

## 锥序蜜心果中的三萜成分

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**摘要:** 从水东哥科植物锥序蜜心果 (*Saurauia napaulensis*) 中分离得到 8 个三萜类化合物, 其中一个为新的三萜, 鉴定其结构为  $2\alpha, 3\alpha, 24$  三羟基 12 熊果烯 23 醛 28 酸。

**关键词:** 锥序蜜心果; 水东哥科; 三萜

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### Triterpenoids from *Saurauia napaulensis* (Saurauaceae)

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**Abstract:** A new triterpenoid and seven known compounds were isolated from ethyl acetate soluble fraction of *Saurauia napaulensis*. The new structure was elucidated as  $2\alpha, 3\alpha, 24$  trihydroxy 12 ursene 23 al 28 oic acid by spectral methods.

**Key words:** *Saurauia napaulensis*; Saurauaceae; Triterpenoids

*Saurauia napaulensis*, an endemic species belonging to the family of Saurauaceae, is distributed in Xishuangbanna of Yunnan province (Feng *et al.*, 1984) (Xu, 2002). Its roots were used in traditional Chinese medicine for the treatment of fracture, cold cough. However, no reports have been found about the constituents of this plant to date. During the investigation of the constituents of *Saurauia napaulensis*, eight triterpenoids, including a new one, were isolated. Seven known triterpenoids were identified as ursolic acid (2) (Zhang *et al.*, 2001),  $2\alpha$ -hydroxyursolic acid (3) (Guo *et al.*, 2003),  $2\alpha, 19\alpha$ -dihydroxyursolic acid (4) (Tsutomu *et al.*, 1987),  $2\alpha, 3\alpha, 24$  trihydroxy 12-oleane 28 oic acid (5) (Raja *et al.*, 1990),  $2\alpha$ -hydroxy  $3\beta$ - (trans- $\gamma$ -coumaroyloxy)-urs-12-en-28 oic acid (6) (Haberlein *et al.*, 1994), Rosamultin ( $2\alpha, 19\alpha$ -dihydroxyursolic acid (28-1)  $\beta$ -D-glucoside) (7) (Isao *et al.*, 1988), nigarichigo-

side F1 (8) (Luo *et al.*, 2003), respectively. This paper dealt with the isolation and elucidation of the new compound,  $2\alpha, 3\alpha, 24$  trihydroxy 12-ursene-23-al 28 oic acid.

### Results and Discussion

Compound 1, was isolated as white amorphous powder, and its molecular formula was established as C<sub>30</sub>H<sub>48</sub>O<sub>6</sub> based on the negative HRFABMS at *m/z* 501.3228 ([M-H]<sup>-</sup>, calc. 501.3216), in accord with seven degrees of unsaturation. IR spectrum showed the following characteristic signals, OH (3424 cm<sup>-1</sup>), C=O (1727 cm<sup>-1</sup>) and C=C (1604 cm<sup>-1</sup>), suggestion the presence of a carbonyl group in the structure.

The <sup>1</sup>H-NMR spectrum of 1 show signals attributed to three tertiary methyl groups ( $\delta_H$  1.02, 0.92, 0.90), two secondary methyl groups ( $\delta_H$  1.11, 1.10), an oxymethylene group ( $\delta_H$  4.36, 4.28), and

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an olefin proton ( $\delta_H$  5.09). The  $^{13}\text{C}$ -NMR and DEPT spectra displayed 30 carbon signals, which consisted of one aldehyde group ( $\delta_C$  207.7), one trisubstituted double bond ( $\delta_C$  125.4, 139.4), one carboxylic group ( $\delta_C$  178.3), one oxymethylene ( $\delta_C$  62.0), five methyl groups, eight methylenes, seven methines (including two oxy-bearing methines), and five quaternary carbons. These spectral data indicated that compound **1** was an ursane-type triterpene (Zhang *et al.*, 2001).

In the HMBC spectrum, three hydroxyl groups at the C-2, C-3 and C-24 position were confirmed by the correlations between the signal at  $\delta$  4.37 (ddd,  $J = 11.2, 3.8, 2.4$  Hz, H-2) with  $\delta$  71.7 (d, C-3),  $\delta$  59.5 (s, C-4), the signal at  $\delta$  4.88 (d,  $J = 2.4$  Hz, H-3) with  $\delta$  66.4 (d, C-2),  $\delta$  59.5 (s, C-4),  $\delta$  43.3 (d, C-5), and the signal at  $\delta$  4.36 (d,  $J = 11.2$  Hz),  $\delta$  4.28 (d,  $J = 11.2$  Hz) / (H-24) with  $\delta$  59.5 (s, C-4),  $\delta$  207.7 (d, C-23) and  $\delta$  43.3 (d, C-5).

The coupling constants between H-2 and H<sub>2</sub>-1 were found to be 11.2 and 3.8 Hz, corresponding to a diaxial and an axial-equatorial coupling, respectively. Thus, H-2 was presumed to be axially oriented. In the NOESY spectrum, both the signals of H-2 and H-3 showed correlations with those of H<sub>3</sub>-24 and H<sub>3</sub>-25, confirming H-2 and H-3 to be  $\beta$ -oriented. However the NMR spectra of **1**, comparing with those

of 2 $\alpha$ , 3 $\alpha$ , 24-trihydroxy-12-ursen-28-oic acid, lacked a methyl singlet (Me-23) and contained a signal for a aldehyde at  $\delta$  10.4 in the  $^1\text{H}$  NMR, which made C-3 shift from 74.3 ppm down to 71.7 ppm, C-4 shift from 43.3 ppm up to 59.5 ppm (Zhang *et al.*, 2001), deducing that Me-23 was replaced by one aldehyde. At the same time, the oxymethylene signals at C-24 correlated to the H<sub>3</sub>-25, and H-3 proton signal (see figure 1 NOESY), indicating CH<sub>2</sub>OH was  $\beta$ -orient and CHO was  $\alpha$ -orient. Accordingly, compound **1** was established as 2 $\alpha$ , 3 $\alpha$ , 24-trihydroxy-12-ursen-23-ol-28-oic acid.

## Experimental

**General experimental procedures** The IR spectrum was measured on a PerkinElmer 577 spectrophotometer. FABMS were performed on a VG AutoSpec 3000 spectrometer. Bruker Avance 400 and DRX-500 instruments were used to record  $^1\text{H}$  NMR and 2D NMR (400 MHz), and  $^{13}\text{C}$  NMR. C<sub>5</sub>D<sub>5</sub>N was solvent and the internal standard at room temperature. Silica gel (200–300 mesh) for column chromatography and silica gel plate (GF 254) for thin layer chromatography were the products of Qingdao Haiyang Chemical Group Co., Qingdao, China.

**Plant material** The original plant *Saurauia napaulensis* was collected in Xishuangbanna of Yunnan province in September 2005, and identified by Zhangshuncheng. A voucher specimen has been deposited in the laboratory of Phytochemistry, Kunming Institute of Botany (No. 2005061010), the Chinese Academy of Sciences, Kunming, China.

Table 1  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectral data of **1** (C<sub>5</sub>D<sub>5</sub>N, ppm)

No	$\delta_C$	$\delta_H$	HMBC (H → C) (selected)	No	$\delta_C$	$\delta_H$	HMBC (H → C) (selected)
1	42.6(t)	1.98 (ddd, 11.2, 6.6, 3.8), 1.78(m, 1H)	C(2), C(3)	16	28.6(t)	2.2 (m, 2H)	
2	66.4(d)	4.37 (ddd, 11.2, 3.8, 2.4)	C(1), C(3), C(4)	17	49.7(s)	—	—
3	71.7(d)	4.88 (d, 2.4)	C(1), C(2), C(4), C(5)	18	53.6(d)	2.57 (d, 11.4)	C(12), C(13), C(28)
4	59.5(s)	—	—	19	39.4(d)	1.34 (m)	C(29), C(20)
5	43.3(d)	2.51 (d, 11.0)	C(4), C(6), C(23)	20	39.4(d)	1.00 (m)	C(19), C(21), C(30)
6	21.1(t)	1.90 (m), 1.75 (m)	C(5), C(7)	21	30.0(t)	1.90 (m, 2H)	C(20), C(22)
7	33.8(t)	1.86 (m, 2H)	C(6), C(8)	22	37.5(t)	1.95 (m, 2H)	C(21), C(17)
8	40.3(s)	—	—	23	207.7(d)	10.40 (s)	C(4)
9	48.1(d)	2.50 (m)	C(8), C(10)	24	62.0(t)	4.36 (d, 11.2), 4.28 (d, 11.2)	C(4), C(23)
10	38.3(s)	—	—	25	17.6(q)	0.92 (s)	C(1), C(9)
11	23.9(t)	—	—	26	17.5(q)	1.05 (s)	C(9)
12	125.4(d)	5.09 (br s, 1H)	C(9), C(13)	27	21.4(q)	0.90 (s)	C(14)
13	139.4(s)	—	—	28	178.3(s)	—	—
14	42.5(s)	—	—	29	23.8(q)	1.11 (d, 3.6)	C(30), C(18)
15	29.7(t)	1.28 (m, 2H)	—	30	17.1(q)	1.10 (d, 3.6)	C(29), C(21)

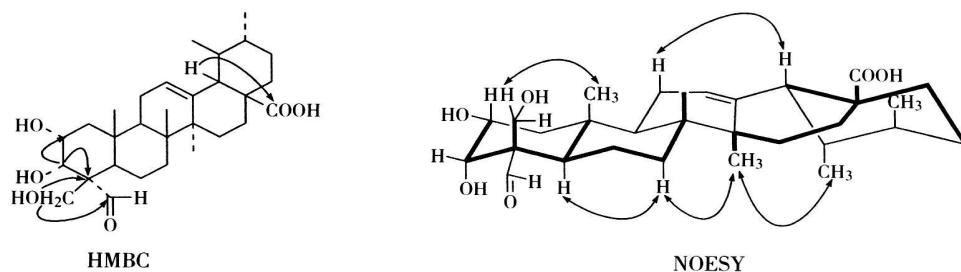


Fig. 1 The key HMBC and NOESY of 1

**Extraction and isolation** The air dried and powdered aerial parts (5.0 kg) were extracted 3 times with 70% MeOH under reflux ( $3 \times 3.0$  L) for 4, 3, 3 h, respectively. After concentrating of the combined extracts, the residue was suspended in water and then extracted with petroleum ether, EtOAc, and BuOH. The EtOAc soluble part (108 g) was subjected to column chromatography (CC) over silica gel eluting with chloroform/methanol (1:0–0:1) to give fractions I - VI, using MCI to remove chlorophyll of Fraction II (22 g), and subjected to CC on silica gel eluting with chloroform/acetone (1:0–0:1), then repeatedly subjected to Sephadex LH-20 and reversed phase silica gel (RP-18) eluted with  $H_2O/MeOH$  (3:7–0:1) to give compounds **1** (13 mg), **2** (22 mg), **3** (21 mg), **4** (27 mg), **5** (14 mg), **6** (19 mg), Fraction IV (2.7 g) subjected to CC on silica gel eluting with  $CHCl_3/CH_3COCH_3$  (1:0–0:1) and get fraction B1B6, B2 (378 mg) repeatedly subjected to Sephadex LH-20 and RP-18 eluted with  $H_2O/MeOH$  (4:6–0:1), and get compound **7** (14 mg), **8** (16 mg).

**Compound 1**, white amorphous powder, IR  $\nu_{\text{max}}^{\text{KBr}}$   $\text{cm}^{-1}$ : 3424, 1727, 1604, 1507, 1270, 671, Negative FAB MS  $m/z$  (%): 501 (100, [M-H]<sup>+</sup>), 473 (10), 453 (15), 325 (6). HR-FAB MS  $m/z$ : 501.3228 ([M-H]<sup>-</sup>, calc. 501.3216). <sup>1</sup>H and <sup>13</sup>C NMR spectral data see table.

**Compound 2**, white powder,  $C_{30}H_{48}O_3$ , Negative FAB MS  $m/z$  (%): 455 (100), 169 (1), 80 (1), <sup>1</sup>H NMR (500 MHz,  $C_5D_5N$ ):  $\delta_H$  5.27 (br s, 1H, H-12), 4.38 (d,  $J = 7.8$  Hz, 1H, H-3), 1.13 (d,  $J = 6.3$  Hz, 3H, H-29), 1.13 (d,  $J = 6.2$  Hz, 3H, H-30), 1.27, 1.10, 0.89, 0.82, 0.53 (s, each 3H), <sup>13</sup>C NMR (125 MHz,  $C_5D_5N$ ):  $\delta_C$  37.5 (t, C-1), 28.2 (t, C-2), 78.3 (d, C-3), 39.2 (s, C-4), 53.7 (d, C-5), 18.9 (t, C-6), 33.7 (t, C-7), 40.1 (s, C-8), 48.2 (d, C-9), 37.4 (s, C-10), 23.7 (t, C-11), 125.8 (d, C-12), 139.4 (s, C-13), 42.6 (s, C-14), 28.8 (t, C-15), 25.0 (t, C-16), 48.2 (s, C-17), 56.0 (d, C-18), 39.6 (d, C-19), 39.5 (d, C-20), 31.2 (t, C-21), 39.2 (t, C-22), 28.9 (q, C-23), 14.3 (q, C-24), 15.8 (q, C-25), 16.7 (q, C-26), 24.0 (q, C-27),

180.0 (s, C-28), 21.5 (q, C-29), 17.6 (q, C-30).

**Compound 3**, white powder,  $C_{30}H_{48}O_4$ , Negative FAB MS  $m/z$  (%): 471 (100), 453 (6), 355 (2), <sup>1</sup>H NMR (400 MHz,  $C_5D_5N$ ):  $\delta_H$  5.40 (br s, 1H, H-12), 4.30 (d,  $J = 11.3$  Hz, 1H, H-2), 3.78 (br s, 1H, H-3), 0.91 (d,  $J = 7.7$  Hz, 3H, H-29), 0.93 (d,  $J = 7.7$  Hz, 3H, H-30), 1.26, 1.09, 1.02, 0.97, 0.87 (s, each 3H), <sup>13</sup>C NMR (100 MHz,  $C_5D_5N$ ):  $\delta_C$  42.7 (t, C-1), 66.3 (d, C-2), 79.4 (d, C-3), 39.0 (s, C-4), 48.8 (d, C-5), 18.6 (t, C-6), 33.6 (t, C-7), 40.1 (s, C-8), 48.0 (d, C-9), 38.7 (s, C-10), 23.8 (t, C-11), 125.7 (d, C-12), 139.4 (s, C-13), 40.3 (s, C-14), 28.7 (t, C-15), 25.0 (t, C-16), 48.2 (s, C-17), 53.6 (d, C-18), 39.6 (d, C-19), 39.5 (d, C-20), 31.3 (t, C-21), 37.6 (t, C-22), 29.6 (q, C-23), 17.7 (q, C-24), 17.7 (q, C-25), 16.9 (q, C-26), 22.4 (q, C-27), 180.1 (s, C-28), 24.0 (q, C-29), 21.5 (q, C-30).

**Compound 4**, white powder,  $C_{30}H_{48}O_5$ , Negative FAB MS  $m/z$  (%): 487 (100), 471 (12), 325 (4), <sup>1</sup>H NMR (500 MHz,  $C_5D_5N$ ):  $\delta_H$  5.57 (br s, 1H, H-12), 4.30 (d,  $J = 11.1$  Hz, 1H, H-2), 3.10 (d,  $J = 4.3$  Hz, 1H, H-3), 1.09 (d,  $J = 3.7$  Hz, 3H, H-30), 1.49, 1.31, 1.25, 1.00, 0.96, 0.88 (s, each 3H), <sup>13</sup>C NMR (125 MHz,  $C_5D_5N$ ):  $\delta_C$  42.9 (t, C-1), 66.1 (d, C-2), 79.4 (d, C-3), 38.8 (s, C-4), 48.8 (d, C-5), 18.6 (t, C-6), 33.7 (t, C-7), 40.6 (s, C-8), 47.7 (d, C-9), 38.7 (s, C-10), 24.1 (t, C-11), 128.1 (d, C-12), 140.0 (s, C-13), 42.2 (s, C-14), 29.3 (t, C-15), 26.4 (t, C-16), 48.3 (s, C-17), 54.6 (d, C-18), 72.7 (s, C-19), 42.4 (d, C-20), 27.0 (t, C-21), 38.5 (t, C-22), 29.4 (q, C-23), 16.8 (q, C-24), 16.7 (q, C-25), 17.3 (q, C-26), 24.7 (q, C-27), 180.6 (s, C-28), 27.1 (q, C-29), 22.3 (q, C-30).

**Compound 5**, white powder,  $C_{30}H_{48}O_5$ , Negative FAB MS  $m/z$  (%): 487 (100), 455 (2), 247 (2), <sup>1</sup>H NMR (500 MHz,  $C_5D_5N$ ):  $\delta_H$  5.46 (br s, 1H, H-12), 4.58 (br s, 1H, H-3), 4.44 (d,  $J = 10.6$  Hz, 1H, H-2), 4.10 (d,  $J = 10.9$  Hz, 1H, H-23a), 3.81 (d,  $J = 10.9$  Hz, 1H, H-23b), 3.28 (d,  $J = 3.3$  Hz, 1H, H-18), 1.18, 1.12, 1.02,

1.01, 1.00, 0.97 ( s, each 3H),  $^{13}\text{C}$ -NMR ( 125 MHz,  $\text{C}_5\text{D}_5\text{N}$ ) :  $\delta_{\text{C}}$  43.1 ( t, C-1 ), 66.3 ( d, C-2 ), 74.3 ( d, C-3 ), 45.2 ( s, C-4 ), 48.3 ( d, C-5 ), 19.0 ( t, C-6 ), 33.8 ( t, C-7 ), 40.1 ( s, C-8 ), 49.6 ( d, C-9 ), 38.7 ( s, C-10 ), 23.8 ( t, C-11 ), 122.5 ( d, C-12 ), 144.9 ( s, C-13 ), 42.0 ( s, C-14 ), 28.3 ( t, C-15 ), 24.1 ( t, C-16 ), 46.5 ( s, C-17 ), 42.2 ( d, C-18 ), 46.7 ( t, C-19 ), 34.3 ( s, C-20 ), 33.7 ( t, C-21 ), 33.2 ( t, C-22 ), 65.3 ( t, C-23 ), 14.4 ( q, C-24 ), 17.4 ( q, C-25 ), 17.1 ( q, C-26 ), 26.1 ( q, C-27 ), 180.2 ( s, C-28 ), 33.2 ( q, C-29 ), 23.8 ( q, C-30 ).

**Compound 6**, white powder,  $\text{C}_{39}\text{H}_{54}\text{O}_6$ , positive FAB MS  $m/z$  (%) : 619 ( 62 ), 437 ( 74 ), 409 ( 31 ), 189 ( 53 ),  $^1\text{H}$ -NMR ( 400 MHz,  $\text{C}_5\text{D}_5\text{N}$ ) :  $\delta_{\text{H}}$  8.01 ( d, 1H,  $J=15.9$  Hz, H- $\alpha$  ), 7.20 ( d, 1H,  $J=8.8$  Hz, H- $\dot{2}$ ,  $\dot{6}$  ), 7.16 ( d, 1H,  $J=8.8$  Hz, H- $\dot{3}$ ,  $\dot{5}$  ), 6.69 ( d, 1H,  $J=15.9$  Hz, H- $\beta$  ), 5.44 ( d, 1H,  $J=3.7$  Hz, H-12 ), 4.37 ( m, 1H, H-3 ), 3.59 ( br s, 1H, H-2 ), 1.16, 1.02, 1.00, 0.98, 0.97, 0.95, 0.94 ( s, each 3H ),  $^{13}\text{C}$ -NMR ( 100 MHz,  $\text{C}_5\text{D}_5\text{N}$ ) :  $\delta_{\text{C}}$  48.6 ( t, C-1 ), 66.5 ( d, C-2 ), 85.1 ( d, C-3 ), 39.9 ( s, C-4 ), 55.6 ( d, C-5 ), 18.7 ( t, C-6 ), 33.4 ( t, C-7 ), 40.1 ( s, C-8 ), 48.0 ( d, C-9 ), 38.3 ( s, C-10 ), 23.8 ( t, C-11 ), 125.5 ( d, C-12 ), 139.4 ( s, C-13 ), 42.6 ( s, C-14 ), 28.7 ( t, C-15 ), 24.9 ( t, C-16 ), 48.1 ( s, C-17 ), 53.6 ( d, C-18 ), 39.5 ( d, C-19 ), 39.5 ( d, C-20 ), 31.1 ( t, C-21 ), 37.5 ( t, C-22 ), 29.1 ( q, C-23 ), 17.0 ( q, C-24 ), 17.5 ( q, C-25 ), 17.6 ( q, C-26 ), 24.0 ( q, C-27 ), 180.1 ( s, C-28 ), 21.5 ( q, C-29 ), 18.3 ( q, C-30 ), 168.0 ( s, C- $\gamma$  ), 116.1 ( d, C- $\beta$  ), 144.9 ( d, C- $\alpha$  ), 126.3 ( s, C- $\dot{1}$  ), 130.7 ( d, C- $\dot{2}$  ), 116.9 ( d, C- $\dot{3}$  ), 161.4 ( s, C-4 ), 116.9 ( d, C-5 ), 130.7 ( d, C-6 ).

**Compound 7**, white powder,  $\text{C}_{36}\text{H}_{58}\text{O}_{10}$ , Negative FAB MS  $m/z$  (%) : 649 ( 28 ), 487 ( 90 ), 273 ( 48 ), 163 ( 35 ), 87 ( 22 ),  $^1\text{H}$ -NMR ( 400 MHz,  $\text{C}_5\text{D}_5\text{N}$ ) :  $\delta_{\text{H}}$  6.30 ( d, 1H,  $J=8$  Hz, H- $\dot{1}$  ), 5.52 ( br s, 1H, H-12 ), 4.47 ( m, 1H ), 4.42 ( m, 1H ), 4.38 ( m, 1H ), 4.36 ( m, 1H ), 4.33 ( m, 1H ), 4.32 ( m, 1H ), 4.08 ( m, 1H, H-3 ), 3.37 ( d,  $J=9.3$  Hz, 1H, H-2 ), 2.92 ( s, 1H, H-18 ), 1.07 ( d,  $J=5.8$  Hz, 3H, H-30 ), 1.65, 1.19, 1.06, 1.04, 1.03, 1.00 ( s, each 3H ),  $^{13}\text{C}$ -NMR ( 100 MHz,  $\text{C}_5\text{D}_5\text{N}$ ) :  $\delta_{\text{C}}$  48.1 ( t, C-1 ), 68.7 ( d, C- $\dot{2}$  ), 83.9 ( d, C-3 ), 39.9 ( s, C-4 ), 56.0 ( d, C-5 ), 19.1 ( t, C-6 ), 33.5 ( t, C-7 ), 40.7 ( s, C-8 ), 47.1 ( d, C-9 ), 38.5 ( s, C-10 ), 24.2 ( t, C-11 ), 128.4 ( d, C-12 ), 139.3 ( s, C-13 ), 42.2 ( s, C-14 ), 29.3 ( t, C-15 ), 26.7 ( t, C-16 ), 48.7 ( s, C-17 ), 54.5 ( d, C-18 ), 72.7 ( s, C-19 ), 42.2 ( d, C-20 ), 26.0 ( t, C-21 ), 37.8 ( t, C-22 ), 29.4 ( q, C-23 ), 17.0 ( q, C-24 ), 16.8 ( q, C-25 ), 17.5 ( q, C-26 ), 24.6 ( q, C-27 ), 17.1 ( s, C-28 ), 27.0 ( q, C-29 ), 17.7 ( q, C-30 ), 95.9 ( d, C- $\dot{1}$  ), 74.1 ( d, C- $\dot{2}$  ), 79.0 ( d, C- $\dot{3}$  ), 71.2 ( d, C-4 ), 79.3 ( d, C-5 ), 62.3 ( t, C-6 ).

3 ), 71.2 ( d, C-4 ), 79.4 ( d, C-5 ), 62.3 ( t, C-6 ).

**Compound 8**, white powder,  $\text{C}_{36}\text{H}_{58}\text{O}_{11}$ , Negative FAB MS  $m/z$  (%) : 665 ( 23 ), 503 ( 100 ), 325 ( 22 ), 119 ( 6.5 ),  $^1\text{H}$ -NMR ( 400 MHz,  $\text{C}_5\text{D}_5\text{N}$ ) :  $\delta_{\text{H}}$  6.30 ( d, 1H,  $J=8.1$  Hz, H- $\dot{1}$  ), 5.51 ( br s, 1H, H-12 ), 3.73 ( d,  $J=9.7$  Hz, H-3a ), 3.53 ( d,  $J=9.2$  Hz, H- $\dot{2}$  ), 4.47 ( m, 1H ), 4.43 ( m, 1H ), 4.39 ( m, 1H ), 4.34 ( m, 1H ), 4.30 ( m, 1H ), 4.06 ( m, 1H ), 4.05 ( m, 1H ), 2.91 ( s, 1H, H-18 ), 1.65, 1.58, 1.37, 1.16, 1.02 ( s, each 3H ), 1.05 ( d,  $J=6.5$  Hz, 3H, H-30 ),  $^{13}\text{C}$ -NMR ( 100 MHz,  $\text{C}_5\text{D}_5\text{N}$ ) :  $\delta_{\text{C}}$  48.0 ( t, C-1 ), 68.7 ( d, C-2 ), 85.8 ( d, C-3 ), 44.0 ( s, C-4 ), 56.6 ( d, C-5 ), 19.5 ( t, C-6 ), 33.8 ( t, C-7 ), 40.6 ( s, C-8 ), 48.0 ( d, C-9 ), 38.3 ( s, C-10 ), 24.4 ( t, C-11 ), 128.3 ( d, C-12 ), 139.3 ( s, C-13 ), 42.1 ( s, C-14 ), 29.2 ( t, C-15 ), 26.7 ( t, C-16 ), 48.7 ( s, C-17 ), 54.4 ( d, C-18 ), 72.7 ( s, C-19 ), 42.2 ( d, C-20 ), 26.1 ( t, C-21 ), 37.7 ( t, C-22 ), 68.7 ( t, C-23 ), 24.6 ( q, C-24 ), 17.5 ( q, C-25 ), 17.3 ( q, C-26 ), 24.2 ( q, C-27 ), 177.0 ( s, C-28 ), 27.0 ( q, C-29 ), 16.7 ( q, C-30 ), 95.9 ( d, C- $\dot{1}$  ), 74.1 ( d, C- $\dot{2}$  ), 79.0 ( d, C- $\dot{3}$  ), 71.2 ( d, C-4 ), 79.3 ( d, C-5 ), 62.3 ( t, C-6 ).

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