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A New Sesquiterpene from the Roots of *Lindera strychnifolia*

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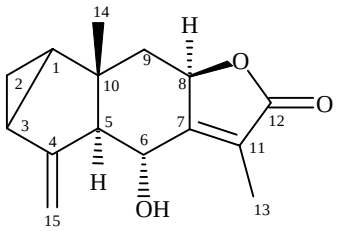
Abstract: A new sesquiterpene lactone, strychnilactone (**1**), together with five known sesquiterpenoids, linderane (**2**), lindenenol (**3**), linderalactone (**4**), hydroxylindestenolide (**5**), pseudoneolinderane (**6**) have been isolated from the extracts of Supercritical Fluid Extraction of *Lindera strychnifolia*. The structure of the new compound was elucidated by means of spectroscopic analysis. And the relative configuration of **1** was assigned on the basis of NOE analysis.

Keywords: *Lindera strychnifolia*, sesquiterpene lactone, supercritical fluid extraction.

The root of *Lindera strychnifolia* is used as a palliative and an antispasmodic in traditional chinese medicine. In previous studies of chemical constituents from this plant, more than 20 sesquiterpene lactones have been isolated and their structures were established[1-7]. In order to compare the difference of chemical constituents extracted by Supercritical Fluid Extraction (SFE) method and by organic solvent, the SFE extract from *Lindera strychnifolia* was investigated. A novel sesquiterpene lactone, strychnilactone (**1**) and five known compounds (**2-6**) have been isolated. The structure of **1** was determined by MS, 1D NMR (NOE, DEPT) and 2D NMR (HMQC, HMBC, ^{1}H-^{1}H COSY) spectral analysis.

Figure 1 The structure of compound **1**



The SFE extract obtained from Guangzhou University of Traditional Chinese Medicine was separated by silica gel column chromatography (CC) eluted with gradient petroleum ether and acetone. The eluate of petroleum ether /Me_2CO (9:1) was isolated by silica gel CC eluted with Petroleum ether /Me_2CO (40:1) to get compounds **2** (1.2 g),

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3 (1.4 g), **4** (183 mg). Another fraction eluted with Petroleum ether/Me_2CO (9:1) was separated by silica gel CC, compound **6** (36 mg) was obtained from Petroleum ether /Et_2O (6:4) eluate and a mixture of compounds **1** and **5** was obtained from pet-Et_2O/Et_2O (1:1) eluate. This mixture was purified by silica gel CC and crystallized with ethanol to get compound **1** (83 mg) and **5** (264 mg).

Strychnilactone (**1**) was obtained as colorless needles. The EI-MS of **1** gave a molecular ion peak $[M]^+$ at *m/z* 246 and its ^{13}CNMR spectrum contained signals of two methyls, three methylenes, five methines and five quarternary carbons. These data indicated that **1** might have the molecular formula $C_{15}H_{18}O_3$, which contained seven double bond equivalents (DBE). Its ^{1}HNMR (**Table 1**) indicated the presence of a vinylidene group at δ 5.15 (s) and 5.16 (s), an olefinic methyl group at δ 1.94 (s), a tertiary methyl group at δ 0.53 (s), two oxygenated methine groups at δ 4.54 (d, J=10.5 Hz) and 5.39 (m). ^{13}CNMR spectrum also showed carbon signals of tetrasubstituted double bond at δ 161.6 (s), 126.2 (s), an exo-methylene group at δ 149.2 (s), 108.1 (t), and a carbonyl group at δ 174.6 (s).

Table 1 ^{1}H and ^{13}CNMR data for **1** in $CDCl_3$ (300 MHz for ^{1}H and 75 MHz for ^{13}C, δ in ppm, J in Hz)

Position	δ_C	δ_H	HMBC (^{1}H to ^{13}C)	NOE
1	29.2 (d)	1.37 (dt, 3.5, 7.5)	C-2, 3, 4, 9, 10, 14	
2a	16.8 (t)	0.73 (m)	C-1, 3, 4, 10	
2b		0.84 (m)		
3	23.9 (d)	2.03 (m)		
4	149.2 (s)			
5	64.2 (d)	2.99 (d, 10.5)	C-4, 6, 9, 10, 14, 15	
6	62.9 (d)	4.54 (d, 10.5)	C-4, 5, 7, 8, 11	H-13,14,15
7	161.6 (s)			
8	77.4 (d)	5.39 (m)	C-7, 9, 11	H-5,9
9a	42.9 (t)	1.79 (dd, 13.5, 5.5)	C-1, 5, 7, 8, 10, 14	
9b		2.61 (dd, 13.5, 11.5)		
10	39.4 (s)			
11	126.2 (s)			
12	174.6 (s)			
13	8.8 (q)	1.94 (s)	C-7, 11, 12	
14	22.1 (q)	0.53 (s)	C-1, 5, 9, 10	H-6,9
15a	108.1 (t)	5.15 (s)	C-3, 4, 5, 6	H-6
15b		5.16 (s)		

All assignments were confirmed by ^{1}H-^{1}H COSY, ^{1}H-^{13}CNMR and HMBC spectra (300MHz for ^{1}H and 75 MHz for ^{13}C).

The presence of a cyclopropane moiety was supported by three upfield carbon signals at δ 23.9 (d), 29.2 (d) and 16.8 (t). Furthermore, all signals in the ^{1}H and ^{13}CNMR spectra could be assigned by analysis of ^{1}H-^{1}H COSY, HMQC and HMBC

spectra. The assignments are shown in **Table 1**. The comparison of spectral data with known sesquiterpenoids indicated that **1** is very similar to strychnistenolide **1A**[7] isolated from the same plant.

The relative configuration of H-5, H-6, H-8 and CH_3-14 was deduced by the NOE difference spectroscopy (**Table 1**). The NOE experiment showed that H-6 at δ 4.54 was related to the CH_3-14 at δ 0.53, and H-8 at δ 5.39 was related to H-5 at δ 2.99. The coupling constant between H-5 and H-6 was 10.5 Hz. These data suggested that H-5 and H-6 were in *trans* axial-axial relationship. The compound **1** belongs to linderane type, so both the cyclopropane ring and the methyl group at C-10 in compound **1** can be determined as β-orientation. And the methyl group ate-14 was also in β-orientation on the basis of above analysis, compound **1** was elucidated as a sesquiterpene lactone, named strychnilactone.

As for the known compounds, the structure of compound **2-6** were identified to be linderane[9], lindenenol[9], linderalactone[9], hydroxylindestenolide[5], pseudoneolinderane[8] by the comparison of EI-MS, ^{1}H and ^{13}CNMR spectral data with those reported compounds.

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