

XANTHONES AND FLAVONOIDS OF *Lomatogonium rotatum*

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The epigeal part of *Lomatogonium rotatum* (L) Fries ex Fern (family *Gentianaceae*) is used in Tibetan medicine in diseases of the liver, the gall bladder, and the spleen, and also as an agent for stimulating the appetite and improving digestion [1]. In view of this, we have investigated the epigeal part of the plant gathered in the flowering period in August, 1990, in the environs of Ulan-Bator. Not less than six compounds were detected in alcoholic extracts of the epigeal part of the species under investigation by paper chromatography in the 15% acetic acid, butan-1-ol–acetic acid–water (4:1:2), and ethyl acetate–formic acid–water (10:2:3) systems. To isolate the substances detected, the air-dry comminuted herb was extracted with 80% ethyl alcohol. The solvent was distilled off and the dried residue was treated successively with chloroform, ethyl acetate, and n-butanol.

In the present communication we give the results of an investigation of the chloroform and ethyl acetate fractions.

The chloroform fraction (35 g) was chromatographed on a column of silica gel using as eluents chloroform and a mixture of chloroform with methanol. As a result, substances (I), (II), and (III) were isolated. By the use of the method described above, the ethyl acetate fraction yielded (IV) and (V). Compounds (I) and (II) were xanthone derivatives, and (II) and (IV) were flavonoids, while (V) proved to be an iridoid.

Substance (I) had composition $C_{16}H_{14}O_6$, mp 154–155°C (from methanol), $\lambda_{\max}^{\text{MeOH}}$ 240, 264, 314, 380 nm; + $AlCl_3$ 248, 278, 333, 402; + CH_3COONa 242, 262, 314, 380 nm. Its PMR spectrum showed the signals of four aromatic protons (6.52 and 6.74 ppm, d, 2.5 Hz each, H-2 and H-4; and 7.15 and 7.54 ppm, 9 Hz each, H-5 and H-6), of three methoxy groups (3.86 ppm, s, 3-OCH₃; 3.91 ppm, s, 7-OCH₃; and 3.98 ppm, 8-OCH₃), and a chelated –OH group (12.6 ppm, br.s). From its spectral characteristics and comparison with literature information, the compound under consideration was identified as decussatin (1-hydroxy-3,7,8-trihydroxyxanthone) [2].

Substance (II) had the composition $C_{15}H_{12}O_6$ (M^+ 288), mp 182–184°C (from methanol), $\lambda_{\max}^{\text{MeOH}}$ 230, 255, 276, 333 nm; + $AlCl_3$ 266, 288, 333, 392, + CH_3COONa 255, 276, 334 nm. The PMR spectrum of (II) contained signals of protons at (ppm) 3.92 (s, 5-OCH₃), 3.96 (s, 3-OCH₃), 6.35 (d, 2.5 Hz, H-2), 6.51 (d, 2.5 Hz, H-4), 7.16 (d, 9 Hz, H-6), 7.51 (d, 9 Hz, H-7), 12.15 and 13.00 (br.s, each, 1-OH and 8-OH). From its spectral characteristics and physical constants, compound (II) was identical with swerchirin (1,8-dihydroxy-3,5-dimethylxanthone [2, 3]).

Substance (III), with the composition $C_{15}H_{10}O_6$, mp > 300°C (from methanol), was identified from its UV, mass, and PMR spectra, and also by comparison with an authentic sample, as luteolin [4].

Substance (IV) had the composition $C_{21}H_{20}O_{11}$, $\lambda_{\max}^{\text{MeOH}}$ 242 (sh.), 255, 271, 350 nm; + CH_3COONa 276, 323, 398 nm; + CH_3COONa/H_3BO_3 265, 377, 429 (sh.) nm, + $AlCl_3$ 278, 332, 429 nm, + $AlCl_3/HCl$ 279, 361, 384 nm; + CH_3ONa 267, 278 (sh.), 337 (sh.), 406 nm. PMR spectrum in DMSO: 4.12 (d, 9.2 Hz, H-1"), 6.02 (s, H-8), 6.20 (s, H-3), 6.80 (d, 8.5 Hz, H-5'), 7.30 (dd, 8.5 and 2.5 Hz, H-6'), 8.20 (d, 2.5 Hz, H-2) and 13.09 ppm (br.s, 5-OH). On the basis of an absence of a depression of the melting point in a mixture with an authentic specimen, this compound was identified as the flavone C-glycoside isoorientin (6-C- β -D-glucopyranosylluteolin) [4, 5].

Substance (V) had the composition $C_{16}H_{22}O_{10}$ (M^+ 374), mp 113–115°C [α]_D –129° (methanol), $\lambda_{\max}^{\text{MeOH}}$ 238 nm (lge 3.93). PMR spectrum (D₂O): 7.66 (s, H-3), 5.75 (d, 1.5 Hz, H-1), 5.35 (H-8), 5.50 (H-10). The ¹³C NMR spectrum in D₂O 32.6 (C-6), 64.6 (C-7), 131.5 (C-8), 50.8 (C-9), 121.3 (C-10), 164.8 (C-11), 97.0 (C-1'), 70.7 (C-2'), 72.4 (C-3'), 68.2 (C-4'), 71.9 (C-5'), 61.6 ppm (C-6'). On the basis of its spectral characteristics, substance (V) was identified as the secoiridoid swertiamarin [6].

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