Asian Journal of Chemistry Vol. 21, No. 7 (2009), 5794-5796

NOTE

A New Lignan from the Fruit of *Schisandra lancifolia* and Its Anti-HIV Activity

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Phytochemical investigation of the fruit of *Schisandra lancifolia* led to the isolation and identification of a new lignan named Schlanctins A. The structures was elucidated by analysis of spectroscopic data and it activity against HIV-1 was evaluated. It showed anti-HIV activity with an EC_{50} value of 1.82 μM.

Key Words: *Schisandra lancifolia*, Schlanctins A, Anti-HIV-1 activity.

Schisandra lancifolia (Rehd. et Wils.) A. C. Smith is a member of *Schisandraceae* family growing in the forests in Yunnan Province, China[1]. Its fruit and stem are used as a folk medicine in China. It was used to staunch, to treat fractures and eliminating stasis to reduce swelling[2-7]. The present study led to the isolation of a new lignan from the fruit of *Schisandra lancifolia*. The structure was established by means of MS and extensive NMR spectra and it activity against HIV-1 was evaluated.

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

The fruit of *Schisandra lancifolia* were collected in Dali Prefecture of Yunnan Province, P.R China, in November 2007 and was identified by Prof. S.G. Wu. A voucher specimen (No. KIB 01-11-06) was deposited in the laboratory.

Extraction and isolation: The air-dried and powdered fruit of *Schisandra lancifolia* (0.5 kg) were extracted with 70 % aqueous Me_2CO (2.0 L × 3, 24 h each) at room temperature and the extract was partitioned successively with petroleum ether (1.0 L × 3) and EtOAc (1.0 L × 3), respectively. The EtOAc extract (24.0 g) was subjected to CC over silica gel eluting with a $CHCl_3$-Me_2CO (1:0-0:1, 18 L)

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gradient system to give fractions 1-5. Fraction 2 (1.2 g) was further purified by HPLC with mobile phase (MeOH-H_2O 65:35) to yield Schlanctins A (28.5 mg).

Anti-HIV-1 assay: The cytotoxicity assay against C8166 cells (CC_{50}) was assessed using the MTT method and anti-HIV-1 activity was evaluated by the inhibition assay for the cytopathic effects of HIV-1 (EC_{50})[8].

Schlanctins A (Fig. 1) was obtained as pale yellow amorphous solid. The molecular formula of Schlanctins A was determined as $C_{24}H_{32}O_6$ from its HRESIMS at m/z 439.2092 $[M + Na]^+$ (calcd. 439.2097). The ^1H and ^{13}C NMR data indicated the presence of two aromatic rings. Strong absorption bands accounting for aromatic groups (1606, 1606, 1592, 1512, 1450) could also be observed in its IR spectrum. The UV spectrum of Schlanctins A showed maximum absorption at 280 and 205 nm which confirmed the existence of the aromatic functions. Schlanctins A possessed four methoxyls groups on the aromatic rings, four secondary methyl groups (include an oxygenated secondary methyl group), three methyl groups, an oxygenated methylene group and a carbonyl group; By comparison, the skeleton of Schlanctins A was the same as that of known compound (kadangustins J)[9]. The major difference is that the Schlanctins A possessed an acetyl group signal. According to the HMBC correlations from H-2', H-6', H-2 and H-6 to C-7 (Fig. 2), both aromatic groups were attached to C-7. The ^1H-^1H COSY correlations of H-7/H-8/H-8'/H-7', H-8/H-9 and H-8'/H-9', as well as the HMBC correlations from H-7 to C-8, C-8' and C-9 indicated the presence of a 2,3-dimethylbutane moiety (Fig. 2). According to the chemical shift of δ_C 67.2 (t) and the HMBC correlations from H-7' to C-1'' (C=O), an acetyl group should be located at C-7' (Table-1, Fig. 2). Four methoxy groups located on C-3', C-4', C-3 and C-4, respectively, can be deduced from its HMBC spectrum (Figu. 2). Thus, the structure of Schlanctins A was established as shown.

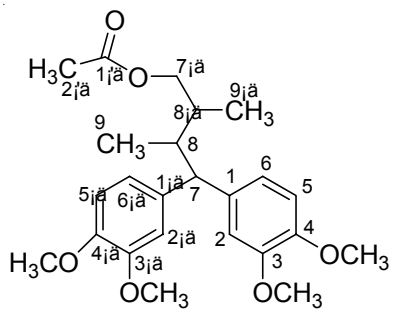

Fig. 1. Structure of Schlanctins A

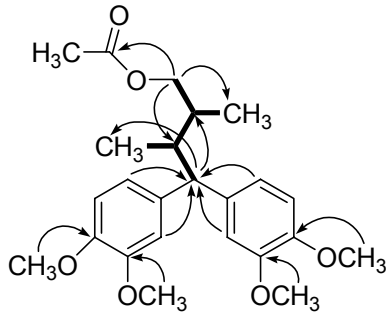

Fig. 2. Selected HMBC (→) and ^1H-^1H COSY (—) correlations of Schlanctins A

The potencies of Schlanctins A in preventing the cytopathic efects of HIV-1 in MT4 cells, as well as compound-induced cytotoxicity in MT4 cells in parallel with the antiviral activity were evaluated. The results from the cell-based assays demonstrated potent anti-HIV-1 activity with EC_{50} (median effect concentration) value of 1.82 μM. Schlanctins A shows an anti-HIV activity.

Schlanctins A: $C_{24}H_{32}O_6$, pale yellow amorphous solid; $[\alpha]2_D^{25.8}$ + 8.26 (c 0.165, MeOH); UV (MeOH) λ_{max} (log ε) 280 (4.36), 205 (5.52) nm; IR (KBr, ν_{max}, cm^{-1}): 2982, 2928, 2856, 2826, 1762, 1714 1658, 1606, 1592, 1512, 1450, 1424, 1371, 1328, 1255, 1220, 1208, 1176, 1140, 1025; ^1H NMR and ^{13}C NMR data ($CDCl_3$, 500 MHz), Table-1; HRESIMS (positive ion mode) m/z 439.2092 $[M + Na]^+$ (calcd. 439.2097 for $C_{24}H_{32}NaO_6$).

TABLE-1
^1H NMR AND ^{13}C NMR DATA OF COMPOUNDS IN $CDCl_3$ (δ ppm)

No.	δC (mult.)	δ_H (mult, *J*, Hz)	No.	δC (mult.)	δ_H (mult, *J*, Hz)
1	137.5 s		3'	148.8 s	
2	111.8 d	7.02, overlap	4'	147.2 s	
3	148.5 s		5'	111.9 d	6.85(d, 8.0)
4	147.0 s		6'	119.5 d	6.99 (d, 8.0)
5	111.6 d	6.83(d, 8.0)	7'α	67.2 t	3.84, overlap
6	119.8 d	6.95 (d, 8.0)	7'β		4.18 (dd, 4.8, 10.6)
7	58.2 d	3.79 (d, 8.2)	8'	35.4 d	1.95, m
8	40.5 d	2.21, m	9'	16.8 q	1.03 (d, 6.9)
9	13.8 q	0.92 (d, 6.8)	3'-OMe	55.9 q	3.85, s
3-OMe	55.9 q	3.85, s	4'-OMe	55.8 q	3.72, s
4-OMe	55.8 q	3.72, s	OAc	173.1, s	
1'	137.4 s			20.9, q	2.03, s
2'	111.6 d	7.04, overlap			

ACKNOWLEDGEMENTS

Financial support was provided by grants from the Young Academic and Technical Leader Raising Foundation of Yunnan Province (NO. 2007PY01-27) and the Natural Science Foundation of Yunnan Province (NO.2005B0027Q).

REFERENCES

1. Flora Yunnanica, Science Press: Beijing, Vol. 11, p. 16 (2000).
2. Y.G. Chen, P. Wang, Z.W. Lin, H.D. Sun, G.W. Qin and Y.Y. Xie, *Phytochemistry*, **48**, 1059 (1998).
3. Y.G. Chen, Y.Y. Xie, K.F. Cheng, K.K. Cheung and G.W. Qin, *Phytochemistry*, **58**, 1277 (2001).
4. J.L. Hanche, R.A. Burgos and F. Ahamada, *Fitoterapia*, **70**, 451 (1999).
5. Y.H. Kuo, L.Y. Kuo and C.F. Chen, *J. Org. Chem.*, **62**, 3242 (1997).
6. D.F. Chen, S.X. Zhang, H.K. Wang, S.Y. Zhang, Q.Z. Sun, M. Cosentino and K.H. Lee, *J. Nat. Prod.*, **62**, 94 (1999).
7. H.D. Sun, S.X. Qiu, L.Z. Lin, Z.Y. Wang, Z.W. Lin, T. Pengsuparp, J.M. Pezzuto and H. Fong, *J. Nat. Prod.*, **59**, 525 (1996).
8. J.H. Wang, S.C. Tam, H. Huang, D.Y. Ouyang, Y.Y. Wang and Y.T. Zheng, *Biochem. Biophys. Res. Commun.*, **317**, 965 (2004).
9. X.M. Gao, J.X. Pu, S.X. Huang and H.D. Sun, *J. Nat. Prod.*, **71**, 558 (2008).

(*Received*: 1 November 2008; *Accepted*: 4 May 2009) AJC-7540