· Letters ·

A New Phenylpropanol Glycoside from Twigs and Leaves of *Rhododendron primulaeflorum*

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Abstract: **Objective** To study the constituents in the twigs and leaves of *Rhododendron primulaeflorum*. **Methods** The constituents were separated and purified with chromatographic methods. Their structures were elucidated by spectroscopic methods (1D, 2D NMR, IR, and HR-ESI-MS) and chemical analyses. **Results** One new phenylpropanol glycoside, 4-hydroxyl-5-methoxyl-phenylpropanol-3-*O*-β-*D*-glucopyranoside (**1**), and its aglycone (**2**) were successfully isolated from the twigs and leaves of *R. primulaeflorum*. **Conclusion** Compound **1** is a new phenylpropanol glycoside. Compounds **1** and **2** are isolated from this plant for the first time.

Key words: aglycone; Ericaceae; 4-hydroxyl-5-methoxyl-phenylpropanol-3-*O*-β-*D*-glucopyranoside; phenylpropanol glycoside; *Rhododendron primulaeflorum*

DOI: 10.3969/j.issn.1674-6384.2012.02.001

Introduction

Rhododendron primulaeflorum Bur. et Franch. (Ericaceae) is a shrub growing mainly in the south-western China, especially in Tibet, Yunnan, and Sichuan, China. For more than one thousand years, its twigs and leaves have been used in traditional Tibetan medicines for treating chronic tracheitis, suppressing cough, and controlling asthma (Li, Zhang, and Hu, 1997; Wu *et al*, 2011). Two methyl benzoates and ten flavonoids had been discovered from this plant (Li, Jin, and Yang, 2008; Li, Jin, and Chen, 2009) to date. Herein, we reported our latest work in isolation and identification of one new phenylpropanol glycoside and its aglycone from the twigs and leaves of *R. primulaeflorum*.

Materials and methods

Plant material

The young twigs and leaves of *Rhododendron primulaeflorum* Bur. et Franch. were collected from Tibet, China, in August, 2009. A voucher specimen (23615090801), identified by associate senior pharmacist Gesang Suolang of Tibet Institute for Food and Drug Control, was deposited at School of Life Science and Engineering, Southwest Jiaotong University, China.

General

Optical rotations were measured on a Perkin-Elmer 341 polarimeter. NMR spectra were recorded on Bruker AC-E 200 and Varian Unity Inova 400/54 NMR spectrometers with TMS as internal standard, δ, and J in Hz. IR was measured with a ThermoFisher Nicolet 6700 Spectrometer, KBr pellets in cm^{-1}. HR-ESI-MS was carried out on a Waters Q-TOF Premier instrument. Silica gel (200 — 300 meshes) for column chromatography (CC) and silica gel GF_{254} for TLC were purchased from Qingdao Haiyang Chemical Co., Ltd. D-101 resin (Rohm & Haas), Sephadex LH-20 (Merck), and RP-18 silica gel (Merck) were also used for CC.

Extraction and isolation

The dried and powdered young twigs and leaves (4.2 kg) of *R. primulaeflorum* were extracted with 95% ethanol for three times at room temperature, a week for

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Received: September 2, 2011; Revised: January 13, 2012; Accepted: February 18, 2012
Fund: National Natural Science Foundation, China (20872122, 21142004), the New Century Talents Scheme of the Ministry of Education, China (NECT-08-0820), the Fundamental Research Funds for the Central Universities, China (SWJTU2010ZT09), and SWJTU Science Research Funds (2008A17)

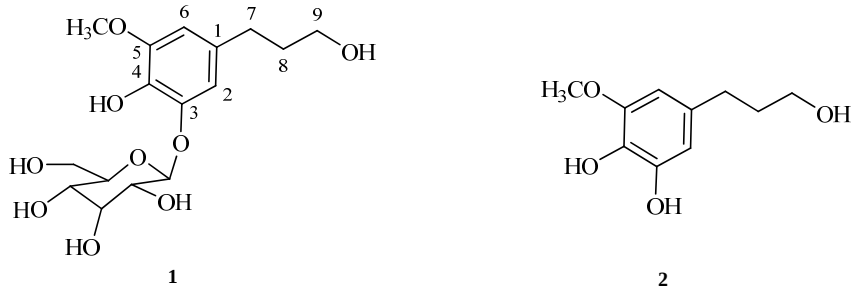
each time. After removal of the solvent by evaporation, ethanol extract (850 g) was obtained. The extract was then suspended in water and extracted successively with petroleum ether (60－90 ℃), chloroform, ethyl acetate, and *n*-butanol, to afford four extracts with the weight of 272, 193, 67, and 120 g, respectively.

The *n*-butanol extract (100 g) was subjected to D-101 resin and eluted with H_2O, 30%, 60%, and 95% EtOH sequentially. After concentration *in vacuo*, the 30% EtOH eluate (15 g) was separated by RP-18 silica gel CC using MeOH-H_2O in a gradient manner (1:100→1:0) to afford Frs. A－F based on TLC analysis. Fr. F (1.0 g) was applied to another RP-18 silica gel CC, eluted with MeOH-H_2O (1:15) to yield compound **1** (18 mg). The ethyl acetate extract (30 g) was chromatographed on a silica gel column with the gradient petroleum ether-acetone (50:1→0:1) as eluant to afford Frs. G－N. Fr. L was subjected to CC on silica gel to afford Frs. L_1－L_6. Fr. L_1 was subjected to CC on silica gel and Sephadex LH-20 column to obtain compound **2** (11 mg).

Results and discussion

Compound **1** was obtained as white powder with $[\alpha]_D^{20}$ −20.8 (*C* 0.125, MeOH). Its HR-ESI-MS data provided a quasi-molecular ion peak at *m*/*z*: 383.1294 $[M + Na]^+$ (calcd. 383.1283), corresponding to the molecular formula of $C_{16}H_{24}O_9$. The IR spectrum indicated the presence of hydroxy (3350 cm^{-1}) and an aromatic ring (1611 and 1457 cm^{-1}). Analysis on the ^{13}C-NMR and DEPT spectra of compound **1** showed the presence of 16 carbon signals, including one methyl group, four methylene groups, seven methine groups, and four quarternary carbon groups, possessing five degrees of unsaturation. The ^{1}H-NMR spectrum displayed signals at δ 6.61 (1H, d, J = 1.2 Hz) and 6.50 (1H, d, J = 1.2 Hz), characteristic of a 1,3,4,5-tetrasubstituted aromatic ring. One methoxy (δ 3.73, 56.1) unit could be found according to its ^{1}H-NMR and ^{13}C-NMR spectra, and a long-range connectivity between the methoxy unit to C-5 (δ 148.1) was revealed by analysis of the HMBC experiment. Two CH_2 triplets at δ 3.40 (2H, J = 6.4 Hz), 2.48 (2H, J = 7.6 Hz), and a CH_2 at δ 1.67 (2H, J = 12 Hz) could be connected through ^{1}H-^{1}H COSY spectroscopy, which suggested that -$CH_2CH_2CH_2OH$ side-chain was present. The attachment of the propanol group at C-1 was determined by HMBC experiments based on the correlation between H-7 (δ 2.48) and C-1 (δ 132.4). According to the NMR data, there was a β-*D*-glucopyranoside moiety [δ_H 4.62 (J = 7.2 Hz); δ_C 102.9 (d), 73.7 (d), 77.4 (d), 70.1 (d), 76.2 (d), 61.0 (t)] in compound **1**. A long-range correlation was observed between anomeric H and C-3 (δ 145.8) in the HMBC spectrum, which indicated that the sugar moiety was linked to C-3. In addition, according to its molecular formula ($C_{16}H_{24}O_9$) and the above assignment, a hydroxyl group must present by default at C-4 position. Based on the above observations and analyses, compound **1** was characterized to be 4-hydroxyl-5-methoxyl-phenylpropanol-3-*O*-β-*D*-glucopyranoside.

Compound **2** was obtained as white powder. The ^{1}H-NMR and ^{13}C-NMR spectral data of compound **2** were similar to those of compound **1** except for β-*D*-glucopyranoside unit and by comparison of its spectroscopic data with reported data (Tsichritzis and Jakupovic, 1990), compound **2** was characterized to be 3,4-dihydroxyl-5-methoxyl-phenylpropanol, a aglycone of compound **1**. The chemical structures of compounds **1** and **2** were in Fig. 1 and ^{1}H-NMR and ^{13}C-NMR data were shown in Table 1.



1 **2**

Fig. 1 Chemical structures of compounds 1 and 2

Table 1 ^{1}H-NMR (400 MHz) and ^{13}C-NMR (100 MHz) data of compounds 1 and 2 (TMS, δ, J in Hz)

Position	Compound **1** (DMSO-d_6)		Compound **2** (acetone-d_6)	
	δ_H	δ_C	δ_H	δ_C
1		132.4		132.4
2	6.61 (1H, d, J = 1.6 Hz)	109.9	6.35 (1H, s)	109.5
3		145.8		145.9
4		134.4		134.0
5		148.1		148.7
6	6.50 (1H, d, J = 1.6 Hz)	107.5	6.36 (1H, s)	104.3
7	2.48 (2H, t, J = 7.6 Hz)	31.9	2.53 (2H, t, J = 7.8 Hz)	32.6
8	1.67 (2H, m)	34.6	1.76 (2H, tt, J = 6.2, 7.8 Hz)	35.6
9	3.40 (2H hidden)	60.5	3.54 (2H, t, J = 6.2 Hz)	61.6
Glc				
1′	4.62 (1H, d, J = 7.2 Hz)	102.9		
2′	3.27 (1H, m)	73.7		
3′	3.26－3.30 (1H, m)	77.4		
4′	3.17 (1H, m)	70.1		
5′	3.17－3.28 (1H, m)	76.2		
6′	3.39－3.69 (2H, m)	61.0		
-OCH_3	3.73 (3H, s)	56.1		56.2

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