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Chemical Constituents of *Garcinia prainiana*

(Komposisi Kimia *Garcinia prainiana*)

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ABSTRACT

Five compounds identified as friedelin 1, eupha-8, 24- diene 3-β-ol 2, stigmasterol 3, teraxerone 4 and teraxerol 5 have been isolated from Garcinia prainiana *(Guttiferae) for the first time. There has been no previous report on the chemical constituents and biological activities of this plant. Compounds 1, 2 & 3 were isolated from the methanol extract of the twigs while compounds 4 & 5 were isolated from the methanol extract of the leaves. The structures for all the compounds were evaluated based on spectroscopic analysis and comparison with the published information in the literature.*

Keywords: Garcinia prainiana*; Guttiferae; isolation; structure elucidation*

ABSTRAK

Lima sebatian yang dikenal pasti sebagai friedelin 1, eupha-8, 24- diene 3-β-ol 2, stigmasterol 3, teraxerone 4 dan teraxerol 5 telah dipisahkan buat pertama kali daripada Garcinia prainiana *(Guttiferae). Komposisi kimia dan aktiviti biologi ke atas G. prainiana belum pernah dilaporkan sebelum ini. Sebatian 1, 2 dan 3 telah dipisahkan daripada ekstrak metanol ranting manakala sebatian 4 dan 5 daripada ekstrak metanol daun. Struktur semua sebatian telah ditentukan dengan bantuan data spektroskopi dan perbandingan dengan data literatur.*

Kata kunci: Garcinia prainiana*; Guttiferae; pemisahan; penentuan struktur*

INTRODUCTION

Garcinia is the most important genus of the Guttiferae family, widely distributed in tropical Africa, Asia, New Caledonia and Polynesia (Ampofo & Waterman 1986). *Garcinia* is well known to be rich in a variety of oxygenated and prenylated phenol derivatives (Bennet & Lee 1989; Peres et al. 2000). Some of these plants exhibited a wide range of biological activities such as cytotoxicity (Lannang et al. 2010; Xu et al. 2010), anti-fungal, anti-oxidant, anti-inflammatory and anti HIV activities (Hay et al. 2004; Hiroyuki et al. 1996; Merza et al. 2004; Nkengfack et al. 2002). Some *Garcinia* species are well known in Asia as medicinal plants and are widely used in folk medicines. For example in Thailand, the stem bark of *Garcinia dulcis* has been used as an inflammatory agent and its fruit juice has been used in traditional medicine as an expectorant (Deachathai et al. 2005). In Indonesia, the leaves and seeds of this genus have been used for the treatment of lymphatitis, parotitis and struma (Likhitwitayawuid et al. 1997). Biologically active substances have also been isolated from the stem bark of *Garcinia smeathmannii* (Komguem et al. 2005).

Most of the species diversity of this genus is centered in Asia with about 400 species and 49 species have been recorded for Malaysia (Whitmore 1973). In our continuing phytochemical investigation of *Garcinia* plants found in Malaysia, we have examined the twigs and leaves of *Garcinia prainiana* known locally by the Malay as *kecupu*. We report the isolation and structure elucidation of friedelin 1, eupha-8, 24- diene 3-β-ol 2, stigmasterol 3, teraxerol 4 and teraxerone 5 from the methanol extract of *G. prainiana* as additional information to the phytochemical work done previously on other *Garcinia* species found in Malaysia (Ee & Mong 2005; Jabit et al. 2007).

MATERIALS AND METHODS

GENERAL EXPERIMENTAL PROCEDURES

The optical rotation was measured with a JASCO DIP-370 polarimeter (digital series) at 26° C (589 nm) using chloroform as solvent and melting points were determined with an Electro thermal apparatus (digital series) and were uncorrected. Ultraviolet (UV) spectra were recorded with a Shimadzu UV-160 Spectrophotometer, in ethanol and methanol solutions in 1 cm Quartz cells. IR spectra were recorded on a Perkins-Elmer GX FTIR instrument using potassium bromide pellets and sodium chloride cells. NMR spectral analyses were carried out with JEOL FT-NMR 400 ECP Spectrometer at 400 MHz (^{1}H) and 100 MHz (^{13}C). ^{1}H-^{1}H COSY, ^{1}H-^{1}H NOESY, ^{1}H-^{13}C HMQC and ^{1}H-^{13}C HMBC were obtained with the usual pulse sequence and data processing was performed with the standard JEOL software. The samples were dissolved in $CDCl_3$ and chemical shifts (in ppm) were referenced to TMS for ^{1}H NMR and the residual solvent peak for ^{13}C NMR while the coupling constants (*J*) are in Hertz. Mass spectra were measured using Hewlett-Packard GC-MS (operating at

70eV), attached to a VG-display digispec data acquisition system computer.

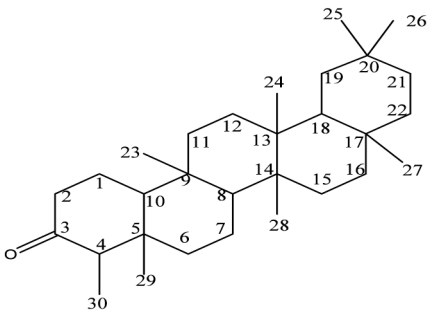
Thin Layer Chromatography (TLC) was carried out on pre-coated silica gel 60 F_{254} TLC plate (Merck, art 5554). The plates were visualized under ultraviolet light (λ_{254} nm, model UVGL-58) and by charring the compounds after spraying the plates with 10% sulphuric acid. The conventional column chromatography was done using silica gel 60 (230-400 mesh ASTM) (Merck, art 9385) while the vacuum liquid chromatography was done over silica gel 60 GF_{254} (TLC grade) (Merck, art. 7730). Radial chromatography was performed on Chromatotron using silica gel 60 PF_{254} containing gypsum (TLC grade) (Merck, art. 7749).

PLANT MATERIAL

Garcinia prainiana was collected from the Experimental plot of Universiti Kebangsaan Malaysia (UKM) and deposited at UKM Herbarium.

EXTRACTION AND ISOLATION

Triterpenoids were extracted by the method described by Rukachaisirikul et al. (2003) and Vieira et al. (2004). Powdered air-dried twigs samples (500 g) were macerated with methanol at room temperature for three days and the process was repeated three times. The extract was evaporated to dryness using a rotary evaporator. This crude extract was partitioned between chloroform-water to obtain chloroform and water fractions. The chloroform fraction was further partitioned with 90% methanol-hexane. The methanol extract was further fractionated using vacuum liquid chromatography over silica gel with hexane-ethyl acetate (9: 1) and chloroform-methanol as eluent. The eluates were combined based on their TLC profile to give four subfractions. Subfraction 1 (400 mg) was further purified on chromatotron (1 mm thickness plate) using hexane-ethyl acetate by increasing polarity to afford 1 (12.7 mg). Subfractions 2 (238 mg) and 3 (450 mg) were further purified individually by chromatotron using hexane-ethyl acetate with increasing polarity to give



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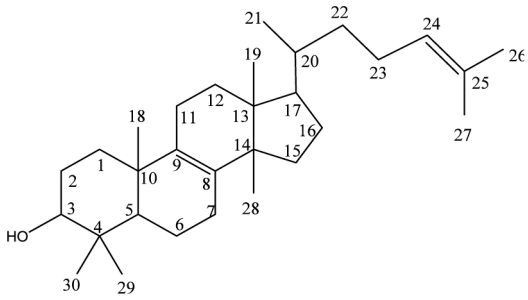

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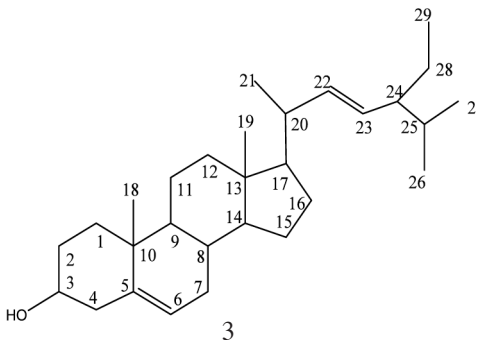

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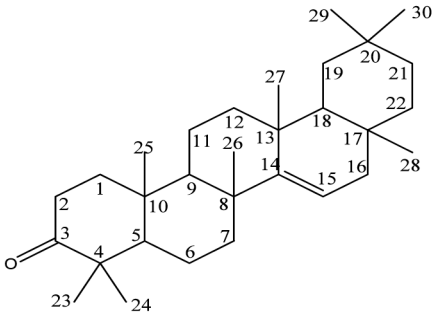

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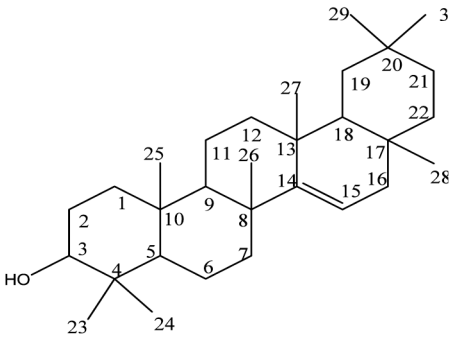

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pure compounds 1 (5.6 mg) and 2 (13.8 mg), respectively. Subfraction 4 was subjected to flash CC on reversed phase silica gel C-18 with solvent mixture of decreasing polarity and subsequent prep TLC to afford 3 (11.3 mg).

Air-dried leaves of *Garcininia prainiana* (1565.8 g) were ground and macerated with methanol (9.50 L) at room temperature for three days and the process were repeated three times. The extract was evaporated to drynessby using a rotary evaporator to obtain crude methanol extract (227.78 g). This crude extract (177.53 g) was partitioned between chloroform-water (1:1) to yield the chloroform and aqueous fractions. The chloroform fraction was then evaporated to obtain crude chloroform extract (50.53 g) which was further partitioned with 90% methanol-hexane (1:1) to yield crude methanolic (25.69 g) and hexane (18.65 g) extracts after removal of solvent.

The crude methanol extract (15.75 g) was separated by using vacuum liquid chromatography over silica gel using hexane-ethyl acetate (9 : 1) and chloroform-methanol (step gradient polarity), respectively. The eluates were combined based on their TLC profile to give two subfractions. The first subfraction (350.50 mg) was purified using chromatotron (1 mm thickness plate) with hexane-ethyl acetate as eluting solvent system to afford 4 (7.2 mg) and 5 (5.3 mg). The second subfraction was purified by a similar method to afford only 5 (6.1 mg).

COMPOUND 1 (FRIEDELIN)

White needles (18.3 mg), m. p. 260-263 °C, optical rotation $[\alpha]_D$ -21° ($CHCl_3$) (c 0.51). IR ν_{max} (KBr) cm^{-1} : 3435, 2927, 2866, 1715, 1639, 1463, 1360, 1108, 1071. MS *m/z* (int. rel. %): 426 (M^+, 100), 411 (95), 393 (20.1), 69 (8).

^{1}H NMR ($CDCl_3$, 400 MHz) ppm :δ_H 0.72 (3H, *s*), 0.87 (3H, *s*, ovlp), 0.89 (3H, *s*, ovlp), 0.93 (3H, *s*), 0.95 (3H, *s*), 1.00 (3H, *s*), 1.05 (3H, *s*), 1.18 (3H,s), 1.96, 1.66 (2H, *m*), 1.34, 1.37 (8H, *m*), 1.39, 1.41 (8H, *m*), 1.48, 1.37 (2H, *m*), 1.39 (*m*), 1.45 (2H, *m*), 1.51 (1H, *m*), 1.55 (2H, *m*), 1.74, 1.77 (2H, *d, J*=11.71 Hz), 2.24 (1H, *d, J*=5.6 Hz), 2.26, 2.38 (*d*, *J*=7.4 Hz).

^{13}C NMR ($CDCl_3$, 100 MHz) ppm : δ_C 7.0 (C-23), 14.8 (C-24), 18.1 (C-25), 18.9 (C-26), 20.4 (C-27), 32.2 (C-28), 31.9 (C-29), 35.2 (C-30), 18.4 (C-7), 20.5 (C-1), 30.7 (C-12), 32.6 (C-15) , 35.5 (C-19), 35.8 (C-11), 36.1 (C-16), 39.4 (C-21), 41.4 (C-6), 41.7 (C-2), 42.9 (C-18), 53.2(C-8), 58.4 (C-4), 59.6 (C-10) , 213.6 (C-3, C=O), 28.3 (C-20), 30.2 (C-17), 32.9 (C-22), 37.6 (C-9), 38.4 (C-14), 39.8 (C-13), 42.3 (C-5).

COMPOUND 2 (EUPHA-8,24-DIEN-3B-OL)

Colourless needles (13.8 mg), m. p. 116-117 °C , optical rotation $[\alpha]_D$ -15.2° ($CHCl_3$) (c 0.53)
IR ν_{max} (KBr) cm^{-1}: 3435, 3019, 2949, 1636, 1452, 1375, 1020, 757, 624. MS *m/z* (int. rel. %): 426 (M^+, 100), 425 (21), 411 (94), 415 (51), 393 (20), 328 (36), 259, 213 (47), 173 (25), 145 (54).

^{1}H NMR ($CDCl_3$, 400 MHz): δ_H 0.73 (3H, *s*), 0.75 (3H, *s*), 0.80 (3H, *s*), 0.83 (3H, *s*), 0.85 (3H, *s*), 0.86 (3H, *s*), 0.95,1.00 (2H, *s*), 1.14(2H, *m*), 1.16 (2H, *m*), 1.31(1H, *m*), 1.32 (1H, *m*), 1.48 (1H, *m*), 1.52 (1H, *m*), 1.59 (3H, *bs*), 1.61 (3H, *m*), 1.70 (1H, *m*), 1.75 (2H, *m*), 2.20 (2H, *m*), 3.26 (1H, *d*, *J*=11.72), 5.10(1H, *bt*).

^{13}C NMR ($CDCl_3$, 100 MHz): δ_C 15.6 (C-19), 15.7 (C-30), 17.9 (C-26), 19.1(C-6), 20.3(C-18), 21.7(C-11), 24.6 (C-28), 25.9 (C-27), 27.8 (C-2), 28.1 (C-7), 28.2 (C-29), 28.3(C-12), 29.9 ((C-16), 31.0 (C-15), 35.4 (C-1), 35.5(C-22), 36.0 (C-20), 36.6 (C-23), 37.4 (C-4), 39.1 (C-10), 44.2 (C-13), 49.7 (C-17), 50.3 (C-5), 51.1 (C-14), 79.1 (C-3), 125.3(C-24), 131.1(C-8), 133.7 (C-25), 134.1 (C-9).

COMPOUND 3 (STIGMASTEROL)

Colourless needles (11.3 mg), m. p. 167°C, optical rotation $[\alpha]_D$ -16.63° C ($CHCl_3$) (c0.54). IR ν_{max} (KBr) cm^{-1}: 3435, 3019, 2940, 1636, 1422, 1380, 1215, 1020, 756, 669. MS *m/z* (int. rel. %): 412 (M^+ 28.6), 300 (16.8), 271 (26.9), 255 (30.2), 159 (30.2), 145 (28.6), 105 (35.3), 55 (100).

^{1}H NMR ($CDCl_3$, 400 MHz): δ_H 0.81 (3H, *s*), 0.84 (3H, *s*), 0.85(3H, *s*), 0.88 (3H, *s*), 0.95 (1H, *m*), 1.00 (1H, *m*), 1.06 (3H, *s*), 1.15, 1.16 (2H, *m*), 1.31-1.40 (2H, *m*), 1.55 (2H, *m*), 1.59 (1H, *m*), 1.69 (3H, *s*), 1.91-1.97 (2H, *m*), 2.07-2.51 (4H, *m*), 3.48 (1H, *m*), 5.11, 5.65 (*d*, *J*=5.1 Hz) .

^{13}C NMR ($CDCl_3$, 100 MHz): δ_C 15.6 (C-18), 15.7 (C-29), 17.9 (C-11), 18.9 (C-19), 19.1 (C-26), 19.2 (C-27), 24.8 (C-15), 25.4 (C-21), 25.7 (C-28), 25.9 (C-23), 28.0 (C-16), 28.4 (C-2), 29.1 (C-7), 30.5 (C-8), 34.3 (C-17), 35.3 (C-14), 35.4 (C-4), 35.5 (C-1), 35.9 (C-10), 41.1 (C-20), 44.7 (C-13), 46.2 (C-12), 47.6 (C-25), 49.6 (C-9), 50.0 (C-24), 122.0 (C-6), 125.3 (C-3), 131.1 (C-22), 142.0 (C-5).

COMPOUND 4 (TARAXERONE)

Colourless needles (7.2 mg), m. p. 239-240° C, optical rotation $[\alpha]_D$ +8.1° ($CHCl_3$) (c 0.97). IR ν_{max} (KBr) cm^{-1}: 3401, 2936, 2962, 2872, 1708, 1457, 1375, 1054, 970. MS *m/z* (int. rel. %): 424 (M^+, 26.8), 409 (19.2), 300 (84.8), 295 (66.4), 204 (100), 189 (35.6), 133 (76.0), 119 (50.8) and 107 (63.5).

^{1}H NMR ($CDCl_3$, 400 MHz): δ_H 0.73 (3H, *s*), 0.87 (3H, *s*), 0.89 (3H, *s*), 0.93 (3H, *s*), 1.05 (3H, *s*), 1.08 (3H, *s*), 1.09 (3H, *s*), 1.18 (3H, *s*), 2.24 (*m*), 2.13 (*m*), 5.56 (1H, *dd J*=3 & 8 Hz).

^{13}C NMR ($CDCl_3$, 100 MHz): δ_C 14.8 (C-25), 16.9 (C-11), 20.0 (C-6), 21.2 (C-30), 21.5 (C-24), 25.3 (C-27), 26.1 (C-23), 28.9 (C-20), 29.8 (C-26), 29.9 (C-28), 33.1 (C-22), 33.5 (C-29), 33.7 (C-21), 34.2 (C-2), 35.1 (C-7), 36.1 (C-12), 37.0 (C-16), 37.6 (C-13), 37.9 (C-10), 38.0 (C-17), 38.4 (C-1), 38.9 (C-8), 40.9 (C-19), 47.9 (C-4), 49.0 (C-18), 49.1 (C-9), 55.9 (C-5), 116.3 (C-15), 157.9 (C-14), 218.0 (C-3).

COMPOUND 5 (TARAXEROL)

colourless needles (11.4 mg), m. p. 279-280° C, optical rotation $[\alpha]_D$ + 61° ($CHCl_3$), IR ν_{max} (KBr) cm^{-1}: 3401, 2916, 2849, 1609, 1460, 1441, 1383, 1376, 1037, 762. MS *m/z* (int. rel. %): 426 (M^+, 6.3), 411 (6.3), 302 (35.4), 287 (34.6), 218 (26.8), 204 (100), 189 (27.6), 135 (35.4).

^1H NMR ($CDCl_3$, 400 MHz): δ_H 0.77 (1H, *d*), 0.82 (3H, *s*), 0.83 (3H, *s*), 0.91 (3H, *s*), 0.93 (3H, *s*), 0.95 (3H, *s*), 0.96 (1H, ovlp), 0.97 (3H, *s*), 1.00 (1H, ovlp), 1.10 (3H, *s*), 1.20 (3H, *s*), 1.31 (1H, ovlp), 1.34 (1H, ovlp), 1.35 (1H, ovlp), 1.37, 1.26 (1H, ovlp), 1.41 (2H, ovlp), 1.46 (1H, ovlp), 1.61, 1.55 (1H, *m*), 1.62, 1.48 (1H, ovlp), 1.64 (1H, ovlp), 1.92 (1H, *bdd*), 2.03 (1H, *dt*), 3.19 (1H, *m*), 5.51 (1H, *m*).

^{13}C NMR ($CDCl_3$, 100 MHz): δ_C 15.5 (C-24), 15.6 (C-25), 17.5 (C-11), 19.1 (C-6), 21.5 (C-30), 26.0 (C-27), 27.3 (C-2), 28.1 (C-23), 29.1 (C-20), 29.9 (C-28), 30.2 (C-26), 33.1 (C-22), 33.5 (C-29), 34.0 (C-21), 35.2 (C-7), 35.9 (C-12), 36.8 (C-16), 37.8 (C-13), 37.9 (C-17), 38.0 (C-10), 38.1 (C-1), 39.0 (C-4), 39.1(C-8), 41.3 (C-19), 49.0 (C-9), 49.5 (C-18), 55.8 (C-5), 79.1 (C-3), 116.9 (C-15), 157.9 (C-14).

Results and Discussion

The mass spectrum of compound 1 showed a molecular ion [M^+] at m/z 426 (100%) which corresponded to the molecular formula of $C_{30}H_{50}O$. There was no significant UV absorption but the IR spectrum showed a band at 1715 cm^{-1} indicating the presence of a carbonyl group and C-H stretching vibration at 2927 cm^{-1} while the methyl bending vibration is at 1360 cm^{-1}. The ^1H spectrum revealed the presence of eight methyl groups, all of which were singlets. The spectrum exhibited a pair of deshielded methylene protons at 2.26 ppm and 2.38 ppm (*d*, *J*=7.4 Hz). Other characteristic peaks appeared at 0.93 ppm which was typical of a C-4 methyl in a fridelane type triterpene. The ^{13}C nmr spectrum and APT spectrum displayed 30 carbons including eight methyls, ten methylenes, four methynes and eight quaternary carbons. One quaternary carbon, δ_C 213 ppm was typical for carbonyl C=O, while there was no sp^2 carbon indicating the absence of double bonds. The correlations of carbon to its proton were concluded by using HMQC spectrum and the positions of carbons and protons were recorded by HMBC spectrum.

Based on the spectral data, 1 was elucidated as friedelin and the structure was confirmed by comparison of its physical properties (Bandara et al. 1986), and proton and carbon NMR data to literature (Abu et al. 1991; Klass et al. 1992). Friedelin was also isolated from the methanolic extract of *Garcinia smeathmannii* Oliver (Clucsiaceae) by Kuete et al. (2007) and also from the bark of *Garcinia speciosa* (Vieira et al. 2004). The antimicrobial activity of triterpenes especially friedelin from *Garcinia* species is well documented (Kuete et al. 2007).

The mass spectrum of compound 2 showed a molecular ion M^+ at *m/z* 426, corresponding to $C_{30}H_{50}O$. Fragment ions at *m/z* 393 and *m/z* 259 indicated the presence of two double bonds while loss of a Me (15 amu) group gave a molecular ion at *m/z* 411 (94%). The IR spectrum displayed absorption for hydroxyl –OH, at 3435 cm^{-1}. Vibration of C=C stretching absorbed at 1636 cm^{-1} while C-H bending for CH_3 was observed at 1452 cm^{-1}. Vibration of C-H stretching of alkane was observed at 3019 and 2949 cm^{-1}. The ^1H spectrum showed eight tertiary methyls appearing as singlets (each) at δ_H 0.73, 0.75, 0.80, 0.83, 0.85, 0.86, 0.95 and 1.00. The other significant peaks appeared at δ_H 1.59, 3.26 and 5.10. The ^{13}C spectrum displayed 30 carbon signals including eight methyls, ten methylenes, five methynes and seven quaternary carbons. Four carbons were detected as sp^2 carbons for two double bonds at δ_C 125.3, 131.1, 133.7 and 134.1. Only one oxygenated carbon (δ_C 79.1 ppm) was present that led to identification of 2 as triterpenoid alcohol. The positions were confirmed by ^1H-^1H correlation in the COSY spectrum.

On comparison of physical properties, ^1H and ^{13}C NMR data to the literature (Spino et al. 1995) and based on spectral data, 2 was identified as eupha-8, 24-dien-3β-ol. The mass spectrum of compound 3 showed a molecular ion peak [M^+] at *m/z* 412 which corresponded to molecular formula $C_{29}H_{48}O$. The ^1H spectrum showed the presence of six methyl groups of a stigmastane carbon skeleton, identical to stigmasterol which appeared at δ_H 0.81, 0.84, 0.85, 0.88, 1.06 and 1.69 ppm. Olefinic protons at δ_H 5.10 and 5.65 ppm (1H each, *d, J*=5.1 Hz) represented for H-22 and H-23 side chain. The deshielding effect of protons at δ_H 3.50 ppm (1H, *m*) (H-3) indicated, they were bonded to oxygenated tertiary carbon. The ^{13}C spectrum displayed 29 carbon signals including six methyls. The correlation of carbons to their respective hydrogens was found by using HMQC spectrum and the assignments were supported by H-C correlation based on HMBC spectrum.

Similarity of the above ^{13}C and ^1H spectral data to those of published data (Jamal et al. 2009; Kojima et al. 1990; Viswanadh et al. 2006) identified 3 as stigmasterol.

The mass spectrum of compound 4 showed a molecular ion [M^+] at *m/z* 424, which corresponded to molecular formula $C_{30}H_{48}O$. An intense peak appeared at *m/z* 204 (100%) and *m/z* 300 (84.8%) indicated the presence of a double bond while loss of methyl (15 amu) gave an ion at *m/z* 409 (19.2%). The IR spectrum showed a band for the presence of a carbonyl at 1708 cm^- and C-H stretching vibration at 2936 cm^{-1} while the methyl bending vibration is at 1375 cm^{-1} .The ^1H spectrum revealed the presence of eight methyl groups, all of which were singlets (δ_H 0.73, 0.87, 0.89, 0.93, 1.05, 1.08, 1.09 and 1.18 ppm) and one olefinic proton at 5.56 ppm (1H, *dd, J*= 3 & 8 Hz). The ^{13}C spectrum showed 30 carbon signals including eight methyls, ten methylenes, four methynes and eight quaternary carbons. One quaternary carbon, δ_C 218.0 ppm was typical for carbonyl C=O, while there were two sp^2 carbons (-CH=C<) at 116.3 and 157.9 ppm. indicating one double bond.

The position of carbons and protons was established by HMBC spectrum and by comparing with literature information, compound 4 was identified as taraxerone.

This is the first time taraxerone is isolated from a *Garcinia* species.

The mass spectrum of compound 5 showed a molecular ion [M^+] at *m/z* 426, corresponded to $C_{30}H_{50}O$ while the base peak appeared at *m/z* 204 (100%). Fragments ion appeared at *m/z* 204 together with fragments ion *m/z* 302 (35.4%) revealed the presence of double bond at C-14. The IR spectrum displayed absorption for hydroxyl –OH, at 3401 cm^{-1} and its overtone was observed at 1037 cm^{-1}. Vibration of C=C stretching absorbed at 1609 cm^{-1} while C-H bending vibration was observed for CH_3 at 1460 cm^{-1} and for gem-dimethyl at1383cm^{-1}. Vibration of C-H stretching of alkane was observed at 2916 and 2849 cm^{-1} while bending vibration of C-H of alkane absorbed at 1441cm^{-1}.

The ^1H spectrum showed signals as 8 methyls and only one olefinic proton at δ_H 5.51 ppm as doublet of doublet. The other three characteristic signals appeared at δ_H 3.19 (1H, *dd*), 2.03 (1H, *dt*) and 1.92 (1H, *bdd*) ppm. The chemical shift of proton at δ_H 3.19 was shifted downfield, possibility due to bonding to an oxygenated tertiary carbon. The ^{13}C spectrum displayed 30 carbon signals including eight methyls, ten methylenes, four methynes and eight quaternary carbons. Two carbons were detected as sp^2 carbons at δ_C 116.9 and 157.9 ppm that was characterized as (-CH=C<) group. There was one oxygenated carbon at δ_C 79.1 ppm that led to identification of 5 as a triterpenoid alcohol. The position of carbons and protons was established by HMBC spectrum.

Based on the above spectral data and comparison to reported data (Dharmaratne et al. 1984) 5 was identified as taraxerol. This is the first time taraxerol is isolated from *Garcinia* species. Taraxerol significantly inhibited growth of the human lung cancer cell line H157 and exhibited visible antibacterial activity against the bacteria *S. aureus, E. feacalis* and *E. coli* (Famakin 2002).

Conclusion

The chemical components of *Garcinia prainiana* is investigated for the first time which resulted in the isolation of friedelin, euphanol, stigmasterol, taraxerone and taraxerol. The presence of taraxerol and taraxerone is reported for the first time from any *Garcinia* species.

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