

CYCLOCANTHOSIDE E FROM *Astragalus caucasicus*

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In continuation of the study of cycloartane triterpenoids from *Astragalus caucasicus* Pall. (Leguminosae L.), we isolated from enriched fractions two components designated as compound **1** (107 mg) and **2** (50 mg) in addition to the previously isolated compounds A, B, and C [1]. Of these, **1** corresponded to C [1].

Based on IR, PMR, and ¹³C NMR spectra, the examined compounds were cycloartanes [1-5] (Table 1).

Compound 2, C₃₀H₅₂O₅, mp 193-195°C (MeOH) [3, 4]. IR spectrum (KBr, ν, cm⁻¹): 3600-3200 (OH), 3050 (cyclopropane ring CH₂). Comparison with ¹³C NMR data for cyclocanthogenin [3, 4] and cycloasgenin C [5, 6] established that **3** was 24*S*-cycloartan-3β,6α,16β,24,25-pentaol [2], i.e., was cyclocanthogenin.

Compound 1, MW 786.986 g/mol, C₄₁H₇₀O₁₄, mp 283-284°C (EtOH). IR spectrum (KBr, ν, cm⁻¹): 3550-3230 (OH), 3060 (cyclopropane ring CH₂).

Acid hydrolysis of **1** produced genin **3** with formula C₃₀H₅₂O₅, [M]⁺ 492 (4.2), mp 193-195°C. A solution of the genin in acetone formed in the presence of H₂SO₄ the monoacetone, mp 220-224°C, indicating the presence of an α-diol in the sidechain. Therefore, it was identified as cyclocanthogenin [2].

According to HPLC, the carbohydrate part of the hydrolysate contained D-glucose and D-xylose in a 1:1 ratio [1].

Enzymatic hydrolysis of the glycoside by stomach fluid of *Helix plectotropis* [7] gave D-glucose and a monoside with mp 153-155°C (EtOAc). Acid hydrolysis of the monoside formed cyclocanthogenin and D-xylose. It was identified as cyclocanthoside A [4].

According to the ¹³C NMR spectra of **1** and **3**, the carbohydrates were located on C-3 and C-6 of the genin (Table 1). The SSCC of the anomeric protons of the monosaccharides are consistent with the β-configuration and the pyranose form of D-xylose and D-glucose.

The products from chemical transformation and HMBC spectra established that D-xylose was attached to C-3; D-glucose, to C-6 of the genin.

Thus, **1**, which was isolated from *A. caucasicus* for the first time, was 24*S*-cycloartan-3β,6α,16β,24,25-pentaol-3-*O*-β-D-xylopyranoside-6-*O*-β-D-glucopyranoside and corresponds to cyclocanthoside E [4].

According to botanical systematics, *A. caucasicus* and *A. tragacantha* belong to the subgenus *Tragacantha* of section Oliganthos [8]. It is possible that cyclocanthogenin derivatives are their sectional taxonomic signature.

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TABLE 1. PMR and ^{13}C NMR Spectra of Compound C (1) and Its Genin (3) and DEPT of 1 ($\text{C}_5\text{D}_5\text{N}$, δ , ppm, J/Hz)

C atom	1	3	^1H (1) SSCC (J/Hz)	DEPT
1	32.3	32.70	1.61; 1.29	CH ₂
2	30.3	31.02	2.36; 1.97 dq	CH ₂
3	88.7	78.30	3.52	CH
4	42.8	42.30		C
5	52.6	53.95	1.91	CH
6	79.2	68.29	3.82	CH
7	34.4	38.45	2.23; 1.87	CH ₂
8	45.7	47.16	1.97	CH
9	21.5	21.35		C
10	28.8	30.37		C
11	26.3	26.43	1.83; 1.30	CH ₂
12	33.2	33.33	1.64	CH ₂
13	45.8	45.77		C
14	47.0	46.85		C
15	47.8	48.40	2.38 (dd, 13.5; 7.8) 1.81 (dd, 3.5; 4.6)	CH ₂
16	72.0	72.03	4.70 (7.8; 7.1; 4.0)	CH
17	57.2	57.39	1.80 (d, 7.1)	CH
18	18.5	18.25	1.38	CH ₃
19	28.3	29.71	0.38; 0.21	CH ₂
20	28.7	28.78	2.37	CH
21	18.4	18.97	1.07 (d, 6.3)	CH ₃
22	33.1	33.07	2.26; 1.47	CH ₂
23	27.9	27.98	1.81; 1.97	CH ₂
24	77.1	77.22	3.92	CH
25	72.6	72.49		C
26	26.2	25.43	1.44	CH ₃
27	25.8	26.46	1.47	CH ₃
28	19.9	20.18	1.97	CH ₃
29	28.6	29.17	1.37	CH ₃
30	16.9	15.99	0.99	CH ₃
1'	107.7		4.82 (d, 7.6)	CH
2'	75.5		4.00 (t, 8.5)	CH
3'	78.3		4.09 (t, 9.0)	CH
4'	71.2		4.19 (t, 9.0)	CH
5'	67.0		4.34; 3.68 (dd, 11.1; 5.3)	CH ₂
1''	105.2		4.89 (d, 7.8)	CH
2''	75.5		4.00 (t, 8.5)	CH
3''	79.0		4.18 (t, 9.0)	CH
4''	71.7		4.13 (t, 9.0)	CH
5''	78.1		3.87 (dd, 11.6; 2.7)	CH
6''	63.0		4.43; 4.27 (dd, 2.8; 11.7)	CH ₂

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