

TRITERPENE GLYCOSIDES OF *Astragalus* AND THEIR GENINS.LI. ISOPRENOIDS OF *Astragalus dissectus*, *A. ephemerotorum*,  
AND *A. kulabensis*

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In continuation of investigations of cycloartane methylsteroids and accompanying isoprenoids, we have studied another three *Astragalus* (Leguminosae) species from the flora of Tadzhikistan: *A. dissectus* B. Fedtsch. et N. Ivanova, *A. ephemerotorum* Gontsch., and *A. kulabensis* Lipsky.

The air-dry comminuted roots with stems of *A. dissectus* (3 kg) gathered in the environs of the village of Obigarm (south-eastern slopes of the Karategin range) were exhaustively extracted with methanol. The yield of extractive substances was 223 g. The methanol extract (115.4 g) was chromatographed on a column of silica gel with elution successively by chloroform and the systems 1) chloroform–methanol (15:1), 2) chloroform–methanol–water (70:12:1), and 3) chloroform–methanol–water (70:23:4). By repeated rechromatography of the fractions obtained, we succeeded in isolating six individual compounds of sterol and triterpenoid natures. All the substances were identified on the basis of physicochemical constants, direct comparison with authentic specimens in TLC, and the indices of their IR, mass, and PMR spectra. The identified components of *Astragalus dissectus* are given below in order of increasing polarity.

**$\beta$ -Sitosterol** (60 mg — 0.0038%, yield here and below calculated on the air-dry material), mp 131-132°C (from MeOH),  $[\alpha]_D^{24} - 38 \pm 2^\circ$  (c 0.9; CHCl<sub>3</sub>) [1].

**Cyclosieversigenin** (100 mg — 0.0064%), mp 239-241° (from MeOH),  $[\alpha]_D^{24} + 52 \pm 2^\circ$  (c 1.1; MeOH) [2].

**$\beta$ -Sitosterol  $\beta$ -D-glucopyranoside** (50 mg — 0.0032%), mp 276-279°C (from MeOH),  $[\alpha]_D^{24} + 36 \pm 2^\circ$  (c 1.0, C<sub>5</sub>H<sub>5</sub>N) [1].

**Cyclosieversigenin 3-O- $\beta$ -D-xylopyranoside** (50 mg — 0.0032%), mp 263-264°C (from MeOH),  $[\alpha]_D^{24} + 41 \pm 2^\circ$  (c 0.6; MeOH) [2].

**Cyclosieversioside F** (9 g — 0.58%), mp 284-286°C (from MeOH),  $[\alpha]_D^{24} + 38 \pm 2^\circ$  (c 0.5; MeOH) [2].

**Cycloacanthoside E** (200 mg — 0.0128%), mp 282-284°C (from EtOH),  $[\alpha]_D^{24} + 24 \pm 2^\circ$  (c 0.6; C<sub>5</sub>H<sub>5</sub>N) [3].

The epigeal part of *Astragalus ephemerotorum* (3 kg), gathered on the outskirts of the kishlak of Ak-Bulak (northern slopes of the Rengen-Tau range), was extracted with methanol. The methanolic extract was evaporated to a viscous consistency and diluted with water. The aqueous solution was treated with ethyl acetate. Evaporation of the ethyl acetate left 15.81 g of triterpenoids. These were chromatographed on a column of silica gel with elution successively by systems 1 and 2. By rechromatographing the fractions eluted by system 1, we isolated 10 mg (0.0003%) of a substance of genin nature with mp 223-226°C (from MeOH),  $[\alpha]_D^{24} - 43 \pm 2^\circ$  (c 0.5; MeOH), identified as **cycloalpiggenin A** [4].

From the fractions accumulated when the column was eluted with system 2, we isolated 800 mg (0.0266%) and 1.150 g (0.0383%) of two glycosides, which were identified as cycloalpiosides B [5], mp 253-254°C (from MeOH),  $[\alpha]_D^{24} - 27 \pm 2^\circ$  (c 0.6; MeOH) and D [6], mp 300-301°C (from MeOH),  $[\alpha]_D^{24} - 19 \pm 2^\circ$  (c 0.9; C<sub>5</sub>H<sub>5</sub>N).

A methanolic extract (14.35 g) from 100 g of roots of *Astragalus kulabensis*, also gathered in the environs of the kishlak of Ak-Bulak, was fractionated on a column of silica gel, with elution first by chloroform and then by systems 2 and 3. The homogeneous fractions obtained on elution by chloroform were combined and rechromatographed in system 4) benzene–chloroform–ethyl acetate (5:1:1). This led to the isolation of 7 mg (0.007%) of  **$\beta$ -sitosterol**.

By eluting the column with system 2, 15 mg (0.015%) of  **$\beta$ -sitosterol  $\beta$ -D-glucopyranoside** was isolated.

The most polar component of this plant was eluted by system 3 in an amount of 200 mg (0.2%). This component was identified as **astrasieversianin IX** [7, 8], mp 180-182°C (from Me<sub>2</sub>CO),  $[\alpha]_D^{24} - 8.5 \pm 2^\circ$  (c 1.2; MeOH).

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