

NOTE**A New Phenylpropanoids From the Leaf of
Smallanthus sonchifolius and Its Antioxidant Activity**

SHUCHENG RUAN, MOUSHENG LIU, LI BI and YALING YANG*
Faculty of Life Science and Technology, Kunming University of
Science and Technology, Kunming 650224, P.R. China
E-mail: yilyil8@163.com

Phytochemical investigation of the leaf of *Smallanthus sonchifolius* led to the isolation and identification of a new phenylpropanoids named **Smallanactone A**. The structures was elucidated by analysis of spectroscopic data and its antioxidant activity was evaluated. It showed antioxidant activity with an IC₅₀ value of 0.46 µg/mL.

Key Words: *Smallanthus sonchifolius*, Smallanactone A, Antioxidant activity.

Smallanthus sonchifolius is a member of asteraceae family. It is a perennial plant grown in the Andes of Perú for its crisp, sweet-tasting tubers. The texture and flavour have been described as a cross between a fresh apple and watermelon thus it is sometimes referred to as the apple of the earth. The tuber is composed mostly of water and fructo-oligosaccharides^{1,2}. It has recently been introduced into farmer's markets and natural food stores in Yunnan. The leaf and root of *Smallanthus sonchifolius* has also received more and more attentions because of its biological activity³⁻⁶. The present study led to the isolation of a new phenylpropanoids from the leaf of *Smallanthus sonchifolius*. The structure was established by means of MS and extensive NMR spectra and its antioxidant activity was evaluated.

Optical rotation was measured in Horiba SEPA-300 High sensitive polarimeter. IR spectra were obtained in KBr disc on a Bio-Rad Wininfrared spectrophotometer. ESI-MS were measured on a VG Auto Spec-3000 MS spectrometer. ¹H, ¹³C NMR and ²D NMR spectra were recorded on Bruker DRX-500 instruments with TMS as internal standard. On second separate used Agilent 1100 HPLC high performance liquid chromatography equipped with ZORBAX-C₁₈ (9.4 × 250 nm, 5.0 µm) column and DAD detector. Column chromatography was performed on silica gel (200-300 mesh), or on silica gel H (10-40 µm, Qingdao Marine Chemical Inc., China).

The leaf of *Smallanthus sonchifolius* were collected in Kunming of Yunnan Province, P.R. China, in November 2008 and was identified by Prof. S.F. Wu. A voucher specimen (No. KIU 05-18-08) was deposited in our laboratory.

Extraction and isolation: The air-dried and powdered leaf of *Smallanthus sonchifolius* (2.0 kg) were extracted with 70 % aqueous Me₂CO (8.0 L × 3, 24 h each) at room temperature and the extract was partitioned successively with petroleum ether (20 L × 3) and EtOAc (2.0 L × 3), respectively. The EtOAc extract (62.8 g) was subjected to CC over silica gel eluting with a CHCl₃-Me₂CO (1:0-0:1, 18 L) gradient system to give fractions 1-5. Fr. 2 (8.2 g) was further purified by HPLC with mobile phase (MeOH:H₂O 70:30) to yield Smallanactone A (12.8 mg).

Antioxidant activity assay: Antioxidant activity was determined by the detection of the oxidative products with the 2',7'-dichlorofluorescein diacetate (DCFH) method reported previously⁷.

Smallanactone A (Fig. 1) was obtained as white amorphous solid. The molecular formula of **Smallanactone A** was determined as C₁₅H₁₈O₅ from its HRESIMS a m/z 301.1048 [M+Na]⁺ (calcd. 301.1052). The ¹H and ¹³C NMR data indicated the presence of an aromatic rings. Strong absorption bands accounting for aromatic groups (1638, 1608, 1508, 1456, 1405) could also be observed in its IR spectrum. The UV spectrum of **Smallanactone A** showed maximum absorption at 278, 235 and 205 nm which confirmed the existence of the aromatic functions. **Smallanactone A** possessed a methoxyl groups on the aromatic rings, two secondary methyl groups (include an oxygenated secondary methyl group), a carbonyl group and an angeloyl group. According to the HMBC correlations (Fig. 2) from H-8 to C-1, H-2 and H-6 to C-7, the aromatic groups were attached to C-7, as well as the HMBC correlations from H-9 to C-1', indicated the angeloyl group were attached to C-9. The HMBC correlations also show that the methoxy groups should be located at C-3. Thus, the structure of **Smallanactone A** was established as shown.

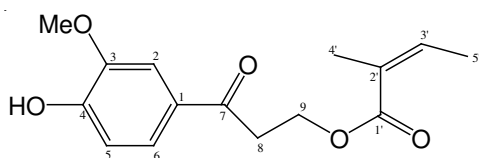


Fig. 1. Structure of **Smallanactone A**

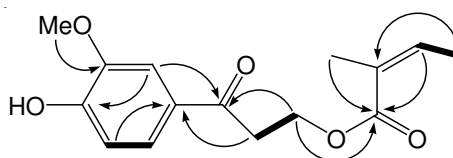


Fig. 2. Selected HMBC (→) and ¹H-¹H COSY (---) correlations of **Smallanactone A**

The antioxidant activity of **Smallanactone A** was determined by the detection of the oxidative products with the 2',7'-dichlorofluorescein diacetate (DCFH) method reported previously⁷. It shows antioxidant activity with an IC₅₀ value of 0.46 μg/mL. **Smallanactone A** shows high antioxidant activity.

Smallanactone A: C₁₅H₁₈O₅, white amorphous solid; UV (MeOH) λ_{max} (log ε) 278 (4.18), 235 (3.86), 205 (5.15) nm; IR (KBr, ν_{max}, cm⁻¹): 3424, 2874, 1742, 1638, 1608, 1508, 1456, 1405, 1318, 1254, 1125, 1036, 942, 872; ¹H NMR and ¹³C NMR data (CDCl₃, 500 MHz), Table-1; HRESIMS (positive ion mode) m/z 301.1048 [M+Na]⁺ (calcd. 301.1052 for C₁₅H₁₈O₅).

TABLE-1
¹H NMR AND ¹³C NMR DATA OF COMPOUNDS IN CDCl₃ (δ ppm)

No.	δ _C (mult.)	δ _H (mult. J, Hz)	No.	δ _C (mult.)	δ _H (mult. J, Hz)
1	130.0 s	7.84 s	9	62.6 t	4.39 m
2	112.6 d		1'	166.4 s	
3	152.5 s		2'	128.9 s	
4	147.7 s		3'	138.2 d	6.02 m
5	117.0 d	7.28, d, J = 10.1 Hz	4'	20.3 q	1.48 s
6	124.3 d	7.81, d, J = 10.1 Hz	5'	15.7 q	1.82 dd, J = 7.1, 1.4 Hz
7	198.0 s		OMe-3	56.0 q	3.70 s
8	40.1 t	3.43 m			

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