Xanthones from *Swertia alternifolia*

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Chemical examination of the whole plant of *Swertia alternifolia* yielded four xanthones, 2,8-dihydroxy-1,6-dimethoxyxanthone, 1,8-dihydroxy-3,5-dimethoxyxanthone, 1,2,6,8-tetrahydroxyxanthone and 1,5,8-trihydroxy-3-methoxyxanthone. These compounds were characterised by chemical and spectral methods. These compounds were isolated for the first time from this plant.

The alcoholic extract of *Swertia* genus showed CNS depressant, mutagenic, antipsychotic, tuberculostatic, choleric and antidiabetic activities. *Swertia chirata* is a well known medicinal herb of Garhwal hills and used in Ayurvedic system of medicine as laxative, febrifuge, stomachic and bitter tonic. The chemical constituents of *S.chirata* responsible for its medicinal properties have been found to be mainly tetraoxygenated xanthones. Xanthones have been evaluated for antioxidative properties and have shown to possess free radical and superoxide anion scavenging activity. Due to the high demand of *S.chirata* and unplanned exploitation by traders, it is getting extinct in hills and people are frequently using the species *S. alata* and *S. paniculata*, which are supposed to be equally effective. Keeping in view the commercial and pharmaceutical importance of this genus we have carried out the chemical investigation of *S. alternifolia* Royle. Four xanthones have been isolated from the whole plant for the first time from this species.

Whole plant of *S. alternifolia* was collected from Tunghath, at an altitude of 4500 m. It is shade dried, powdered (2 kg) and Soxhlet extracted with light petroleum (60-80°). The extract when concentrated under vacuum afforded compound 1 (250 mg). Petroleum ether free mass was re-extracted with ethyl acetate, concentrated in vacuo and after drying subjected to column chromatography over si-gel. Elution with CHCl₃:MeOH (98:2–95:5) afforded compound 2 (150 mg). Ethyl acetate-free mass was extracted with MeOH, which on column chromatography and gradient elution with CHCl₃:MeOH (95:5–90:10) afforded compounds 3 (100 mg) and 4 (150 mg) which have been repeatedly purified by RPHPLC using CHCl₃:cyclohexane (99:1) as a solvent system.

**Compound 1**, yellow crystalline solid, m.p. 195° (lit. m.p 191-193°); molecular formula C₁₅H₁₂O₆, MS m/z M⁺ [288], positive to iron (II) chloride. KI exposure and 15% H₂SO₄ test, fluoresced yellow under UV light. Its UV λmax MeOH 207, 230, 254, 267, 279 and 300 ¹H-NMR (CDCl₃, TMS); δ 4.05 (3H, s (OMe)), 3.74 (3H, s, 1 x OMe), 11.8 and 13.9 (each 1H, chelated OH), 7.59 (d, J=9 Hz, H-3), 7.23 (d, J=1.5 Hz, H-7) were in accordance to 2,8-dihydroxy-1,6-dimethoxyxanthone, further confirmed by ¹³C NMR spectrum.

**Compound 2**, C₁₅H₁₂O₆, m.p. 184-185° indicated it to be a 1,3,5,8-tetraoxygenated xanthone by its UV spectrum which showed λmax MeOH at 238, 260, 315 and 317 nm. The ¹H-NMR spectrum showed the presence of two methoxyl groups at δ 3.89 and 3.96, two chelated hydroxyl groups at 11.98 and 11.39 and four aromatic protons at 6.35 and 6.54 (2H, dd, J=2.2 Hz meta protons), 7.22 and 6.71 (2H, dd, J=8.8 Hz, ortho protons). On this basis 2 was identified as 1, 8-dihydroxy-3, 5-dimethoxyxanthone and confirmed by ¹³C NMR spectrum.

**Compound 3**, yellow crystalline solid m.p. 330-331°, mol. formula C₁₅H₁₂O₆, MS m/z [M+H]+ [261] gave all the chemical tests for xanthones similar to compounds 1 and 2. Its UV, IR and mass fragmentation pattern and
H-NMR chemical shifts indicated two chelated hydroxyl groups and two non-chelated hydroxyl groups with two seats of ortho and meta coupled protons, similar to 1,2,6,8-tetrahydroxyxanthone. Compound 4, C_{14}H_{10}O_{6}, m.p. 263-265°MS m/z M^+ [274], belonged to 1,3,5,8-tetraoxogenned series of xanthones on the basis of its UV spectrum which showed λ_{max} MeOH 201, 253, 276 and 330 nm. It was identified as 3-methoxy-1,5,8-trihydroxyxanthone on the basis of UV, IR, 1H-NMR and MS result as well as by converting it into 1,3,5,8-tetramethoxyxanthone, m.p. 225°by treating with dimethyl sulphate and potassium carbonate.

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