

CYCLOARTANES FROM *Astragalus flexus*

T. Kh. Naubeev,¹ K. K. Uteniyazov,¹
V. V. Kachala,² and A. S. Shashkov²

UDC 547.918:547.926

In continuation of research on cycloartane triterpenoids, we studied *Astragalus flexus* Fisch (Leguminosae) [1] collected during mass flowering at the beginning of June 1998 on the collective farm Berdakh (Republic of Karakalpakstan).

Air-dried ground aerial part (5 kg) of *A. flexus* was exhaustively extracted five times with MeOH (15 L) at room temperature. TLC of the MeOH extract detected 10 glycosidic compounds. The MeOH extract was evaporated to a syrup, which was treated with twice the volume of water. The resulting precipitate was filtered off. The aqueous solution was extracted first with EtOAc and then *n*-BuOH. Solvents were evaporated in vacuo to afford EtOAc (117 g) and *n*-BuOH (100 g) extracts.

The EtOAc extract was chromatographed over a column of silica gel (KSK, 0.1-0.08 and 0.16-0.1 mm) with elution by CHCl₃:CH₃OH (9:1) followed by the same solvents with an increased CH₃OH concentration (4:1). Four minor compounds that were cycloartane glycosides were isolated.

Compound **1**, C₃₈H₆₄O₁₁, mp 172-175°C, 0.003% (here and henceforth yields are calculated per air-dried raw material), was identified as cyclounifolioside D (lit. [2] mp 171-173°C, [α]_D +36°); compound **2**, C₃₆H₆₀O₁₀, mp 238-241°C, 0.00024%, was identical to cycloaraloside A (lit. [3] mp 240-242°C, [α]_D²⁵ +33 ± 2°); compound **3**, C₄₀H₆₆O₁₃, mp 252-254°C, 0.00021%, was identical to cyclosiversioside E (lit. [4] mp 257-258°C); compound **4**, C₄₁H₆₈O₁₄, mp 262-264°C, 0.00024%, was identified as cyclosiversioside F (lit. [4] mp 260-261°C).

The BuOH extract was separated by column chromatography over silica gel with successive elution by CHCl₃:CH₃OH (9:1, 1), CHCl₃:CH₃OH:H₂O (4:1:0.1, 2; 70:23:3, 3) to isolate additional amounts of **3** and **4** and also **5**, C₄₂H₇₀O₁₅, mp 212-214°C, which was identical to cyclounifolioside B, 0.00034% (lit. [5] mp 210-215°C); compound **6**, C₄₇H₇₈O₁₈, mp 258-260°C, 0.00128%, which was identified as cyclosiversioside H (lit. [6] mp 262-264°C, [α]_D²⁰ -30 ± 2°); compound **7**, C₄₆H₇₆O₁₇, mp 226-228°C, 0.029%, which was identical to cyclosiversioside G (lit. [7] mp 222-224°C, [α]_D²⁰ -5.42 ± 2°); and compound **8**, C₄₇H₇₈O₁₉, mp 289-292°C, 0.00394%, which was identified as astragaloside VII (lit. [8] mp 292-293°C, [α]_D¹⁸ +10.3°).

All isolated compounds were identified using physical chemical constants, chemical transformations, PMR and ¹³C NMR spectroscopy, two-dimensional spectra (TOCSY, ROESY, HMBC, HSQC, COSY), and TLC behavior compared with standards. All isolated compounds were known and were isolated from *A. flexus* Fisch for the first time.

REFERENCES

1. K. J. Kucherbaev, K. K. Uteniyazov, V. V. Kachala, Z. Saatov, and A. S. Shashkov, *Khim. Prir. Soedin.*, 146 (2002).
2. K. J. Kucherbaev, K. K. Uteniyazov, V. V. Kachala, Z. Saatov, and A. S. Shashkov, *Khim. Prir. Soedin.*, 456 (2002).
3. M. I. Isaev, M. B. Gorovits, and N. K. Abubakirov, *Khim. Prir. Soedin.*, 806 (1989).
4. K. K. Uteniyazov, Z. Saatov, N. D. Abdullaev, and M. G. Levkovich, *Khim. Prir. Soedin.*, 509 (1998).
5. K. J. Kucherbaev, K. K. Uteniyazov, V. V. Kachala, Z. Saatov, and A. S. Shashkov, *Khim. Prir. Soedin.*, 50 (2002).
6. A. N. Svechnikova, R. U. Umarova, N. D. Abdullaev, M. B. Gorovits, T. T. Gorovits, and N. K. Abubakirov, *Khim. Prir. Soedin.*, 460 (1983).
7. A. N. Svechnikova, R. U. Umarova, M. B. Gorovits, N. D. Abdullaev, and N. K. Abubakirov, *Khim. Prir. Soedin.*, 312 (1983).
8. I. Kitagawa, H. K. Wang, and M. Yoshikawa, *Chem. Pharm. Bull.*, **31**, 716 (1983).

1) S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (99871) 120 64 75, ukarim@inbox.ru; 2) N. D. Zelinskii Institute of Organic Chemistry, Russian Academy of Sciences, Moscow, Leninskii prosp., 47. Translated from *Khimiya Prirodnykh Soedinenii*, No. 3, p. 298, May-June, 2007. Original article submitted February 12, 2007.