

NOTE

DIPRENYLATED XANTHONE FROM THE STEM BARK OF KANDIS GAJAH (*Garcinia griffithii*)

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ABSTRACT

A diprenylated xanthone, 1,5-dihydroxy-3-methoxy-4,7-diprenylxanthone (**1**) had been isolated the first time from the dichloromethane extract of the stem bark of *Garcinia griffithii*, together with 1,7-dihydroxyxanthone (**2**) and polyisoprenylated benzophenone, guttiferone I (**3**). The structure of these compounds were determined on the basis of spectroscopic data including UV, IR, ¹H NMR, ¹³C NMR, HMQC, HMBC and COSY.

Keywords: diprenylated xanthone, 1,5-dihydroxy-3-methoxy-4,7-diprenylxanthone, *Garcinia griffithii*

INTRODUCTION

The genus *Garcinia* (Guttiferae) is known to produce a variety of biologically active metabolites such as polyisoprenylated benzophenone and xanthone [1,2]. Some of them exhibited a wide range of biological activities such as cytotoxic, antifungal, antimicrobial, antioxidant, antiinflammatory, and antiHIV activities [3,4]. *Garcinia griffithii* T. Anders. is a medium-sized tree found in South East Asia [5]. No medicinal uses are recorded for this species although it has been used as a fruit tree [6]. As part of a phytochemical study of our research, we have previously reported the presence of 1,7-dihydroxyxanthone (**2**) [7] and guttiferone I (**3**) [8] and now describe the isolation and structural elucidation of further constituent of the stem bark of *G. griffithii* collected in West Sumatra.

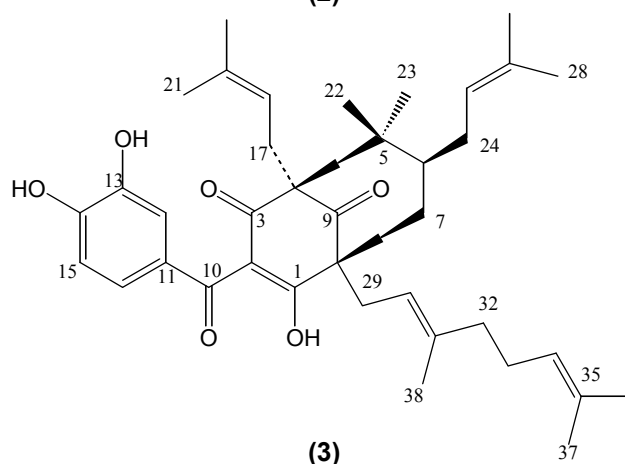
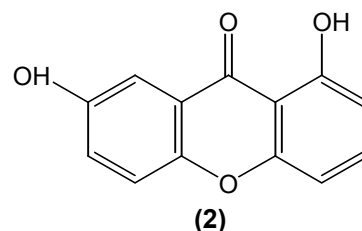
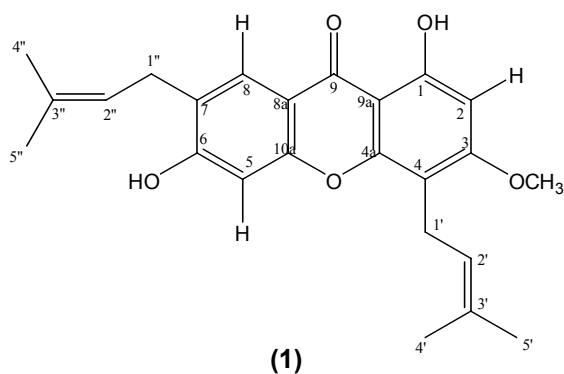
EXPERIMENTAL SECTION

Materials

Vacuum Liquid Chromatography (VLC) was carried out using Merck Si Gel 60 GF254 (230-400 Mesh), column chromatography using Si Gel 60 (70-230 mesh), TLC analysis was performed on Si Gel plates (Merck kieselger 60 GF254, 0,25 mm, 20x20 cm). Solvents were of technical grade and were distilled before use.

Instrumentation

Melting point was determined on a micromelting point apparatus UV and IR spectra were measured with Cary Varian 100 Conc. and Shimadzu FTIR 8400 spectrophotometers, respectively. The ¹H and ¹³C NMR spectra were recorded using JEOL JNM ECA-500 FTNMR spectrometer, operating at 500 MHz (¹H) and



125 MHz (^{13}C) with TMS as an internal reference and CDCl_3 as a solvent.

Plant material

Stem bark of *G. griffithii* was collected on April 2006 from the Sarasah Bonta, Lembah Arau, Kabupaten Lima Pulu Kota, West Sumatra. The plant was identified by the staff at the Andalas University Herbarium (ANDA), Padang and voucher specimen had been deposited at the Herbarium.

Extraction and isolation of the compounds

Powdered stem bark (1 kg) of the plant was successively extracted into three fractions with hexane (35.2 g of dry weight), dichloromethane (23.5 g), and methanol (125.4 g). A portion (20 g) of the total dichloromethane extract was fractionated by VLC eluted with hexane- dichloromethane of increasing polarity and dichloromethane-methanol (9:1, 8:2, and 7:3) to given six fractions F1–F6 (2.61; 2.23; 1.71; 7.98; 4.04; and 5.80 g respectively). The first fraction, F1 (2.50 g) was further fractionated by column chromatography eluted with hexane-ethylacetate of increasing polarity to given five fractions F1.1–F1.5. Purification at the third fraction, F1.3 by column chromatography eluted with hexane-ethylacetate (8:2) afforded compound **1** (6 mg). Fraction F4 (4.91 g) was further fractionated by column chromatography eluted with hexane-ethylacetate of increasing polarity to given five fractions F4.1–F5.5. Fraction F4.1 had been recrystallization afforded compound **2** (10 mg). Fraction F4.4 had been recolumn chromatography eluted with hexane-dichloromethane (4:6) afforded compound **3** (5 mg).

RESULT AND DISCUSSION

The dichloromethane extract from the stem bark of *Garcinia griffithii* had been isolated a diprenylated xanthone, 1,5-dihydroxy-3-methoxy-4,7-diprenylxanthone (**1**) as a yellow solid, m.p. 153-155°C. The UV spectrum showed absorptions at λ_{max} 236 and 255 nm revealed aromatic and conjugated carbonyl chromophores. Some bathochromic shifts of absorption bands in the spectrum (λ_{max} 205, 368 nm) suggested the presence of xanthone skeleton [9]. The IR spectrum exhibited bands for hydroxyl (3375.4 cm^{-1}), alifatic C-H (2923.9 and 2854.5 cm^{-1}), carbonyl (1643.2 cm^{-1}), aromatic C=C (1600.8 , 1581.5 , 1481.2 cm^{-1}) and C-O eter (1115 cm^{-1}).

The $^1\text{H-NMR}$ spectrum (Fig 1) revealed the presence of three singlet aromatic signal at δ_{H} 6.14, 6.37, and 7.59 ppm, one methoxy group at δ_{H} 3.90 ppm (3H, s), two hydroxyl and two prenyl group. The presence of a chelated hydroxyl and another one hydroxyl group showed by the signal at δ_{H} 13.13 ppm (1H, s), 5.67 ppm (1H, s). One of prenyl group characterized by the signal at δ_{H} 3.50 ppm (2H, d, $J=7.3$, H-1'), 5.21 ppm (1H, t, $J=7.3$, H-2'), 1.85 ppm (3H, s, H-4'), 1.70 ppm (3H, s, 1H-5') respectively. The other of prenyl group characterized by the signal at δ_{H} 3.42 ppm (2H, d, $J=7.4$, H-1''), 5.34 ppm (1H, t, $J=7.4$, H-2''), 1.75 ppm (3H, s, H-4''), 1.77 ppm (3H, s, 1H-5'') respectively. The ^{13}C NMR spectrum revealed the presences of 24 carbon resonances due to a carbonyl carbon, 12 aromatic carbon, one methoxyl group and 10 carbon of two prenyl group.

The position of the side chains were assigned from the HMBC spectrum (Tabel 1). The methylen

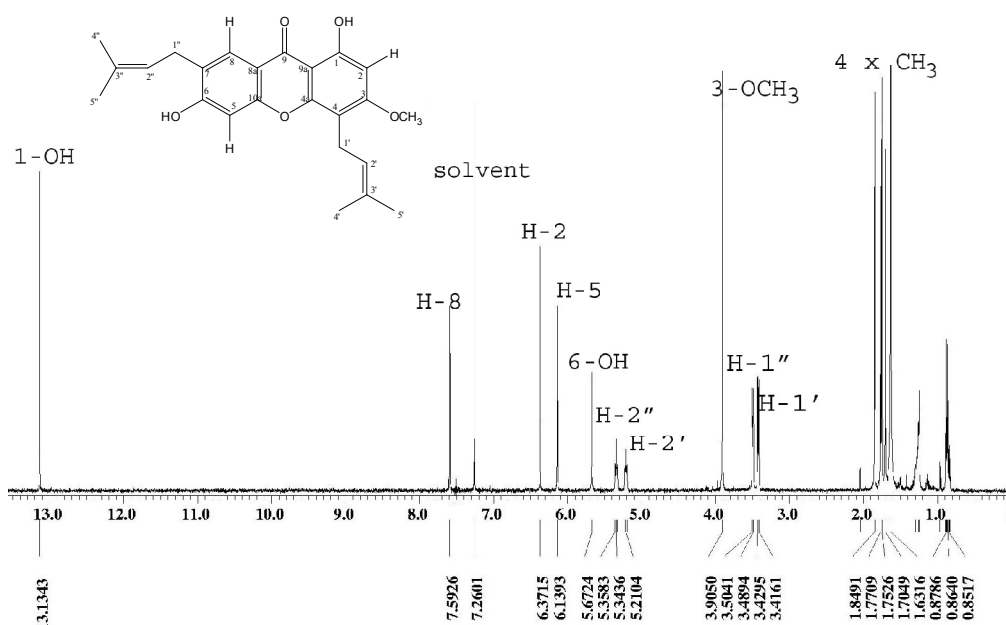


Fig 1. $^1\text{H-NMR}$ spectrum of **1** (CDCl_3 , 500 MHz).

Table 1. ^1H (500 MHz), ^{13}C (125 MHz), HMBC and COSY data for **1** in CDCl_3

No. C	^1H (ppm)	^{13}C (ppm)	HMBC	COSY
1		162.3		
2	6.37 (1H,s)	94.5	103.1, 107.5, 162.3	
3		163.8		
4		107.5		
4a		153.9		
5	6.14 (1H,s)	113.5	125.5 , 147.9	
6		147.9		
7		125.5		
8	7.59 (1H,s)	117.2	143.9, 147.9, 180.9	
8a		130.3		
9		180.9		
9a		103.1		
10a		143.9		
1'	3.50 (2H, d, J=7.3)	21.9	107.5, 123.0, 131.9, 153.9, 163.8	5.21 , 1.70
2'	5.21 (1H, t, J=7.3)	123.0		3.50
3'		131.9		
4'	1.85 (3H, s,)	18.1	25.8, 123.0, 131.9	
5'	1.70 (3H, s,)	25.8	18.1, 123.0 , 131.9	3.50
1''	3.42 (2H, d, J=7.4)	28.6	117.2, 121.2, 125.5, 134.5, 147.9	5.34 , 1.77
2''	5.34 (1H, t, J=7.4)	121.2		3.42
3''		134.5		
4''	1.75 (3H, s)	18.1	26.0 , 134.5	
5''	1.77 (3H, s)	26.0	18.1 , 121.2	3.42
1-OH	13.13 (1H, s)			
3-OCH ₃	3.90 (3H, s)	56.3	163.8	
5-OH	5.67 (1H, s)			

protons at δ_{H} 3.50 (H-1') showed five correlations [2J : C-4 (107.5), C-2' (123.0); 3J : C-3' (131.9), C-4a (153.9), C-3 (163.8)] which required the placement of one of the 3-methylbut-2-enyl groups at C-4. The methylene protons at δ_{H} 3.42 (H-1'') showed five correlations [2J : C-7 (125.5), C-2'' (121.2); 3J : C-3'' (134.5), C-6 (147.9), C-8 (117.2) which required the placement of the other 3-methylbut-2-enyl groups at C-7. The methoxy proton at δ_{H} 3.90 showed correlation with 2J : C-3, which required the placement of one methoxy groups at C-3.

Three aromatic proton at δ_{H} 6.37 showed three correlations [2J : C-1 (162.3); 3J : C-4 (107.5), C-9a (103.1)], δ_{H} 6.14 showed two correlations [2J : C-6 (147.9); 3J : C-7 (125.5)] and δ_{H} 7.59 showed three correlations [3J : C-6 (147.9), C-9 (180.9), and C-10a (143.9)] which required the placement of three aromatic proton at C-2, C-5 and C-8, respectively. The hydroxyl proton at δ_{H} 13.13 showed correlation with 3J : C-2 (94.5) and the other hydroxyl proton at δ_{H} 5.67 correlation with 2J : C-6 (147.9), which required the placement of two hydroxyl groups at C-1 and C-6, respectively. Correlation ^1H - ^{13}C HMBC (Fig 2 and Fig 3).

The allylic methylene proton at δ_{H} 3.50 (H-1') a COSY cross-peak to methine and methyl protons at δ_{H} 5.21 (H-2') and 1.70 (H-5') respectively, δ_{H} 5.21 (H-2')

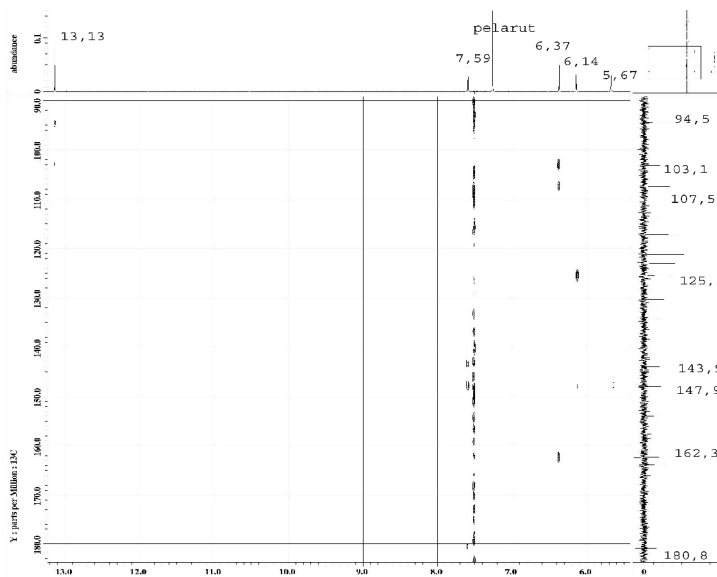


Fig 2. HMBC spectrum of **1**: correlation of two hydroxyl proton (1-OH and 6-OH) and three aromatic proton (H-2, H-5, and H-8) (CDCl_3 , 500 MHz).

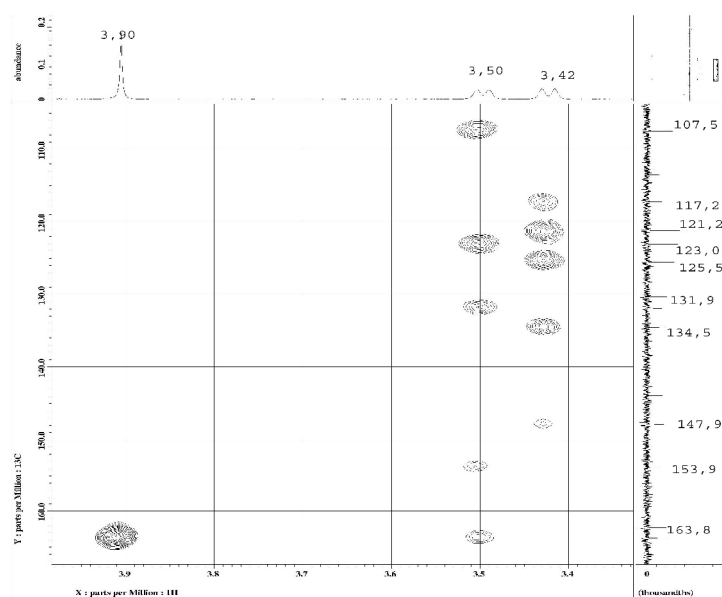


Figure 3. HMBC spectrum of **1**: correlation of H-1'; H-2'' and 3-OCH₃ (CDCl₃, 500 MHz).

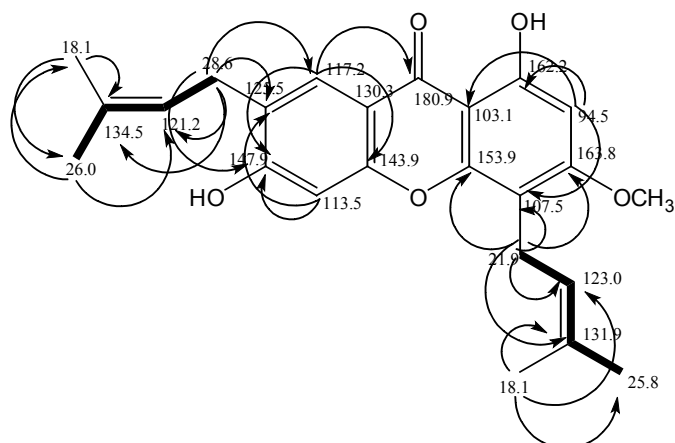


Fig 4. Arrows denote key HMBC correlations and bold lines indicate COSY cross peak for **1**

cross-peak to 3.50 (H-1'), and δ_H 1.70 (H-5') cross-peak to 3.50 (H-1'). The allylic methylene proton at δ_H 3.42 (H-1'') a COSY cross-peak to methine and methyl protons at δ_H 5.34 (H-2'') and 1.77 (H-5'') respectively, δ_H 5.34 (H-2'') cross-peak to 3.42 (H-1''), δ_H 1.70 (H-5') cross-peak to 3.42 (H-1''). The methoxy protons at δ_H 3.90 / δ_C 56.3 correlated with C-3 (163.8). The HMBC and COSY correlation of **1** (Fig 4).

CONCLUSION

A diprenylated xanthone, 1,5-dihydroxy-3-methoxy-4,7-diprenylxanthone had been isolated from the dichloromethane extract of the stem bark of *Garcinia*

griffithii, together with 1,7-dihydroxyxanthone (**2**) and polyisoprenylated benzophenone, guttiferone I (**3**). Existence of compound **1** owning important meaning at chemotaxonomy from *Garcinia* genus and add kinds of xanthone which have been found at *G. griffithii*.

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