2. T. Kh. Khasanov, A. I. Saidkhodzhaev, and G. K. Nikonov, Khim. Prir. Soedin., 807-808 (1972).
3. A. Sh. Kadyrov, T. Kh. Khasanov, A. I. Saidkhodzhaev, and G. K. Nikonov, Khim. Prir. Soedin., 808-809 (1972).
4. A. I. Saidkhodzhaev, N. D. Abdullaev, T. Kh. Khasanov, G. K. Nikonov, and M. R. Yagudaev, Khim. Prir. Soedin., 519-525 (1977).
5. L. A. Golovina, T. Kh. Khasanov, A. I. Saidkhodzhaev, V. M. Malikov, and U. Rakhmankulov, Khim. Prir. Soedin., 566-570 (1978).
6. A. Sh. Kadyrov and G. K. Nikonov, Khim. Prir. Soedin., 72-76 (1972).
7. N. P. Kir'yalov, Plants of the Family *Umbelliderae* as Sources of Biologically Active Substances [in Russian], Leningrad (1968), p. 129.

ESSENTIAL OIL OF Artemisia lagopus

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Samples of the essential oil for analysis were obtained by steam distillation from the epigeal part of *Artemisia lagopus* L. gathered in the flowering phase in Okhotia, Ayano-Maiskii region, in the Topko mountain mass if at 900 m above sea level. The period of collection was August.

The oil consisted of a light, mobile, clear, light yellow liquid with a specific pleasant and attractive odor and a burning taste. The yield of the oil was 0.12%; n_D^{20} 1.4804; d_{20}^{20} 0.9038.

Acids, phenols, and a terpene fraction were isolated from the oil by the usual procedure [1]. The following were identified: butyric, caproic and enanthic acids and anethole. The terpene fraction was studied by the GLC method. The conditions for recording the chromatograms and the principle of the identification and determination of the individual components have been reported previously [2].

In the terpene fraction we detected 36 components, of which the following were identified: α-pinene (0.9%), β-pinene (0.9%), camphor (1.1%), borneol (0.6%), caryophyllene (10.0%), α-humulene (0.8%), germacrone (19.6%), and palustrol (41.3%). The main component of the terpene fraction was palustrol.

Earlier, in an investigation of the essential oils of the wormwoods of Siberia and the Far East we failed to detect ledol and palustrol [3], which are so characteristic for plants of the family Ericaceae [4].

Analysis of samples of the essential oils of arctic species of wormwood growing in the north-eastern part of the CIS enabled us to establish the presence of these compounds. Thus, in the essential oil of *Artemisia arctica* Less., palustrol amounted to 5.2% [5], while in the essential oil of *Artemisia lagocephala* (Bess.) DC the amounts of palustrol and ledol ranged from 15.3 to 64.0% and from 0.0 to 2.1%, respectively, depending on the growth site [6]. Under severe arctic conditions these components accumulate in considerable amount, which agrees with information on their amount in the essential oil of the genus *Ledum* L. [7].

LITERATURE CITED

1. M. I. Goryaev and I. Pliva, Methods of Investigating Essential Oils [in Russian], Alma-Ata (1962), p. 750.
2. M. A. Khanina, E. A. Serykh, T. P. Berezovskaya, and V. A. Khan, Khim. Prir. Soedin., No. 6, 859 (1991).
3. T. P. Berezovskaya, V. P. Amel'chenko, I. M. Krasnoborov, and E. A. Serykh, Wormwoods of Siberia [in Russian], Nauka, Novosibirsk (1991), p. 123.

Siberian State Medical Institute. Novosibirsk Institute of Organic Chemistry, Siberian Branch, Russian Academy of Sciences. Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 303-304, March-April, 1993. Original article submitted August 3, 1992.

0009-3130/93/2902-0254$12.50

4. M. V. Klokova, V. A. Khan, Zh. V. Dubovenko, V. A. Pentegova, T. P. Berezovskaya, and E. A. Serykh, Khim. Prir. Soedin., No. 3, 293 (1983).
5. M. A. Khanina, E. A. Serykh, T. P. Berezovskaya, and V. A. Khan, in: A Collection of Theses on The State and Prospects of Development of Pharmacy in Siberia and the Far East [in Russian], Tomsk (1991), p. 196.
6. E. A. Serykh, M. A. Khanina, T. P. Berezovskaya, V. A. Khan, and S. S. Kharkevich, Khim. Prir. Soedin., No. 3, 429 (1991).
7. L. I. Prokosheva, Influence of the Optimum Regions for Obtaining Marsh Tea (*Ledum palustre*) in terms of Crop Yield and Content of Active Substances in the European Part of the USSR [in Russian], Author's abstract of Dissertation ... Candidate of Biological Sciences, Moscow (1980), p. 15.

TRITERPENOIDS FROM THE STEMS OF Astragalus galegiformis

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Continuing an investigation of the chemical composition of individual parts of the plant *Astragalus galegiformis* L. (Fabaceae) growing in Georgia, we have studied the isoprenoids of the stems gathered in the flowering phase in the environs of Tbilisi.

The air-dry comminuted raw material was extracted with a tenfold amount of 80% ethanol. After evaporation of the ethanol, the residual liquid was treated with chloroform. The chloroform was distilled off, and the residue was precipitated from hot water, filtered off, dried to a syrupy mass, and chromatographed on a column of type L 100/160 silica gel (Czechoslovakia).

Four individual isoprenoids were isolated: one aglycon and three glycosides, and from their IR and PMR spectra these were assigned to the cycloartanes [1, 2].

Substance (1): $C_{30}H_{60}O_5$, M^+ 490, mp, 195–196°C (from methanol); $[\alpha]_D^{20}$ + 28.7 ± 2° (c 1.15; methanol). ν_{max}^{KBr}, cm^{-1}: 3460-3380 (OH), 3040 (CH_2 of a cyclopropene ring), PMR spectrum (δ, ppm); 0.22; 0.50 (^2J = 4.2 Hz); 0.89; 1.17; 1.22; 1.25; 1.41; 1.58; 1.79 (s, 7 × CH_3); 3.55 (q, ^3J = 4.8,; 11.2 Hz, H-3); 3.69 (sx, ^3J = 3.6; 9.6; 9.6 Hz, H-6); 4.70 (sx, Σ ^3J = 21 Hz, H-16); 3.83 (t, ^3J = 15 Hz H-24).

A comparison of the results obtained with the constants of cyclogalegigenin [3, 5] showed their identity.

Substance (2): $C_{37}H_{60}O_{10}$, M^+ 664, mp 223-226°C [from chloroform—methanol (1:1)], $[\alpha]_D^{24}$ + 40 ± 2° (c 1.0; pyridien). ν_{max}^{KBr}, cm^{-1}: 3530-3300 (OH), 3050 (CH_2 of a cyclopropene ring); 1755, 1245 (ester group).

Substance (3): $C_{35}H_{58}O_9$, M^+ 622, mp 252-254°C [from chloroform—methanol (1:1)], $[\alpha]_D^{24}$ + 32 ± 2° (c 1.0; pyridine).

On the basis of the results obtained, substances (2) and (3) were identified as cyclogaleginosides A and B [4, 5].

Substance (4) formed white acicular crystals with mp 184-188°C. It was cleaved by acid into cyclogalegigenin and D-xylose, and was also hydrolyzed by alkali. This glycoside is an acylated bioside, and the determination of its structure is continuing.

LITERATURE CITED

1. M. D. Alaniya, Rast. Res., 21, No. 4, 510 (1985).
2. M. I. Isaev, M. B. Gorovits, and N. K. Abubakirov, Khim. Prir. Soedin., No. 4, 431-478 (1985).
3. M. D. Alaniya, M. I. Isaev, M. B. Gorovits, N. D. Abdullaev, É. P. Kemertelidze, and N. K. Abubakirov, Khim. Prir. Soedin., No. 3, 330-339 (1983).

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