

SAPONINS FROM *Climacoptera subcrassa*

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Steroid and triterpene glycosides are an interesting and important class of secondary metabolites. They belong to a large group of compounds that can dissolve in water to form a stable foam, as a result of which they are called saponins [1, 2]. Most representatives of this group have high biological activity and are responsible for the therapeutic effect of the plants.

The aerial parts of *Climacoptera subcrassa* from regional flora of the Republic of Kazakhstan that was collected during flowering in 2012 were studied.

Ground aerial parts of the plant (3 kg) were extracted by EtOH (70%) for 2 h at 80°C. The resulting extract was concentrated in vacuo at 55°C and then extracted by AV-8 macroporous resin. Column chromatography over silica gel of the macroporous concentrate (eluents CHCl₃–MeOH, 5:1 and 3:1) produced total saponins that were separated into pure compounds using Sephadex LH-20 gel chromatography.

The compounds (1–4) were identified using physicochemical data and comparisons with the literature.

Oleanolic Acid (1). C₃₀H₄₈O₃, white crystals, mp 271–273°C (MeOH). UV spectrum (MeOH, λ_{max}, nm): 215. EI-MS *m/z* 456 [M – H][–]. ¹³C NMR spectrum (100 MHz, MeOH, δ, ppm, J/Hz): 37.6 (C-1), 26.7 (C-2), 78.5 (C-3), 39.2 (C-4), 55.5 (C-5), 18.3 (C-6), 32.6 (C-7), 39.6 (C-8), 48.1 (C-9), 37.0 (C-10), 22.7 (C-11), 122.4 (C-12), 144.1 (C-13), 42.0 (C-14), 27.7 (C-15), 22.8 (C-16), 46.7 (C-17), 41.5 (C-18), 46.1 (C-19), 30.4 (C-20), 33.7 (C-21), 32.3 (C-22), 28.8 (C-23), 14.7 (C-24), 15.1 (C-25), 16.5 (C-26), 25.2 (C-27), 180.4 (C-28), 32.8 (C-29), 23.3 (C-30) [3].

Gypsogenin 3-O-β-D-Glucopyranosyl-28-O-β-D-glucopyranoside (2). C₄₃H₇₀O₁₄, white crystals, mp 198–200°C (MeOH). UV spectrum (MeOH, λ_{max}, nm): 215, 217, 221. EI-MS *m/z* 809.7 [M – H][–]. ¹³C NMR spectrum (100 MHz, MeOH, δ, ppm, J/Hz): 39.6 (C-1), 26.5 (C-2), 78.5 (C-3), 39.2 (C-4), 56.5 (C-5), 18.3 (C-6), 32.7 (C-7), 39.6 (C-8), 48.6 (C-9), 37.0 (C-10), 22.9 (C-11), 123.4 (C-12), 143.6 (C-13), 42.5 (C-14), 27.7 (C-15), 22.8 (C-16), 46.7 (C-17), 41.5 (C-18), 46.1 (C-19), 30.4 (C-20), 33.7 (C-21), 32.6 (C-22), 209.0 (C-23), 14.7 (C-24), 15.1 (C-25), 16.5 (C-26), 25.2 (C-27), 181.4 (C-28), 33.3 (C-29), 23.3 (C-30), 104.8 (C-1'), 75.3 (C-2'), 78.5 (C-3'), 71.5 (C-4'), 78.5 (C-5'), 62.8 (C-6'), 105.7 (C-1''), 75.6 (C-2''), 78.3 (C-3''), 71.7 (C-4''), 77.5 (C-5''), 62.8 (C-6'') [4].

Oleanolic Acid 28-O-β-D-Xylopyranoside (3). C₃₅H₅₆O₇, white crystals, mp 198–210°C (MeOH). UV spectrum (MeOH, λ_{max}, nm): 215, 221, 226. EI-MS *m/z* 587.5 [M – H][–]. ¹³C NMR spectrum (100 MHz, MeOH, δ, ppm, J/Hz): 38.6 (C-1), 25.6 (C-2), 78.5 (C-3), 40.2 (C-4), 55.5 (C-5), 18.6 (C-6), 32.6 (C-7), 39.1 (C-8), 48.1 (C-9), 37.3 (C-10), 23.2 (C-11), 121.4 (C-12), 144.1 (C-13), 41.6 (C-14), 27.7 (C-15), 21.8 (C-16), 46.7 (C-17), 41.5 (C-18), 42.1 (C-19), 30.4 (C-20), 33.0 (C-21), 32.3 (C-22), 28.6 (C-23), 14.7 (C-24), 15.6 (C-25), 16.5 (C-26), 25.2 (C-27), 178.6 (C-28), 31.8 (C-29), 23.3 (C-30), 107.8 (C-1'), 76.3 (C-2'), 79.5 (C-3'), 71.9 (C-4'), 67.5 (C-5') [5].

Oleanolic Acid 28-O-β-D-Glucopyranoside (4). C₃₆H₅₈O₈, white crystals, mp 198–217°C (MeOH). UV spectrum (MeOH, λ_{max}, nm): 215, 221. EI-MS *m/z* 617.41 [M – H][–]. ¹³C NMR spectrum (100 MHz, MeOH, δ, ppm, J/Hz): 38.6 (C-1), 26.7 (C-2), 78.8 (C-3), 39.5 (C-4), 55.5 (C-5), 18.3 (C-6), 32.8 (C-7), 39.6 (C-8), 49.1 (C-9), 37.0 (C-10), 22.7 (C-11), 121.4 (C-12), 144.1 (C-13), 42.0 (C-14), 27.7 (C-15), 22.8 (C-16), 46.7 (C-17), 42.5 (C-18), 46.1 (C-19), 30.4 (C-20), 33.7 (C-21), 31.3 (C-22), 28.2 (C-23), 14.2 (C-24), 15.1 (C-25), 16.5 (C-26), 25.6 (C-27), 181.8 (C-28), 32.8 (C-29), 23.5 (C-30), 105.6 (C-1'), 75.3 (C-2'), 78.3 (C-3'), 71.5 (C-4'), 78.2 (C-5'), 62.8 (C-6') [6, 7].

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The aforementioned compounds were isolated for the first time from plants of the genus *Climacoptera*, but were isolated previously from plants of the family Chenopodiaceae.

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