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ISOLATION AND STRUCTURE DETERMINATION OF TWO NEW COMPOUNDS FROM *ZANTHOXYLUM INTEGRIFOLIOLUM*

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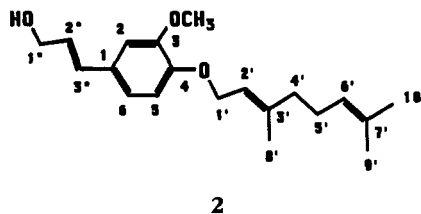
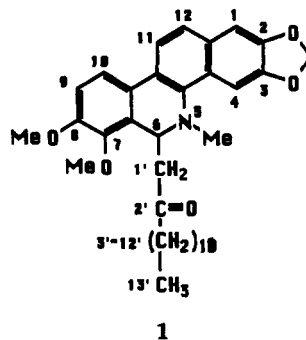
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ABSTRACT.—Two new compounds, tridecanonchelerythrine [**1**] and conifegerol [**2**], were isolated from *Zanthoxylum integrifoliolum*, and their structures were elucidated on the basis of spectroscopic data including 2D nmr.

Zanthoxylum integrifoliolum Merr. is a Rutaceous plant growing in the northern Philippines and occasionally in Eastern Taiwan (1). Thirty-two components isolated from this plant have been previously reported (2,3), including triterpenoids, steroids, coumarins, and alkaloids.

Two new compounds, tridecanonchelerythrine [6-(2'-oxotridecyl)dihydrochelerythrine] [**1**] and conifegerol [{*trans*-4-(3,7-dimethylocta-2,6-dienyl)-3-methoxy]phenyl-2-propen-1-ol} [**2**], were isolated by our group. Compound **1** belongs to the benzo[*c*]phenanthridine alkaloids. It is a 6-substituted dihydrochelerythrine. The long chain of the 2'-oxotridecyl group is interesting, in comparison with other known 6-substituted dihydrochelerythridines, 6-(2'-ketobutyl)dihydrochelerythrine (4) and 6-(2'-acetyl)dihydrochelerythrine (5,6). Compound **2**, which is fragrant, can be viewed as an ether of a coniferyl alcohol and a geraniol.

The uv spectrum suggested that tridecanonchelerythrine [**1**] belonged to the 2,3,7,8-tetrasubstituted benzo[*c*]phenanthridinic group (7). The ms fragmentation is characteristic of 6-substituted benzo[*c*]phenanthridines with a parent peak at *m/z* 348 (5). In the positive ion fabms, the peak at *m/z* 546 [M+1]⁺ suggested that the mol wt of the 6-substituted group is 197. The ¹³C-nmr



and DEPT spectra showed a total of 33 carbon peaks, including 13 peaks of an oxotridecyl group (a carbonyl peak at δ 210.44, an Me peak at δ 14.18, and 11 methylene peaks at δ 22.76, 23.51, 29.27, 29.37, 29.43, 29.50, 29.56, 29.70, 32.00, 44.29, 45.91). In the ¹H-nmr spectra, the splitting patterns and coupling constants of H-6 (δ 5.06, dd, 11 and 3.7 Hz), H_a-1' (δ 2.20, dd, 15.0 and 3.7 Hz), and H_b-1' (δ 2.60, dd, 15.0 and 11.0 Hz) demonstrated that the only possible position of the carbonyl group is between C-1 and C-3'; otherwise the H_a-1' and H_b-1' peaks would be further split by H-3. From the above experimental results, the chemical structure of **1** was proposed.

The ms fragmentation of conifegerol [**2**] was characteristic of a coniferyl alcohol with a parent peak at *m/z* 180

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[M-136]⁺ (8). In the ¹H-nmr spectra, the chemical shifts and coupling constants of H-2 (δ 6.96, d, 1.8 Hz), H-5 (δ 6.82, d, 8.1 Hz), and H-6 (δ 6.90, dd, 1.8 and 8.1 Hz) indicated a 1,3,4-trisubstituted benzene. These three substituted groups were proposed as follows: one is an MeO group (δ 3.89), another is a geranyloxy group (refer to the ¹H-nmr assignments of geraniol) (9), and the other is a *trans*-3-hydroxy-1-propenyl group [H-3" (δ 6.55, d, 15.9 Hz), H-2" (δ 6.24, td, 6.0 and 15.9 Hz), 2× H-1" (δ 4.31, d, 6.0 Hz), OH (δ 1.62, s), OH and C-1" are connected as proven by the COSY spectrum]. The NOESY spectrum showed the nOe correlation as follows: H-5 correlates to H-1'; H-6 to H-3"; and H-2 to both H-2" and OMe. In this way, the only possible arrangement of the substituted groups was that the *trans*-3-hydroxy-1-propenyl, MeO, and geranyloxy group are on positions 1, 3, and 4, respectively. From the above experimental results, the chemical structure of **2** was proposed.

EXPERIMENTAL

PLANT MATERIAL.—The bark of *Z. integrifolium* was collected in eastern Taiwan on June 29, 1989. The freshly collected sample was air-dried and stored in the dark.

EXTRACTION AND ISOLATION.—The dried bark (2.83 kg) was extracted with cold MeOH. The MeOH solution was concentrated under reduced pressure, and the residue was partitioned between CHCl₃ and H₂O. The CHCl₃ layer was extracted with 5% NaOH solution. The remaining CHCl₃ layer was further concentrated to a residue (25.87 g). This residue was chromatographed on Si gel, eluted with *n*-hexane containing increasing amounts of EtOAc (1–10%). The fractions eluted by 5% EtOAc were collected and concentrated. After crystallization in MeOH, compound **1** (0.022 g) was obtained from the above residue (0.184 g).

The column was further eluted with C₆H₆/EtOAc. The fractions eluted by 25% EtOAc were collected and concentrated. The residue was chromatographed on preparative tlc over Si gel with the mobile phase of *n*-hexane–Et₂O–EtOAc (1:1:1). The middle band, under uv light, was collected and eluted with CHCl₃. After concentration, compound **2** (0.015 g) was obtained.

Tridecanonchelerythrine [**1**].—Mp 68–72°;

eims *m/z* [M]⁺ 348, 333, 332, 290; positive ion fabms *m/z* [M+1]⁺ 546, 545, 349, 334, 332, 290; uv (MeOH) 229 (4073) 283 (4785) 320 sh (1514); ir (KBr) 2940, 1720, 1500, 1480, 1045, 950 cm⁻¹; ¹H nmr δ 0.88 (13-Me, s), 1.00–1.60 (H-4'-H-12', m), 2.20 (H₁-1, dd, *J*=3.7, 15.0), 2.22 (2×H-3', t, *J*=8.0), 2.60 (H₅-1', dd, *J*=11.0, 15.0), 2.64 (NMe, s), 3.90 (OMe, s), 3.93 (OMe, s), 5.06 (H-6, dd, *J*=3.7, 11.0), 6.04 (OCH₂O, q), 6.96 (H-9, d, *J*=8.5), 7.11 (H-1, s), 7.49 (H-12, d, *J*=8.5), 7.51 (H-4, s), 7.55 (H-10, d, *J*=8.5), 7.71 (H-11, d, *J*=8.5); ¹³C nmr δ 14.18 (C-13'), 22.76 (C-12'), 23.51 (C-4'), 29.27, 29.37, 29.43, 29.50, 29.56, and 29.70 (C-5'-C-10'), 32.00 (C-11'), 42.92 (NMe), 44.29, 45.91, 55.93 (8-OMe), 61.18 (7-OMe), 100.97, 101.31 (OCH₂O), 104.62, 111.67, 119.13, 120.10, 123.63, 124.15, 125.10, 127.65, 128.74, 131.35, 140.00, 145.86, 147.94, 148.52, 152.59, 210.44 (CO).

Conifegrol [**2**].—Eims *m/z* [M]⁺ 316, 180, 152, 137, 124; uv (MeOH) 220 (33,884) 265 (19,952) 295 sh (7586); ir (neat) 3350, 2940, 1600, 1500, 1450, 1250 cm⁻¹; ¹H-nmr δ 1.60 (Me, s), 1.62 (OH, s), 1.67 (Me, s), 1.72 (Me), 2.00–2.20 (H₂-4' and H₂-5', m), 3.89 (OMe, s), 4.31 (2×H, d, *J*=6.0), 4.62 (2×H-1', d, *J*=6.4), 5.08 (H-6', m), 5.51 (H-2', dt, *J*=1.2, 6.4), 6.24 (H-2", td, *J*=6.0, 15.9), 6.55 (H-3", d, *J*=15.9), 6.82 (H-5, d, *J*=8.1), 6.90 (H-6, dd, *J*=1.8, 8.1), 6.96 (H-2, d, *J*=1.8) (the δ 1.62 peak disappeared when D₂O was added); ¹³C nmr δ 16.90 (Me), 17.90 (Me), 25.92 (Me), 26.45 (C-4'), 39.79 (C-5'), 56.11 (OMe), 64.18 (C-1"), 66.17 (C-1'), 109.36 (C-2), 113.32 (C-5), 120.06 (C-2'), 120.14 (C-6), 124.33 (C-6'), 126.91 (C-2"), 130.16 (C-7'), 131.74 (C-3"), 132.16 (C-3'), 141.24 (C-1), 148.68 (C-4), 149.96 (C-3).

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