

Two new phenylpropanoid glycosides from *Sanguisorba officinalis*Jiang Hu^{*}, Xiao Dong Shi, Xia Mao, Wei Dong Lu, Lei Zhu, Long Yu

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Abstract

Two new phenylpropanoid glycosides, 9-*O*-[6-*O*-acetyl- β -D-glucopyranosyl]-4-hydroxycinnamic acid (**1**) and 8-*O*- β -D-glucopyranosyl-(R)-(+)-3,4,8-trihydroxy methyl phenylpropionate (**2**) were isolated from the 80% EtOH extract of the roots of *Sanguisorba officinalis*. Their structures were characterized by spectroscopic analysis and chemical method, including 1D NMR, 2D NMR, and HR-ESI-MS. Compounds **1** and **2** exhibited the moderate antimicrobial activities against all Gram-positive and Gram-negative bacteria tested.

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Keywords: *Sanguisorba officinalis*; Rosaceae; Phenylpropanoid glycosides; NMR techniques

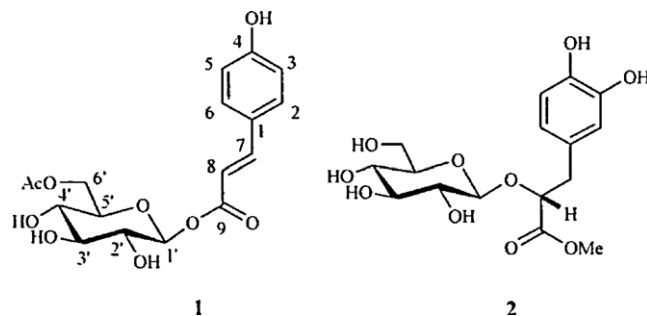
Sanguisorba officinalis L. (Rosaceae), a perennial plant, distributes widely in northern districts of China [1]. In China, Korea, and Japan, this plant has been used for the treatment of inflammatory and metabolic disease such as diarrhea, chronic intestinal infections, duodenal ulcers, and bleeding [2,3]. Previous studies reported the isolation of triterpenoids, triterpenoid glycosides, and a series of hydrolysable tannins which were reported as characteristic constituents of *S. officinalis* and are considered to be partially responsible for the therapeutic effects of this herbal drug [4–6]. The chemical investigation of the 80% EtOH extract of the dry fronds of *S. officinalis* had led to the isolation of two new phenylpropanoid glycosides (Fig. 1). This paper deals with the isolation and structural elucidation of the new compounds on the basis of extensive 1D and 2D NMR (COSY, HMQC, HMBC, and NOESY) analyses. Furthermore, the two new phenylpropanoid glycosides were *in vitro* evaluated for their antimicrobial activities against two Gram-positive and three Gram-negative bacteria.

The dried roots of *S. officinalis* were collected in the suburb of Qujing, Yunnan province of China, in October 2010 and identified by one of the authors (X. Mao). A voucher specimen (20101001) is deposited in the Herbarium of the College of Biological Resources and Environment Science, Qujing Normal University, Qujing, Yunnan Province, China.

The roots (5 kg) of *S. officinalis* were extracted with 80% EtOH (10 L \times 3). After removal of EtOH under reduced pressure, the aqueous brownish syrup (1 L) was partitioned with AcOEt to afford AcOEt extract (42 g). AcOEt soluble extract was subjected to chromatography over SiO₂ column, eluting with gradient CHCl₃/MeOH to afford fractions 1–8. Fraction 5 (9.0 g) was chromatographed on a MCI gel column eluted with MeOH/H₂O (from 60% to 95%) to

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Fig. 1. Structures of compounds **1** and **2**.

yield 3 subfractions, 5A–5C. Subfraction 5B (1.6 g) was separated by repeated column chromatography (CC) over Sephadex LH-20 (MeOH), silica gel, and then preparative HPLC (MeOH/H₂O 40% to 70%), yielding **1** (27.1 mg) and **2** (29.7 mg).

Compound **1** was obtained as a white amorphous solid. Its molecular formula was established as C₁₇H₂₀O₉ with 8 degrees of unsaturation by HRESIMS (*m/z* 367.1025 [M–H][–], calcd. for C₁₇H₁₉O₉, 367.1029). The ¹³C NMR (125 MHz, CD₃OD) data of **1** (Table 1) displayed the presence of one carboxyl group [δ_{C} 166.6 (s)], one Ac group [δ_{C} 172.2 (s) and 20.4 (q)], and eight olefinic carbons arising from a phenyl and a disubstituted double bond [δ_{C} 145.9, 115.0 (d, each 1H)]. The ¹H NMR (600 MHz, CD₃OD) spectrum showed four aromatic protons at δ_{H} 7.60 (d, 2H, *J* = 8.2 Hz), 6.95 (d, 2H, *J* = 8.2 Hz) arising from a 1,4-disubstituted benzene ring, two olefinic protons at δ_{H} 7.65 (d, 1H, *J* = 16.0 Hz) and 6.30 (d, 1H, *J* = 16.0 Hz) for a disubstituted *trans* double bond. These spectroscopic data indicated the characteristic signals of one phenylpropanoid glycoside. The sugar moiety was identified as a β -glucopyranosyl unit by the coupling constant of the anomeric proton [δ_{H} 4.32 (d, 1H, *J* = 8.0, glc H-1')] and similarity of their NMR data with literature data (Table 1) [7]. The HMBC between the anomeric proton of the glucopyranosyl unit and C-9 (δ_{C} 166.6) of the aglycone (Fig. 2). The C-6' location of the AcO group

Table 1

¹H and ¹³C NMR data of compounds **1** and **2** (¹H: 600 MHz; ¹³C: 125 MHz, in CD₃OD).

	1		2		3	
	δ_{C}	δ_{H} (mult., <i>J</i> in Hz)	δ_{C}	δ_{H} (mult., <i>J</i> in Hz)	δ_{C}	δ_{H} (mult., <i>J</i> in Hz)
1	127.0 (s)	–	129.8 (s)	–	130.2 (s)	–
2	116.7 (d)	7.60 (d, 8.2)	118.3 (d)	6.72 (d, 2.5)	117.9 (d)	6.69 (d, 2.5)
3	131.2 (d)	6.95 (d, 8.2)	147.2 (s)	–	146.5 (s)	–
4	160.3 (s)	–	145.8 (s)	–	145.5 (s)	–
5	131.2 (d)	6.95 (d, 8.2)	117.2 (d)	6.68 (d, 8.2)	116.7 (d)	6.66 (d, 8.2)
6	116.7 (d)	7.60 (d, 8.2)	122.8 (d)	6.57 (dd, 8.2, 2.5)	122.4 (d)	6.55 (dd, 8.2, 2.5)
7	145.9 (d)	7.65 (d, 16.0)	39.0 (t)	2.82, 2.94 (dd, 12.6, 7.8)	41.5 (t)	2.81, 2.93 (dd, 12.6, 7.8)
8	115.0 (d)	6.30 (d, 16.0)	77.2 (d)	3.88 (d, 7.8)	73.7 (d)	4.26 (d, 7.8)
9	166.6 (s)	–	176.6 (s)	–	176.3 (s)	–
O-glc						
1'	106.8 (d)	4.32 (d, 8.0)	103.9 (d)	4.28 (d, 8.0)		
2'	75.8 (d)	3.20 (m)	74.2 (d)	3.17 (m)		
3'	78.1 (d)	3.38 (m)	76.9 (d)	3.40 (m)		
4'	73.0 (d)	3.28 (m)	70.6 (d)	3.28 (m)		
5'	75.2 (d)	3.38 (m)	77.0 (d)	3.36 (m)		
6'	64.8 (t)	4.26 (dd, 13.0, 6.6) 4.31 (dd, 13.0, 6.6)	61.9 (t)	3.82 (dd, 13.0, 7.0) 3.62 (dd, 13.0, 7.0)		
OMe	–	–	52.7 (q)	3.68 (s)	52.5 (q)	3.69 (s)
C=O	172.2 (s)	–	–	–		
Me	20.4 (q)	2.02 (s)	–	–		

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