Journal of Chemistry, Vol. 42 (1), P. 121 - 124, 2004

A NEW 3α-ACETOXY-URS-23,28,30-TRIOIC ACID FROM THE LEAVES OF *ACANTHOPANAX TRIFOLIATUS*

Received 7-7-2003

PHAN VAN KIEM[1], NGUYEN TIEN DAT[3], CHAU VAN MINH[1],
JUNG JOON LEE[2], YOUNG HO KIM[3]

[1]*Institute of Natural Products Chemistry, Vietnamese Academy of Science and Technology*
[2]*Korea Research Institute of Bioscience and Biotechnology, Daejeon, Korea*
[3]*College of Pharmacy, Chungnam National University, Daejeon, Korea*

ABSTRACT

*A new 3α-acetoxy-urs-23,28,30-trioic acid, named acantrifoic acid B (**1**), has been isolated from the leaves of Acanthopanax trifoliatus. Its chemical structure has been characterized on the basis of spectral and chemical evidence.*

I - INTRODUCTION

Acanthopanax trifoliatus (L.) Merr., (Araliaceae) is distributed in North Vietnam and used in the folk medicines of south–east Asia (Chi, 1997; Loi, 2001) as a drug with ginseng-like activity. Lupane-triterpene carboxylic acids and a lupane-triterpene glycoside have been reported from the leaves of *A. trifoliatus* (Ty *et al.*, 1984; Lischewski *et al.*, 1985; Yook *et al.*, 1998). As a part of our continuing studies on *Acanthopanax* species, we report here the isolation and the structure determination of a new compound from *A. trifoliatus*. Based on spectroscopic data, the chemical structure of constituent was determined as 3α-acetoxy-urs-23,28,30-trioic acid (**1**).

II - RESULTS AND DISCUSSION

Repeated column chromatography on silica gel of the dichloromethane extract of the dried leaves of *A. trifoliatus* yielded a new carboxylic acid **1**. Compound **1** was formed as white crystals, and produced a due to carbonyl IR absorption peaks at 1748 - 1750 cm^{-1}, acid IR absorption peaks at 3400 cm^{-1}. The FAB-MS spectrum of **1** showed an $[M+H]^+$ ion peak at *m/z* 561, correspond to a molecular formula of $C_{32}H_{48}O_8$. The ^{1}H-NMR spectrum of **1** (Table **1**) showed signals due to five tertiary methyl groups [δ 0.96 (3H, s, H_3-25), 1.01 (3H, s, H_3-26), 1.04 (3H, d, *J* = 7.2 Hz, H_3-29), 1.08 (3H, s, H_3-27) and 1.24 (3H, s, H_3-24)], one oxygen bearing a proton (δ 4.92, H-3) and one acetoxy proton [δ 1.95 (3H, s)]. The ^{13}C-NMR and DEPT spectrums revealed 32 carbon signals,

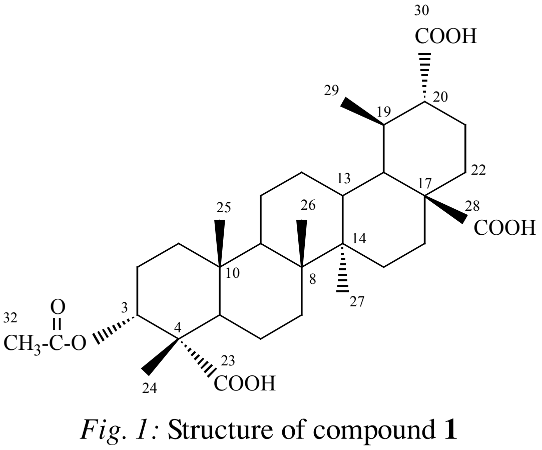

Fig. 1: Structure of compound **1**

including three carboxyl groups at δ 177.0, 178.0 and 178.1, one ester carbonyl group at δ170.0, one oxygen bearing methine carbon at δ 76.0, and six methyl carbons at δ 9.8, 15.2, 16.7, 16.9, 17.5 and 21.3. A ^{1}H-^{1}H COSY experiment allowed analysis of their spin systems and assignments of their proton resonances. The assignment of their corresponding carbons, made by a HMQC spectrum. The C-H long-range correlations between proton H-3 (δ_H 4.92) and carbons C-31 (δ_C 170.0) / C-32 (δ_C 21.3), between protons H-3 (δ_H 4.92) / H-24 (δ_H 1.24) and carbon C-23 (δ_C 177.0), between protons H-29 (δ_H 1.04) / H19 (δ_H 2.70) and carbon C-30 (δ_C 178.0), and between protons H-18 (δ_H 1.45) / H-22 (δ_H 1.35) and carbon C-28 (δ_C 178.1) were observed in the HMBC spectrum. This evidence confirmed that an acetoxy group was connected to C-3, three carboxyl groups (δ_C 177.0, 178.1, 178.0) were connected to C-23, C-28 and C-30, respectively. Further more, NOESY correlations were observed between H$_\beta$-3 [4.92 (1H, br s)] and H$_3$-24 [1.24 (3H, s)]. This evidence confirmed the location of C-23 carboxyl group. The chemical shift at δ_C 76.0 (C-3) is typical for the location of 3α-acetoxy of pentacyclic triterpenoids (Shashi B. M. et al., 1994). Based on the ^{1}H-^{1}H COSY, NOESY, HMQC, HMBC spectral data, compound **1** was determined to be 3α-acetoxy-urs-23,28,30-trioic acid, which we named acantrifoic acid B.

Table 1: ^{1}H-, ^{13}C- NMR spectral data of compound **1** (in acetone-d_6)

Pos.	δ_C (150 MHz)	δ_H (600 MHz)
1	33.7 (t)	1.49 (2H, m)
2	25.2 (t)	1.55 (2H, m)
3	76.0 (d)	4.92 (1H, br s)
4	50.4 (s)	-
5	46.1 (d)	1.96 (1H, m)
6	21.6 (t)	1.67 (2H, m)
7	34.9 (t)	1.35 (2H, m)
8	42.2 (s)	-
9	51.3 (d)	1.58 (1H, m)
10	37.7 (s)	-
11	21.9 (t)	1.52 (2H, m)
12	27.4 (t)	1.82 (2H, m)
13	39.0 (d)	2.45 (1H, dt, J = 12.6, 3.6 Hz)
14	43.6 (s)	-
15	30.4 (t)	1.29 (2H, m)
16	23.0 (t)	1.66 (2H, m)
17	57.1 (s)	-
18	49.1 (d)	1.45 (1H, m)
19	41.7 (d)	2.7 (1H, dd, J = 10.2, 3.0 Hz)
20	40.8 (d)	2.94 (1H, ddd, J = 7.8, 3.0 Hz)
21	32.8 (t)	2.28 (2H, ddd, J = 7.8, 2.4 Hz)
22	38.1 (t)	1.35 (1H, m); 1.86 (1H, m)
23	177.0 (s)	-
24	17.5 (q)	1.24 (3H, s)
25	16.7 (q)	0.96 (3H, s)

26	16.9 (q)	1.01 (3H, s)
27	15.2 (q)	1.08 (3H, s)
28	178.1 (s)	-
29	9.8 (q)	1.04 (3H, d, *J* = 7.2 Hz)
30	178.0 (s)	-
31	170.0 (s)	-
32	21.3 (q)	1.95 (3H, s)

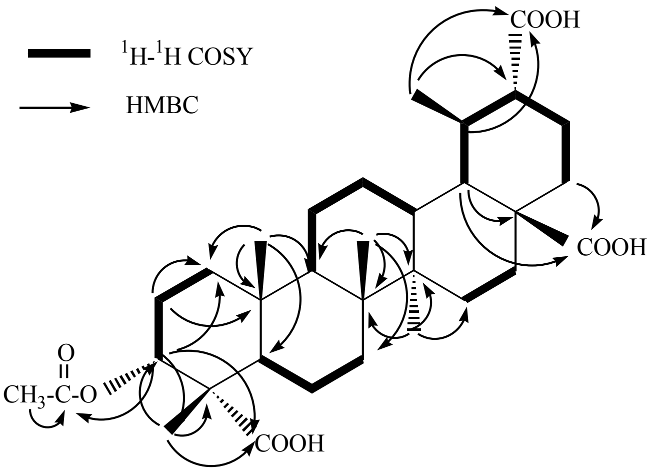

Fig. 2: Important H-C correlations in HMBC and H-H correlations in ^{1}H-^{1}H COSY spectrums of **1**

III - MATERIALS AND METHODS

General experimental procedures

Melting points were determined using a Yanagimoto micro hot-stage melting point apparatus. IR spectra was obtained on a JASCO DIP-370 Digital polarimeter. Optical rotations were determined on a JASCO DIP-1000 KUY polarimeter. FAB-MS and HR FAB-MS were obtained using a JEOL JMS-DX 300 spectrometer. ^{1}H-NMR (600 MHz) and ^{13}C-NMR (150 MHz) spectra were recorded on a Bruker-AM600 FT-NMR unit and chemical shifts are expressed as δ values using TMS as an internal standard. Column chromatography (CC) was performed on silica gel 60.

Plant material

A. trifoliatus was collected in Langson province, Vietnam in January 2001 and identified by Prof. Dr. Tran Minh Hoi, Institute of Ecology, Biological Resourses, Vietnamese Academy of Science and Technology (VAST). Voucher specimens (No 2539) are deposited at the herbarium of the Institute of Natural Product Chemistry, VAST, and at the herbarium of the College of Pharmacy, Chungnam National University, Korea.

Extraction and isolation

Dried and powdered leaves (3.7 kg) were extracted repeatedly with hot MeOH three times. The combined solutions were evaporated under reduced pressure to give MeOH extract (250.0 g), which was suspended in water and then partitioned with dichloromethane. The dichloro-methane fraction (56.0 g) was then subjected to repeated chromatography on a silica gel column, using hexane-acetone (4 : 1) as eluent and repeatedly recrystallized from hexane-acetone (8 : 1) to yield **1** (10.0 mg) as white crystals.

3.4 3α-acetoxy-urs-23,28,30-trioic acid (1)

White crystals, m.p. 225 - 228°C, $[\alpha]^{25}_{D}$ -35.7° (c 0.51, MeOH); IR $^{KBr}\nu_{max}$ cm^{-1}: 3400 (br, -COOH), 2890 - 2950 (C-H), 1748 - 1750 (>C=O); FAB-MS (positive) m/z: 561 $[M+H]^+$; ^{1}H- and ^{13}C-NMR: see Table 1.

Acknowledgements: *This study was supported by a grant from the Vietnam - Korea international cooperation project. We are grateful to KBSI for measuring NMR and MS spectra and we thank to Prof. Dr. Tran Minh Hoi, Institute of Ecology, Biological Resources, VAST for the plant identification.*

REFERENCES

1. V. V. Chi. Vietnamese Medical Plant Dictionary. Hanoi Medicine Pub. (1997).
2. D. T., Loi. Glossary of Vietnamese Medical Plants. Hanoi S&T Pub (2001).
3. M. Lischewski, P. D. Ty, L. Kutschabsky, D. Pfeiffer, H. V. Phiet, A. Preiss, T. V. Sung, and G. Adam. Phytochemistry, Vol. 24**,** P. 2355 - 2357.
4. B. M. Shashi B. M. and P.K. Asish. Phytochemistry, Vol. 3**7**, P. 1517 - 1575 (1994).
5. S. Siddiqui, B. S. Siddiqui, F. Hafeez, and S. Begum. Planta Medica, Vol. 54, P. 232 (1988).
6. S. Siddiqui, S. Begum, B. S. Siddiqui, and F. Hafeez. J. Nat. Prod., Vol. 52, P. 57 (1989).
7. Ph. D. Ty, M. Lischewski, H. V. Phiet, A. Preiss, T. V. Sung, J. Schmidt, and G. Adam. Phytochemistry, Vol. 23, P. 2889 - 2891 (1984).
8. C. S. Yook, I. L. Kim, D. Y. Hahn, T. Nohara, and S. Y. Chang. Phytochemistry, Vol. 49*,* P. 839 - 843 (1998).