

FLAVONOIDS FROM *Scutellaria cordifrons* AND *S. phyllostachya* ROOTS

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UDC 547.972

Plants of the genus *Scutellaria* L. (Lamiaceae) are rich sources of flavonoids, terpenoids, phenylpropanoids, and other biologically active compounds [1]. In continuation of research on flavonoids from plants of this genus, we studied roots of *S. cordifrons* Juz. and *S. phyllostachya* Juz. [2]. Baikalein, 5,7-dihydroxy-2'-methoxyflavone, and chrysin have previously been isolated from roots of *S. phyllostachya* [3]. The flavonoid composition of *S. cordifrons* has not previously been studied.

Ground air-dried roots (1 kg) of *S. cordifrons* were collected at the end of vegetation (November 2000) near the village Chodak of Namangan District of the Republic of Uzbekistan and were exhaustively extracted with ethanol. The ethanol extract was condensed in vacuo, diluted with water, and extracted successively with hexane, chloroform, and ethylacetate. Chromatography of the CHCl₃ fraction (20.0 g) over a silica-gel column with gradient elution by CHCl₃:propan-2-ol isolated **1** and **2**, which were also isolated from the CHCl₃ extract of the alcohol extract of *S. phyllostachya* (raw material collected in November 2000 near the village Mamai of Yangikurgan Region of Namangan District).

Flavonoid **1**, C₁₈H₁₈O₇, mp 220-221°C (dec.). The UV spectrum (EtOH, λ_{max}, 242 sh, 290, 346 nm) was characteristic of flavanone derivatives [4]. The IR spectrum of **1** contained absorption bands for hydroxyl (3200, 3450 cm⁻¹), methoxyls (2930), pyrone carbonyl (1650), and aromatic C=C (1615, 1590). The mass spectrum exhibited peaks for ions with *m/z* 346 [M]⁺, 328 [M - H₂O], 313 (100) [M - H₂O - CH₃], 285, 197, 196, 181, 168, 153. The PMR spectrum (DMSO-d₆, ppm, J/Hz) had signals for protons at 2.52 (1H, dd, J = 17.5, 3.2, H-3_{eq}), 3.65, 3.76, 3.83 (each 3H, s, 3 × OCH₃), 3.95 (1H, dd, J = 17.5, 13.5, H-3_{ax}), 5.96 (1H, dd, J = 13.5, 3.2, H-2), 6.22 (1H, s, H-8), 6.51 (2H, br. d, J = 8.5, H-3', H-5'), 7.20 (1H, br. t, J = 8.5, H-4'), 9.90 (1H, s, 2-OH), 12.10 (1H, s, 5-OH).

Based on PMR and mass spectral data, **1** contains three methoxyls and two hydroxyls. The mass spectral fragmentation is consistent with two methoxyls and one hydroxyl on ring A [5]. Comparison of the spectral data with those of an authentic sample of **1** identified it as (+)-5,2'-dihydroxy-6,7,6'-trimethoxyflavanone [6, 7].

Flavonoid **2**, C₁₉H₂₀O₈, mp 148-149°C, was a flavanone derivative according to its UV spectrum (λ_{max} 289, 359 nm) [4]. The IR spectrum contained absorption bands at 3450-3250, 2950, 1660, 1617, and 1578 cm⁻¹. The mass spectrum of **2** had peaks for ions with *m/z* 376 [M]⁺, 358, 343, 315, 226, 211, 183, 131, 119, 83, and 69 (100). The PMR spectrum (DMSO-d₆, J/Hz): 2.75 (1H, dd, J = 3.1, 17.5, H-3_{eq}), 3.16, 3.30, 3.43, 3.55 (each 3H, s, 4 × OCH₃), 3.75 (1H, dd, J = 3.1, 17.5, H-3_{ax}), 5.95 (1H, dd, J = 13.5, 3.1, H-2), 6.52 (2H, br. d, J = 8.5, H-3', H-5'), 7.19 (1H, br. t, J = 8.5, H-4'), 11.90 (1H, s, 5-OH). The PMR and mass spectrum indicated that **2** differed from **1** by the presence of an additional methoxyl in the 8-position of the flavanone nucleus. Based on the data and a direct comparison with an authentic sample, **2** was identified as (-)-5,2'-dihydroxy-6,7,8,6'-tetramethoxyflavanone [7, 8]. Flavonoids **1** and **2** were isolated for the first time from these *Scutellaria* species.

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