Available online at www.sciencedirect.com
ScienceDirect
Chinese Journal of Natural Medicines 2018, **16**(2): 0139–0142
Chinese Journal of Natural Medicines

Three new alkaloids isolated from the stem tuber of *Pinellia pedatisecta*

DU Jing[1], DING Jie[1], MU Zhen-Qiang[1], GUAN Shu-Hong[2], CHENG Chun-Ru[1*], LIU Xuan[3*], GUO De-An[2]

[1] *School of Chemical Engineering, Institute of Pharmaceutical Engineering Technology and Application, Key Laboratory of Green Chemistry of Sichuan Institutes of Higher Education, Sichuan University of Science & Engineering, Zigong 643000, China;*
[2] *Shanghai Institute of Materia Medica, Chinese Academy of Sciences, Shanghai 201203, China;*
[3] *Institute of Interdisciplinary Integrative Biomedical Research, Shanghai University of Traditional Chinese Medicine, Shanghai 201203, China*

Available online 20 Feb., 2018

[ABSTRACT] The present study was designed to determine the chemical constituents of the stem tuber of *Pinellia pedatisecta*. The chemical constituents were isolated and purified by various chromatographic techniques, and their structures were elucidated on the basis of physicochemical properties and spectral data. Three new alkaloids (compounds **1**, **2**, and **3**) were obtained and identified as 9-((5-methoxypyridin-2-yl)methyl)-9*H*-purin-6-amine (**1**), 4-(2-(2, 5-dioxopyrrolidin-1-yl)ethyl)phenyl acetate (**2**), and *N*-(9-((5- methoxypyridin-2-yl)methyl)-9*H*-purin-6-yl)acetamide (**3**). These compounds were evaluated for their cytotoxicity against human cervical cancer HeLa cells. Compounds **1** and **3** significantly inhibited the proliferation of HeLa cells with IC_{50} values being 3.02 ± 0.54 and 7.16 ± 0.62 μmol·L^{-1}, respectively.

[KEY WORDS] *Pinellia pedatisecta*; Alkaloids; Structure identification; Anti-tumor

[CLC Number] R284 **[Document code]** A **[Article ID]** 2095-6975(2018)02-0139-04

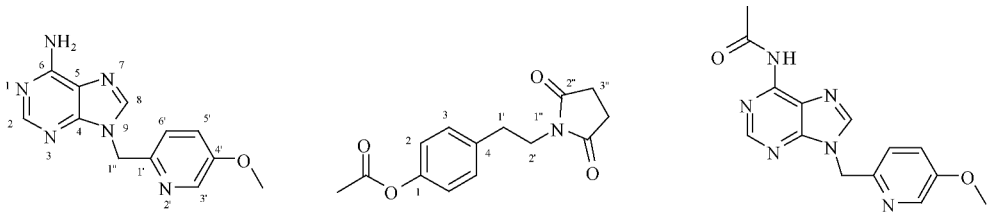
Introduction

Rhizoma Pinelliae is the dried stem tuber of *Pinellia pedatisecta* Schott in Pinellia plant, belonging to Araceae family [1]. Previous phytochemical investigations on Rhizoma Pinelliae have led to the isolation of various types of compounds, including amino acids, fatty acids, cyclic dipeptides, and alkaloids [2-6]. Some of these compounds have been reported to exhibit various pharmacological activities, including antitumor, antibacterial, and antiarrhythmic effects [7-11]. Due to the similarity in its appearance with Arisaematis Rhizoma, there is a confusion in the usage of the two as medicinal materials to treat a variety of diseases, such as cancer, induration, swelling, and damp-phlegm [11-12]. In order to differentiate the two plants and find out the active components, we carried out a chemical investigation on the stem tuber of *P. pedatisecta*. Three new alkaloids were isolated in the present study (Fig. 1). Herein, we describe the isolation and structure elucidation of these three new alkaloids and their cytotoxicity against human cervical cancer HeLa cells.

Results and Discussion

Compound **1** was isolated as a white powder. The molecular formula, $C_{12}H_{12}N_6O$, was determined by HR-ESI-MS (*m/z* 257.115 4 $[M + H]^+$, Calcd. for *m/z* 257.115 1). The ^1H NMR spectrum (Table 1) of compound **1** in DMSO-d_6 indicated one methoxyl at δ_H 3.79 (3H, s, -OCH_3), one methylene at δ_H 5.40 (2H, s, -CH_2-), and seven down-field proton signals at δ_H 8.20 (2H, s), 8.10 (1H, s), 7.37 (1H, d, *J* = 6.0 Hz), 7.26 (1H, d, *J* = 6.0 Hz), 7.13 (2H, s). The ^{13}C NMR (Table 1) gave 12 signals including 10 aromatic carbons, one methoxyl

[Received on] 26-June-2017
[Research funding] This work was supported by the National Natural Science Foundation of China (No. 81373964), Introduction Program of Scientific Researcher of Sichuan University of Science & Engineering (Nos. 2016RCL07 and 2017RCL61), the Opening Project of Key Laboratory of Green Chemistry of Sichuan Institutes of Higher Education (No. LYJ1302), the Scientific Research Fund of the Sichuan Provincial Education Department (No. 13ZB0133), and the Science and Technology Program Project of Sichuan (No. 2015JY0024).
[*Corresponding author] Tel: 86-21-68383952, E-mails: 13764960370@163.com (LIU Xuan); pharmaceutics@163.com (CHENG Chun-Ru).
These authors have no conflict of interest to declare.



1 **2** **3**

Fig. 1 Structures of compounds 1−3

Table 1 The NMR data (600 MHz for ^{1}H, 150 MHz for ^{13}C) of compounds 1−3 (*J* in Hz)

No.	1[a]		2[b]		3[c]	
	δ_H	δ_C	δ_H	δ_C	δ_H	δ_C
1				149.2		
2	8.10 (1H, s)	152.9	7.03 (2H, d, 8.0)	115.2	8.70 (1H, s)	152.4
3			6.76 (2H, d, 8.0)	129.1		
4		150.0		130.2		146.2
5		119.1				121.2
6		156.4				151.4
8	8.20 (1H, s)	141.7			8.17 (1H, s)	143.1
1′		148.1	2.72 (2H, t, 8.0)	32.4		149.1
2′			3.57 (2H, t, 8.0)	39.7		
3′	8.20 (1H, s)	137.4			8.25 (1H, s)	137.8
4′		155.2				155.5
5′	7.37 (1H, d, 6.0)	121.7			7.37 (1H, d, 6.0)	121.4
6′	7.26 (1H, d, 6.0)	122.9			7.26 (1H, d, 6.0)	123.1
2″				176.9		
3″, 4″			2.64 (4H, s)	27.8		
-OCH_3	3.79 (3H, s)	47.6			3.84 (3H, s)	48.3
-CH_2-	5.40 (2H, s)	56.1			5.47 (2H, s)	55.7
-NH_2	7.23 (2H, s)				8.75 (1H, s)	
-$COCH_3$			2.28 (3H, s)	169.2, 20.8	2.60 (3H, s)	170.8, 25.6

[a] recorded in DMSO-d_6; [b] recorded in Acetone-d_6; [c] recorded in $CDCl_3$

carbon δ_C 47.6, and one methylene carbon δ_C 56.0. Combined with 10 degrees of unsaturation, it was suggested that compound **1** had the same skeleton with pedatisectine A [2]. Meanwhile, the HMBC experiment exhibited correlations from 5.40 (-CH_2-) to 122.9 (C-6′), 141.7 (C-8), and 148.1 (C-1′); 7.23 (-NH_2) to 119.1 (C-5); 7.26 (6′-H) to 148.1 (C-1′), 155.2 (C-4′); 7.25 (5′-H) to 122.9 (C-6′), 137.4 (C-3′) and 148.1 (C-1′); 8.10 (2-H) to 150.0 (C-4), 156.4 (C-6) (Fig. 2), which further proved that compound **1** had an identical skeleton as that of pedatisectine A. A comparison between the NMR data of compound **1** and that of pedatisecine A demonstrated that compound **1** had one more signal of methyl group than the latter one. After analysis of the HSQC and HMBC spectrum, the correlation of compound **1** (Fig. 2) from 3.79 (-OCH_3) to 155.23 (C-4') indicated that the methoxyl group was attached to the pyridine ring of the skeleton. The signal of δ_H 7.37 (1H, d, J = 6.0 Hz) and δ_H 7.26 (1H, d, J = 6.0 Hz) showed that the methoxyl group was attached to the C-4'. Thus, compound **1** was determined as 9-((5-methoxypyridin-2-yl) methyl)-9*H*-purin-6-amine.

Compound **2** was isolated as a white, amorphous powder. The HR-ESI-MS peak at *m/z* 284.089 1 $[M + Na]^+$ (Calcd. for *m/z* 284.089 9) indicated its molecular formula to be $C_{14}H_{15}NO_4$ with 8 degrees of unsaturation. The ^{1}H NMR spectrum (Table 1) of compound **2** in acetone-d_6 revealed a fragment of -CH_2CH_2- signals at δ_H 3.57 (2H, t, J = 8.0 Hz),

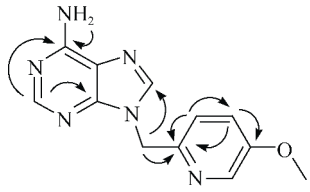


Fig. 2 The key HMBC (H→C) correlations of the moieties of compound 1