

Chemical Investigation of *Limnophila heterophylla* and *Borreria articularis*

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In continuation of our studies on *Limnophila* genus^{1,2} and *Borreria articularis*³, we now report the results of our systematic chemical investigation of *L. heterophylla* (Schrophulariaceae)⁴ and further work on *B. articularis*. *L. heterophylla* grows widely in and around Santiniketan and is locally used as folk medicine. Literature survey reveals that no phytochemical work has yet been reported on this plant.

Air-dried powdered whole plants (aerial parts and roots) of *L. heterophylla* was extracted with petroleum-ether (b.p. 60–80°). The concentrated petroleum-ether extract was subjected to chromatographic analysis over silica gel. Elution of the column with petroleum ether (b.p. 60–80°)-benzene (1 : 1) afforded a triterpene, C₃₀H₄₈O₃ (*M*⁺ 456), m.p. 291°, *v*_{max} (KBr) 3 480 (OH), 1 695 (COOH), 1 645 cm⁻¹ (C=C); methyl ester, m.p. 173°, characterised as ursolic acid⁵ by usual comparison (m.m.p., co-tlc and co-ir).

Further elution of the column with benzene furnished a yellow solid, C₁₉H₁₈O₇ (*M*⁺ 358), m.p. 189–90°; responded positively to flavonoid test with magnesium and HCl; *λ*_{max} (EtOH) 220 (log *ε* 4.20), 275 (4.18) and 320 (4.10); *v*_{max} (KBr) 3 400, 1 650 1 600 and 1 570 cm⁻¹.

Its identity with the 5-hydroxy-7,8, 2',4'-tetramethoxyflavone, m.p. 188–89°, isolated from *L. rugosa*¹ in this laboratory was established by m.m.p., co-tlc and co-ir with authentic sample.

The benzene extract of *B. articularis* on usual

chromatography gave a solid, C₃₀H₄₈O₃ (*M*⁺ 456), m.p. 291°, in benzene-chloroform (1 : 1) eluate; responded positively to Liebermann-Burchardt test for triterpene; *v*_{max} (KBr) 3 480 (OH), 1 695 (COOH) and 1 645 cm⁻¹ (C=C) methyl ester, m.p. 173°, and was identified as ursolic acid⁵ by m.m.p., co-tlc and co-ir with authentic sample.

Further elution of the column with benzene-chloroform mixture (1 : 1) gave methyl ursolate as white solid, C₃₁H₅₀O₃ (*M*⁺ 470), m.p., 173°; responded Liebermann-Burchardt test for triterpene; *v*_{max} (KBr) 3 480 (OH), 1 765 (COOCH₃), 1 645 cm⁻¹ (C=C), acetate, m.p. 246–47°. Elution of the column with benzene-chloroform (1 : 3) mixture gave a white solid, C₃₀H₅₀O₂ (*M*⁺ 442), m.p. 230–32°; responded positively to Liebermann-Burchardt test for triterpene; *v*_{max} (KBr) 3 840 (OH), 1 645 cm⁻¹ (C=C), and was found to be identical with uvaol⁶ (m.m.p., co-tlc and co-ir).

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