

Chemistry of *Flacourtia jangomas*, *Limnophila heterophylla* and *Hoppea fastigiata*

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Flacourtia jangomas Racusch, belongs to the family Flacourtiaceae and exhibits significant medicinal activities¹. We now report the results of a systematic chemical examination of the whole plant on which no such work has been done so far. *Limnophila heterophylla* (Scrophulariaceae)² and *Hoppea fastigiata* (Gentianeaceae)³ are the two plants growing abundantly in and around Santiniketan and are used locally by the tribes as traditional remedy for various ailments. We have been working on the constituents of these two plants and have already reported some unknown phytochemicals. Now, we report the isolation and characterisation of two more phytochemicals one from each of these two plants.

The concentrated petroleum ether (b.p. 60–80°) extract of the whole plant (aerial parts and roots) of *F. jangomas* on chromatographic analysis over silica gel (mesh 60–120) furnished a white solid, C₃₀H₄₈O, m.p. 206–07°, $[\alpha]_D^{30} + 54^\circ$, $[M^+]$ at m/z 424, in petroleum ether (b.p. 60–80°)-benzene (1 : 1) eluent. It responded positively to Liebermann-Bürchardt test for triterpene; $\nu_{\max}$ (KBr) 1 730 (C=O), 1 645 cm⁻¹ (C=C); δ (90 MHz, CDCl₃) 0.75 (3H, s), 0.83 (3H, s), 0.98 (6H, s), 1.00 (6H, s), 1.70 (3H, s) for seven methyls, a multiplet of two protons at δ 2.30 (–CO–CH₂–), 4.72 (2H, m) for two vinylic protons. The mass spectral fragmentation of the triterpene is closely similar to hopane type of triterpene and records significant peaks at m/z 424 (M⁺), 409, 396, 205, 191 and 150. From the comparison of the physical constants and also the aforesaid spectral data, the triterpene has been characterised as 21 α -H-Hop-28-en-3-one (moretenone)⁴.

Air-dried powdered defatted whole plant (aerial parts and roots) of *L. heterophylla* was extracted with petroleum ether (b.p. 60–80°). The concentrated petroleum ether extract on chromatographic analysis over silica gel (60–120 mesh) afforded a white solid, C₃₀H₄₈O₃, m.p. 285–87°, $[\alpha]_D^{30} + 47^\circ$, $[M^+]$ at m/z 456, in petroleum ether-benzene (1 : 3) eluent; responded to Liebermann-Burchardt test for triterpene; $\nu_{\max}$ (KBr) 3 450 (OH), 1 690 (COOH) and 1 650 cm⁻¹ (C=C); a methyl ester, C₃₁H₅₀O₃, m.p. 189–90°, $[\alpha]_D^{30} + 18^\circ$; δ (90 MHz, CDCl₃) 0.69 (3H, s), 0.75 (3H, s), 0.80 (3H, s), 0.90 (6H, s), 1.20 (6H, s) for seven tertiary C-methyls, one proton triplet at δ 4.55 and one vinylic proton at δ 5.20; m/z 456 (M⁺), 441 (M⁺–CH₃), 438 (M⁺–H₂O), 411 (M⁺–COOH), 248 (base peak), 207 (R.D.A. around ring C), 233 (248–CH₃), 203 (248–COOH) and 189 (207–

H₂O). From the above spectral data as well as from the comparison of its ¹³C nmr spectral data [δ (100 MHz, CDCl₃) at 36.7(C-1), 27.3(C-2), 76.2(C-3), 39.2(C-4), 53.3(C-5), 18.4(C-6), 32.5(C-7), 39.1(C-8), 47.6(C-9), 37.1(C-10), 23.5(C-11), 123.3(C-12), 143.1(C-13), 42.5(C-14), 25.4(C-15), 19.1(C-16), 24.1(C-17), 45.6(C-18), 40.2(C-19), 42.7(C-20), 34.2(C-21), 36.4(C-22), 28.2(C-23), 21.8(C-24), 15.8(C-25), 16.4(C-26), 25.9(C-27), 24.6(C-28), 182.2(C-29), 20.6(C-30)] with those of the compounds having similar skeleton⁵, this triterpene has been characterised as 3 α -hydroxyolean-12-ene-29-oic acid (katiconic acid)^{2,6} which has been finally confirmed by co-ir, m.m.p. (undepressed) and co-tlc.

The concentrated chloroform extract of the whole plant (aerial parts and roots) of *H. fastigiata* upon chromatographic resolution over silica gel (60–120 mesh) furnished a yellow solid in petroleum ether (b.p. 60–80°)-benzene eluent (3 : 1) which on crystallisation from acetone gave yellow solid, C₁₄H₁₀O₅ (M⁺ 258), m.p. 259–60°; responded positively with Gibb's and other tests for xanthenes; $\lambda_{\max}$ (EtOH) (log ϵ) 240 (4.15), 270 (4.30) and 305 (4.05) nm showing a remarkable bathochromic shift of the higher wavelength band at 305 nm by 22 (305–327) nm upon addition of AlCl₃ which remained unchanged on addition of hydrochloric acid suggesting the presence of a OH group *peri* to carbonyl group, i.e. OH group at C₁ or C₈ position⁷. Further, the uv-band at higher wavelength also recorded a bathochromic shift by 15 (305–320) nm in ethanolic NaOAc solution which indicates a free OH group at C₃ position⁷. The xanthone on treatment with diazomethane in ether solution formed a monomethyl derivative characterised as 1-hydroxy-3,7-dimethoxyxanthone. As expected, its ir spectrum (KBr) showed absorption bands at 3 340 (broad chelated OH), 1 650, 1 570 and 1 530 cm⁻¹ (chelated α,β -unsaturated carbonyl), while the ¹H nmr spectrum (90 MHz, CDCl₃) of the xanthone records (i) signals for a pair of *meta*-coupled aromatic protons at δ 6.30 (1H, d, J 3 Hz, H-4) and 6.50 (1H, d, J 3 Hz, H-2), indicative of a 1,3-disubstituted A-ring, (ii) ABM pattern of signals at δ 7.30 (H-6), 7.65 (H-5) and 7.85 (H-8) for B-ring protons besides a singlet of three protons at δ 3.90 due to a methoxyl function. Finally, a comparison of its ¹³C nmr spectral data [δ (130.9110 Hz, CD₃COCD₃) at 163(C-1), 98(C-2), 168(C-3), 94(C-4), 158.5(C-4a), 149.5(C-4b), 116(C-5), 125(C-6), 156(C-7), 108(C-8), 121(C-8a), 101.5(C-8b), 178.5(C-9) and 56.5(OMe)] with

NOTE

other xanthone⁸ led us to characterise this xanthone as 1,3-dihydroxy-7-methoxyxanthone⁹.

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