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COMPOSITION OF THE ESSENTIAL OIL OF *Lysimachia paridiformis*

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The genus *Lysimachia* belongs to the Primulaceae family, often has yellow flowers, and grows vigorously. They tend to grow in damp conditions. Several species within *Lysimachia* are commonly called loosestrife, although this name is also used for plants within the genus *Lythrum*. The genus consists of 180 species widespread throughout the word, mainly in temperate and subtropical regions, including 120 species in China [1]. *Lysimachia paridiformis* Franch is a well-known traditional Chinese medicinal herb in Tu and Miao Nationality [2, 3].

Phytochemical research showed that triterpenoid and steroidal saponins were the main compounds in *L. paridiformis* [4, 5], and (+)-catechin, (–)-epicatechin, pavetannin A, cinnamtannin B1, maesopsin-6-*O*-glucopyranoside,quercetin-3-*O*-α-L-rhamnopyranosyl(1→2)-β-D-xylopyranoside, and allantoin were also isolated from *L. paridiformis* [6]. Pharmacological investigations showed that paridifomoside in *L. paridiformis* could excite isolated uterus of rabbit, guinea-pig, and rats by acting on the H_1 and α receptor [7, 8].

In order to identify the chemical composition of the oils of *L. paridiformis*, we report on the essential oil from the whole plant of *L. paridiformis* using the HS-SPME technique and subsequently analyzed it by GC-MS for the first time.

The samples of air-dried plant of *L. paridiformis* were collected in Guizhou, China, in August 2007. They were identified by Prof. Fan Liu. All the plant samples were deposited in the Institute of Chinese Materia, Henan University (20070831). We used an Agilent GC 6890 N GC/5975 MS (Agilent, USA) spectrometer, a manual solid-phase micro-extraction injector, and 65 μm PDMS-DVB fibers (Supelco, USA).

Volatile organic compounds were extracted by the manual SPME holder together with 15 mL vials and PDMS-DVB fibers purchased from Supelco Inc. (Bellefonte, USA). The powder of *L. paridiformis*, about 1.0 g, was placed in vials (15 mL), then the SPME fiber was exposed in the upper space of the sealed vial for 30 min at 90°C to adsorb the analytes. After that, the fiber was withdrawn and directly inserted into the GC-MS inlet for desorption of the volatiles for 1 min [9].

The volatile constituents were analyzed by HS-SPME-GC-MS. Analysis was carried out using an Agilent 6890 N gas chromatograph equipped with a capillary column HP-5 MS (5% phenylmethylsiloxane, 30 m × 0.25 mm, film thickness 0.25 μm, Agilent Technologies, USA) and coupled with a 5975B mass selective detector spectrometer from the same company. The front inlet was kept at 250°C in the splitless mode. The temperature program was as follows: the initial column temperature was 50°C, held for 1 min, then programmed to 120°C at a rate of 3°C min^{-1} and held for 2 min; it was finally programmed to 210°C at a rate of 4°C min^{-1}, and held at 210°C for 10 min. As a carrier gas, helium at 1.0 mL min^{-1} was used. The MS detector was used in the EI mode with an ionization voltage of 70 eV. The ion source temperature was 230°C. The transfer line was 280°C. The spectra were collected at 3 scans/s over the mass range (*m*/*z*) 30–440. Retention indices were calculated by using the retention times of *n*-alkanes injected at the same chromatographic conditions. The compounds were identified by comparison of their relative retention indices and computer matching with the Wiley275.L library.

The chemical composition of the oil is presented in Table 1. Twenty-seven compounds were identified, which comprised 71.1% of the volatile fraction. The main constituents were L-bornyl acetate (28%), β-selinene (8.87%), camphene (5.93%), palmitic acid (5.06%), 1-octen-3-yl-acetate (1.78%), 1-octen-3-ol (1.49%), and α-pinene (1.24%).

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TABLE 1. The Essential Oils of *L. paridiformis*

Compound	RI*	%	Compound	RI*	%
α-Pinene	928	1.24	α-Amorphene	1462	1.26
Camphene	944	5.93	β-Selinene	1475	8.87
β-Pinene	972	0.53	Myristicin	1540	0.76
1-Octen-3-ol	980	1.49	Spathulenol	1562	2.30
3-Octanone	983	0.25	Hexadecane	1595	1.07
3-Octanol	1000	1.89	β-Eudesmol	1639	0.57
o-Cymene	1100	0.25	β-Panasinsene	1642	1.10
1-Octen-3-yl-acetate	1107	1.78	Cadalene	1657	0.88
Borneol	1168	0.49	Fitone	1834	1.79
(–)-Verbenone	1202	0.80	Diisononyl phthalate	1847	0.65
Thymol methyl ether	1226	0.46	Methyl hexadecanoate	2017	0.54
L-Bornyl acetate	1280	28.00	Dibutyl phthalate	1939	1.43
6*S*-2,3,8,8-Tetramethyltricyclo[5.2.2.0(1,6)]undec-2-ene	1366	0.94	Palmitic acid	1869	5.06
β-Elemene	1377	0.76	Total		71.1

*Retention indices calculated against *n*-alkanes.

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