

FLAVONOIDS FROM *Scutellaria phyllostachya* ROOTSG. U. Siddikov,¹ M. P. Yuldashev,² and Sh. V. Abdullaev¹

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In continuation of the study of flavonoids from plants of the genus *Scutellaria* L. (Lamiaceae) [1], we studied flavonoids from *S. phyllostachya* Juz. roots.

Ground air-dried roots of *S. phyllostachya* that were collected in Namangan District of the Republic of Uzbekistan were extracted nine times at room temperature with ethanol (80%). The condensed alcoholic extract was diluted with water and worked up successively with CHCl₃, EtOAc, and *n*-BuOH. The solvents were distilled off to afford CHCl₃ (20.0 g), EtOAc (15.0 g), and *n*-BuOH (23.0 g) extracts.

The EtOAc extract (18.0 g) was chromatographed over a column of silica gel with gradient elution by CHCl₃:*i*-PrOH (95:5–85:15).

Elution of the column by CHCl₃:*i*-PrOH (95:5) isolated chrysin-7-*O*-β-D-methylglucuronide (0.15 g) and apigenin-7-*O*-β-D-glucuronide (0.13 g). Elution of the column by CHCl₃:*i*-PrOH (90:10) afforded baicalein-7-*O*-β-D-glucopyranoside (0.12 g). Finally, elution of the column by CHCl₃:*i*-PrOH (85:15) isolated oroxyloside (0.18 g).

The *n*-BuOH extract (23.0 g) was chromatographed over a column of silica gel with gradient elution by CHCl₃:*i*-PrOH (95:5–85:15). Elution of the column by CHCl₃:*i*-PrOH (90:10) isolated scutellarein-7-*O*-β-D-glucuronide (0.15 g). Elution of the column by CHCl₃:*i*-PrOH (90:10) produced apigenin-7-*O*-β-D-glucoside (0.10 g) and norwogonin-7-*O*-β-D-glucoside (0.18 g). Elution by CHCl₃:*i*-PrOH (85:15) afforded wogonin (0.24 g) and luteolin-7-*O*-β-D-glucuronide (0.15 g).

Chrysin-7-*O*-β-D-methylglucuronide (1), C₂₂H₂₀O₁₀, mp 184–186°C (MeOH). UV spectrum (EtOH, λ_{max}, nm): 270, 305. IR spectrum (KBr, ν, cm⁻¹): 3510–3320 (OH), 1660 (γ-pyrone C=O), 1728 (ester C=O). PMR spectrum (100 MHz, C₅D₅N, δ, ppm, J/Hz): 3.48 (3H, s, COOCH₃), 4.00–4.67 (3H, m, H-2'', H-3'', H-4''), 4.84 (1H, d, J = 8.5, H-5''), 5.88 (1H, d, J = 6.5, H-1''), 6.70 (1H, d, J = 2, H-6), 6.78 (1H, s, H-3), 6.97 (1H, d, J = 2, H-8), 7.51–7.73 (3H, m, H-3', 4', 5'), 7.15–7.73 (2H, m, H-2', 6'), 12.49 (1H, br.s, 5-OH). Acid hydrolysis of **1** produced chrysin (C₁₅H₁₀O₄, mp 290–292°C, [M]⁺ 254) and D-glucuronic acid (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [2].

Apigenin-7-*O*-β-D-glucuronide (2), C₂₁H₁₈O₁₁, mp 173–176°C, [α]_D -115.0°. UV spectrum (EtOH, λ_{max}, nm): 270sh, 335; +ZrOCl₂ 295, 390. IR spectrum (KBr, ν, cm⁻¹): 3400 (OH), 1730 (COOH), 1650 (γ-pyrone C=O), 1600, 1580 (aromatic C=C). Acid hydrolysis of **2** produced apigenin and D-glucuronic acid (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [3].

Baicalein-7-*O*-β-D-glucopyranoside (3), C₂₁H₂₀O₁₀, mp 206–207°C (dec.). UV spectrum (EtOH, λ_{max}, nm): 279, 314; +AlCl₃ 290, 341. IR spectrum (KBr, ν, cm⁻¹): 3385 (OH), 1660 (γ-pyrone C=O), 1622, 1584 (aromatic C=C). Acid hydrolysis of **3** produced baicalein and D-glucose (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [4].

Oroxyloside (oroxylin-7-*O*-β-D-glucuronide) (4), C₂₂H₂₀O₁₁, mp 193–195°C. UV spectrum (EtOH, λ_{max}, nm): 280, 315; +CH₃COONa 281, 316. Acid hydrolysis of **4** produced oroxylin A (mp 217–218°C, C₁₆H₁₂O₅, [M]⁺ 284) and D-glucuronic acid (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [5].

Scutellarein-7-*O*-β-D-glucoside (5), C₂₁H₂₀O₁₁, mp 193–195°C. UV spectrum (MeOH, λ_{max}, nm): 288, 337; +CH₃COONa 290, 340; +AlCl₃ 292sh, 306, 371. Acid hydrolysis of **5** produced scutellarein (mp >340°C, C₁₅H₁₀O₆, [M]⁺ 286) and D-glucose (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [5].

Apigenin-7-*O*-β-D-glucoside (6) (cosmosiin), C₂₁H₂₀O₁₀, mp 203–205°C. UV spectrum (EtOH, λ_{max}, nm): 268, 339; +CH₃COONa 267, 339; +AlCl₃ 279, 301, 343; +CH₃COONa 267, 397. PMR spectrum (100 MHz, C₅D₅N, δ, ppm, J/Hz): 3.59–4.64 (sugar protons), 5.72 (1H, d, J = 7.0, H-1''), 6.64 (1H, d, J = 2.5, H-6), 6.78 (1H, s, H-3), 6.96 (1H, d, J = 2.5, H-8), 7.12 (2H, d, J = 8.0, H-3', 5'), 7.81 (2H, d, J = 8.0, H-2', 6'), 13.62 (1H, br.s, 5-OH). Acid hydrolysis of **6** produced apigenin (mp 345–346°C, C₁₅H₁₀O₅, [M]⁺ 270) and D-glucose (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [6].

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Norwogonine-7-O- β -D-glucoside (7), C₂₁H₂₀O₁₀, mp 278-280°C. UV spectrum (EtOH, λ_{\max} , nm): 279, 350. IR spectrum (KBr, ν , cm⁻¹): 3450 (OH), 1660 (γ -pyrone C=O), 1618, 1575, 1517 (aromatic C=C), 1075, 1024, 1005 (glucoside C-O). Acid hydrolysis of **7** produced norwogonine (mp 250-252°C, C₁₅H₁₀O₅, [M]⁺ 270) and D-glucose (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [7].

Wogoninide (wogonine-7-O- β -D-glucuronide) (8), C₂₂H₂₀O₁₁, mp 194-196°C. UV spectrum (MeOH, λ_{\max} , nm): 276, 345. Acid hydrolysis of **7** produced wogonine (mp 200-202°C, C₁₆H₁₂O₆) and D-glucuronic acid (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3). Mass spectrum (*m/z*): 284 [M]⁺, 269 (100) [M - CH₃]⁺, 241 [M - CH₃ - CO], 167, 139, 105, 102 [8, 9].

Luteolin-7-O- β -D-glucuronide (9), C₂₁H₁₈O₁₂, 462, mp 192-195°C. UV spectrum (EtOH, λ_{\max} , nm): 256sh, 350; +ZrOCl₂ 415; +NaOH 400; +CH₃COONa/H₃BO₃ 390. Acid hydrolysis of **9** produced luteolin (mp 327-330°C) and D-glucuronic acid (PC, *n*-BuOH:C₅H₅N:H₂O, 6:4:3) [8, 9].

Compounds **1-9** were isolated from *S. phyllostachya* Juz. for the first time.

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