinensis* (Tobl.) Hand.-Mazz. (Araliaceae) was investigated gas chromatography coupled with a mass spectrometry (GC-MS) for the first time. Forty-one compounds, accounting for 96.9% of the total oil, were identified. The most abundant constituents of the essential oil were (*E*)-asarone (25.6%) and epizonarene (17.8%). The other minor constituents were germacrene B (6.6%), germacrene D (5.7%), *δ*-elemene (5.2%), 10-*epi*-*γ*-eudesmol (4.0%), sabinene (3.5%), *allo*-aromadendrene (3.2%) and (*Z*)-asarone (3.1%). The oil was found to be rich in sesquiterpene hydrocarbon (46.3%) type constituents.

INTRODUCTION

The genus *Hedera* L. (Araliaceae) has been represented about fifteen species in the world. Out of fifteen species, only two species viz., *Hedera sinensis* (Tobler) Hand-Mazz. and *Hedera sinensis* var. *leucotricha* Grushv. & N. Skvorts. are found in Vietnam (Nguyen, 2003). This species is a shrub candent and young branches arises with ferruginous scales. The leaves are dimorphic on sterile branches entire or 3-lobed, usually triangular-ovate or triangular-oblong, rarely triangular or sagittate. The fertile branches are elliptic-ovate or elliptic-lanceolate, rarely ovate or lanceolate, blade glabrous or with sparse scales abaxially, venation distinct on both surfaces, base broadly cuneate, margin entire, apex acuminate. Inflorescence a terminal umbel or a small raceme, with ferruginous scales. In Vietnam, the flowering of this plant appears from September to November. The plant *H. sinensis* has been widely distributed in Vietnam, including Son La, Hoa Binh, Lao Cai, Ha Giang, and Lam Dong provinces (Pham, 2002). The plant *H. sinensis* is an important medicinal native to Vietnam and the leaves and seeds are used in the folk medicine for treatment of detoxification, hepatitis, headaches, and rheumatism (Vo, 2012). The aim of the present study was to identify essential oil compounds from the aerial parts of *H. sinensis*. To the best of authors knowledge, this is the first report on the essential oil constituents of aerial parts of *H. sinensis*.

MATERIALS AND METHODS

***Plant material*:** The aerial parts of *H. sinensis* were collected from Da Nhim commune, Lac Duong district, Lam Dong province, Vietnam, in November 2017 at an elevation of 1529 m. The species was identified by Dr. The Cuong Nguyen at the Department of Botany, Institute of Ecology and Biological Resources, and a voucher specimen has been deposited in the herbarium of Vietnam National Museum of Nature (VNMN) under the

number TN17/C04-034.

***Isolation of essential oil*:** The fresh plant (1000 g) was used for extraction of the essential oil by hydrodistillation using a Clevenger-type apparatus for 3 hours according to the Vietnam Pharmacopoeia method (Ministry of Health Portal, 2009). The obtained oil was yellowish with characteristic odor and then dried over anhydrous Na_2SO_4 and the solvent was removed under vacuum in a vial and stored in darkness at 4°C until analysis. The yield of oil was 0.3% (v/w).

***Gas chromatography-mass spectroscopic analysis*:** Gas Chromatography-Mass Spectrometer (GC-MS) analysis of the essential oil of *H. sinensis* was employed a Thermo Scientific Trace 1310 coupled with mass spectrometry Thermo Scientific ITQ 900 equipped with capillary column TG-5MS (30 m x 0.25 mm i.d, 0,25 µm film thickness). The oven temperature was held at 40°C, then programmed to 240°C (hold 5 min) at a rate of 4°C/min. Helium was used as a carrier gas at flow rate of 1.0 mL/min. The injector temperature was 250°C, and the injection volume of 0.1 mL in *n*-hexane, with a split ratio of 1:60. The mass spectra (MS) were operated in electron impact mode (70 eV), and the MS data were acquired in scan mode with a mass range of *m/z* 40 - 400.

***Identification of the components*:** The peaks were quantified by calculating the percentage of the peak area of each component by comparison to the sum of the peaks of other compounds. The identification of the components was made on the basis of retention index (RI, determined with reference to a homologous series of *n*-alkanes C_8-C_{20}, under identical experimental conditions), MS library search (NIST 14 version 2.2) and by comparing with MS literature data (Adams, 2017).

RESULTS AND DISCUSSION

Forty-one compounds were identified according to their mass spectra and their relative retention indices determined in a non-polar stationary phase capillary column, comprising 96.9% of the total oil constituents. The identified compounds are listed in Table 1, along with the percentage composition determined using GC-MS of each component and its retention index.

The major constituents of the essential oil were (*E*)-asarone (25.6%) and epizonarene (17.8%). The other minor constituents were germacrene B (6.6%), germacrene D (5.7%), *δ*-elemene (5.2%), 10-*epi*-*γ*-eudesmol (4.0%), sabinene (3.5%), *allo*-aromadendrene (3.2%) and (*Z*)-asarone (3.1%). The oil was found to be rich in sesquiterpene hydrocarbons (46.3%), followed by other (34.7%), monoterpene hydrocarbons (9.0%) and oxygenated sesquiterpene (6.9%) type compounds. Compare the various parts viz., berry, leaf and stem essential oils of the species of *H. pastuchovii* growing in Iran (Baharfar *et al*., 2017) and this report only a few compounds viz., *α*-pinene (0.3-22.2%), *γ*-terpinene (0.1-1.5%), *α*-cubebene (0.1%), *α*-copaene (0.1-3.2%), *β*-elemene (1.5%), epizonarene (0.2%), germacrene B (0.8%) and spathulenol (0.3%) were found to be similar. It is interesting to note that the compound epizonarene which has been reported in *H. pastuchovii* berry was 0.2%, in this report the quantity of epizonarene was found 17.8% in aerial parts of *H. sinensis*. Similarly, the compound (*E*)-asarone (25.6%) which was found the high amount in this report, not reported in *H. pastuchovii* oil. This is the first report on the chemical constituents of the essential oil of *H. sinensis* and represented (*E*)-asarone and epizonarene chemotypes.

ACKNOWLEDGEMENT:

The authors are thankful to the Project number TN17/C04 for financial support of this work.

REFERENCES

Adams RP, 2017. *Identification of Essential Oil Components by Gas Chromatography/Mass Spectrometry*, ed. 4.1. Allured Publishing: Carol Stream, Illinois.

Baharfar R, Azimi R, Rahmani Z and Naqinezhad A, 2017. Chemical composition of the essential oil from leaves, berries, and stems of *Hedera pastichovii*. *Chemistry of Natural Compounds*, **53**(1): 162-164.

Ministry of Health Portal, 2009. *Pharmacopoeia Vietnamica*. Medical Publishing House, Ha Noi, Vietnam, Pp PL234-PL235.

Nguyen TB, 2003. *Checklist of plant species of Vietnam*, Vol 2. Agriculture Publishing house, Ha Noi, Vietnam, Pp 1074-1075.

Pham HH, 2002. *Cay Co Vietnam - An Illestrated Florta of Vietnam*, Vol 2. Tre Publishing house, Ho Chi Minh City, Vietnam, Pp 511.

Vo VC, 2012. *The Dictionary of Medicinal Plants of Vietnam*, Vol 1. Medical Publishing house, Ha Noi, Vietnam, Pp 1028.

Table 1: Chemical composition of the essential oil of *H. sinensis* from Vietnam.

Components	**RI**	**Percentage (%)**
α-Pinene	932	2.9
Sabinene	975	3.5
Myrcene	990	0.2
α-Phellandrene	1003	0.2
Sylvestrene	1028	1.3
(*Z*)-*β*-Ocimene	1037	0.1
(*E*)-*β*-Ocimene	1047	0.5
γ-Terpinene	1058	0.1
Methyl salicylate	1194	1.9
Bornyl acetate	1287	0.1
δ-Elemene	1340	5.2
α-Cubebene	1352	0.2
α-Copaene	1379	0.8
β-Bourbonene	1388	0.2
β-Elemene	1394	1.0
α-Gurjunene	1413	0.2
(*E*)-Caryophyllene	1423	1.6
β-Gurjunene	1432	0.4
α-Guaiene	1443	0.3
allo-Aromadendrene	1458	3.2
Germacrene D	1485	5.7
Epizonarene	1505	17.8
Cubebol	1519	1.5
Zonarene	1527	2.9
α-Cadinene	1535	0.1
β-Vetivenene	1546	0.3
Germacrene B	1562	6.6
(*Z*)-Isoelemicin	1576	0.2
Spathulenol	1582	0.4
Guaiol	1588	0.2
Khusimone	1595	0.3
β-Atlantol	1609	0.3
(*Z*)-Asarone	1623	3.1
10-*epi*-*γ*-Eudesmol	1630	4.0
Muurola-4,10(14)-dien-1-*β*-ol	1647	0.4
4,6-Dimethoxy-5-vinyl-1,2-benzodioxide	1653	0.7
Valerianol	1659	0.1
Khusinol	1673	0.7
(*E*)-Asarone	1683	25.6
Germacrone	1701	2.0
7,14-anhydro-Amorpha-4,9-diene	1766	0.1
Monoterpene hydrocarbons		9.0
Sesquiterpene hydrocarbons		46.3
Oxygenated sesquiterpenes		6.9
Others		34.7
Total identified		96.9

RI: retention indices relative to C_8 - C_{20} *n*-alkanes on TG-5MS capillary column

How to cite this article
Van Huong BUI, Ngoc Anh LUU DAM1, Dam Cu LUU1, Van Thanh BUI, The Cuong NGUYEN, Rajesh K. JOSHI, 2019. Chemical composition of the essential oil *Hedera sinensis* (Tobler) Hand. - Mazz.: An important herb species of Vietnam. *Bioscience Discovery*, **10**(3):108-111.