

Xanthenes from *Swertia alternifolia*

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Chemical examination of the whole plant of *Swertia alternifolia* yielded four xanthenes, 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 activities¹⁻⁶. *Swertia chirata* is a well known medicinal herb of Garhwal hills and used in Ayurvedic system of medicine as laxative, febrifuge, stomachic and bitter tonic⁷. The chemical constituents of *S. chirata* responsible for its medicinal properties have been found to be mainly tetraoxygenated xanthenes⁸. Xanthenes have been evaluated for antioxidative properties and have shown to possess free radical and superoxide anion scavenging activity⁹⁻¹¹. 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*¹², 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* Royle¹³. Four xanthenes have been isolated from the whole plant for the first time from this species.

Whole plant of *S. alternifolia* was collected from Tungnath, 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 CHCl_3 :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 CHCl_3 :MeOH (95:5-90:10) afforded compounds 3 (100 mg) and 4 (150 mg) which have been repeatedly purified by RPHPLC using CHCl_3 :cyclohexane (99:1) as a solvent system.

Compound 1, yellow crystalline solid, m.p. 195° (lit. m.p.¹⁴. 191-193°), molecular formula $\text{C}_{15}\text{H}_{12}\text{O}_6$, MS m/z M^+ [288], positive to iron (III) chloride. KI exposure and 15% H_2SO_4 test, fluoresced yellow under UV light. Its UV λ_{max} MeOH 207, 230, 254, 267, 279 and 300 $^1\text{H-NMR}$ ($\text{C}_5\text{D}_5\text{N}$, TMS); δ 4.05 (3H, s, 1xOMe), 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 ^{13}C NMR spectrum.

Compound 2, $\text{C}_{15}\text{H}_{12}\text{O}_6$, m.p. 184-185° indicated it to be a 1,3,5,8-tetraoxygenated xanthone by its UV spectrum which showed λ_{max} MeOH at 238, 260, 315 and 317 nm¹⁵. The $^1\text{H-NMR}$ 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-dimethoxyxanthone¹⁵ and confirmed by ^{13}C NMR spectrum.

Compound 3, yellow crystalline solid m.p. 330-331°¹⁶, mol. formula $\text{C}_{13}\text{H}_8\text{O}_6$, MS m/z $[\text{M}+\text{H}]^+$ [261] gave all the chemical tests for xanthenes similar to compounds 1 and 2. Its UV, IR and mass fragmentation pattern and

*For correspondence

¹H-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-tetrahydroxyxanthone¹⁷.

Compound 4, C₁₄H₁₀O₆, m.p. 263-265^{o18} MS m/z M⁺ [274], belonged to 1,3,5,8-tetraoxygenated series of xanthenes 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 result¹⁹ as well as by converting it into 1,3,5,8-tetramethoxyxanthone, m.p. 225^{o16} by treating with dimethyl sulphate and potassium carbonate.

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