COMPOSITE CONSTITUENT: NOVEL TRITERPENOID, 17-EPI-LUPENYL ACETATE, FROM AERIAL PARTS OF *IXERIS CHINENSIS*

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A novel triterpenoid, 17-epilupenyl acetate (1), has been isolated together with twelve known triterpenoid acetates, and the structure was determined by extensive spectroscopic analyses.

KEYWORDS *Ixeris chinensis*; triterpenoid; 17-epilupenyl acetate; Compositae

The dried whole plant of *Ixeris chinensis* (Thunb.) Nakai is a folk medicine in Taiwan with analgesic, antipyretic and anti-inflammatory actions; and isolation of a triterpenoid, bauerenyl acetate, was reported.[1] On reinvestigation of the aerial part of *I. chinensis*, collected in Taiwan, we isolated a novel triterpenoid, 17-epilupenyl acetate (**1**, 0.0009% of the dried material), together with known compounds, lupenyl acetate (**2**, 0.0067%),[2] germanicyl acetate,[2] β-amyrin acetate,[2] multiflorenyl acetate,[3] taraxasteryl acetate,[2] ψ-taraxasteryl acetate,[2] 3β-acetoxytaraxaster-20-en-30-al,[4] α-amyrin acetate,[2] bauerenyl acetate,[1,2] dammaradienyl acetate,[5] tirucalla-7,21-dien-3β-yl acetate,[6] and butyrospermyl acetate.[7] In this paper, we report the isolation and structure elucidation of compound **1** on the basis of spectral evidences.

A hexane extract from 1.7 kg of dried aerial materials was chromatographed on silica gel to give an acetate fraction (6.5 g, 0.38 % of the dried materials) as hexane-benzene (8:2) elutes. This fraction was chromatographed repeatedly on 20% $AgNO_3$-impregnated silica gel and prep. HPLC [C-18 reverse phase, CH_3CN–$CHCl_3$ (9:1)] to give **1** (colorless plates), mp 219–221° C, $[\alpha]_D$ +24.7° ($CHCl_3$, c= 0.1), Rt_R 3.99. The MS of **1** showed the molecular ion at m/z 468.3965 ($C_{32}H_{52}O_2$), and many significant fragment ions at m/z (rel. int.): 453 (5, M^+–CH_3), 425 (2, M^+–C_3H_7), 408 (12, M^+–AcOH), 393 (6, M^+–CH_3–AcOH), 262 (17, a), 249 (10, b), 218 (11, c), 204 (25, d), 203 (34, d–H), 202 (12, a–AcOH), 189 (100, b–AcOH, e), and 175 (15, c–C_3H_7) (Chart 1). This fragmentation pattern was essentially identical with that of **2**.[8] The ^{1}H-NMR spectrum of **1** indicated the presence of six tertiary methyl groups, an isopropenyl group, and 3β-acetoxyl group in the molecule. The analysis of ^{1}H-^{1}H, ^{13}C-^{1}H COSYs, HMBC, and HSQC spectra suggested that **1** was a lupane-type compound on being compared with those of **2**. Useful information for stereochemistry of **1** was obtained by the NOESY spectrum. That is, cross-peaks were observed between H-24 and H-25, H-25 and H-26, H-26 and H-13β, H-13β and H-19β; H-5α and H-9α, H-9α and H-27, H-27 and H-28; and H-27, H-28 and H-18α (Table I and Fig. 1). The structure of rings A, B, C and D of **1** was the same as that of **2**, while the D and E ring juncture was the *cis* configuration of 18α-H and 28α-methyl. Two chair-chair-chair-

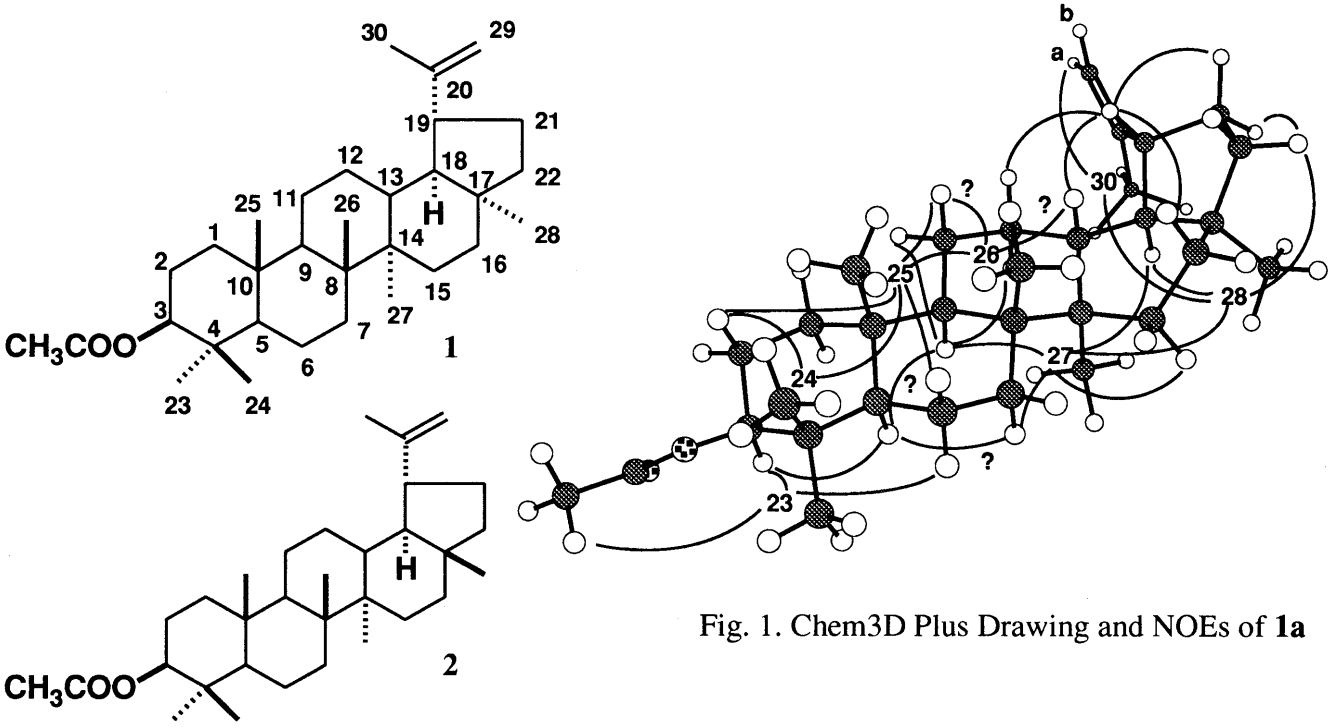

Fig. 1. Chem3D Plus Drawing and NOEs of **1a**

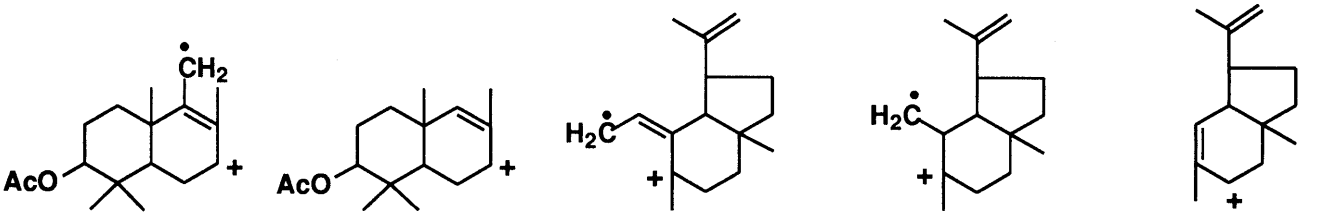

Chart 1

TABLE I. ^{1}H-NMR Spectral Data (500 MHz, $CDCl_3$, δ)

	H-1	H-2	H-3	H-5	H-6	H-7	H-9	H-11
1	1.01;1.70	1.64;1.64	4.477 (dd, 5.8, 10.8)	0.80	1.52;1.36	1.33;1.33	1.33	1.48;1.18
2	1.00;1.67	1.62;1.62	4.471 (dd, 5.8, 10.7)	0.80	1.48;1.40	1.38;1.38	1.32	1.40;1.31

	H-12	H-13	H-15	H-16	H-18	H-19	H-21	H-22
1	0.88;1.58	1.19	1.07;1.50	1.45;1.51	1.35	2.272 (ddd, 3.1, 8.9, 8.9)	1.53;1.84	1.74;1.14
2	1.08;1.67	1.66	1.00;1.68	1.36;1.45	1.36	2.376 (ddd, 5.8, 11.2, 11.2)	1.32;1.92	1.37;1.19

	H-23	H-24	H-25	H-26	H-27	H-28	H-29	H-30
1	0.848	0.837	0.865	0.953	0.865	0.901	a 4.638(br s) b 4.741(br s)	1.734
2	0.845	0.835	0.854	1.029	0.938	0.786	a 4.568(m) b 4.686(br d, 2.5)	1.683

Coupling constant are shown in parentheses and acetyl methyl protons were observed at δ 2.043 in **1**, δ 2.041 in **2**. Methylene signals are shown for α; β.

TABLE II. ^{13}C-NMR Spectral Data (125 MHz, $CDCl_3$, δ)

	Carbon numbers									
	1	2	3	4	5	6	7	8	9	10
1	38.57	23.72	80.98	37.83	55.65	18.13	33.79	40.87	51.33	37.16
2	38.38	23.71	80.97	37.79	55.37	18.20	34.20	40.85	50.34	37.08

	11	12	13	14	15	16	17	18	19	20
1	21.57	27.07	43.36	40.66	27.33	33.08	40.47	49.39	54.16	150.94
2	20.94	25.10	38.04	42.82	27.42	35.57	43.00	48.28	48.00	150.97

	21	22	23	24	25	26	27	28	29	30
1	29.62	37.46	27.92	16.50	16.61	15.60	14.84	29.99	107.63	22.60
2	29.83	39.99	27.95	16.50	16.17	15.97	14.51	18.00	109.35	19.28

Acetyl signals were observed at δ 21.33, 171.04 in **1**, δ 21.32, 171.03 in **2**.

boat-envelope conformations of **1** with different side chain form (**1a**, shown in Fig. 1, steric energy 82.394 Kcal/mole, and **1b**, whose side chain at C-19 being opposite direction, 82.810 Kcal/mole) were simulated by Chem3D Plus/MM2.[9] The preferred conformation **1a** was well confirmed by NOEs as shown in the figure, especially H-30 and H-28. The presence of another preferred conformation **1b** in the solution was proved by the two singlet signals of H-29 protons and NOEs between H-29b and H-18α; H-30 and H-19β. This case is very similar to that of hop-22(29)-ene.[10]

Although yield of compound **1** was only 1/75 of that of **2**, the former could be a very interesting alternative product of lupeol biosynthesis.

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