used as indicator. Formic acid (R_f 0.07) and n-valeric acid (R_f 0.55) were detected in comparison with markers.

The terpenes were studied by gas-liquid chromatography under the following conditions: 1) KhL-4 chromatograph with a thermal conductivity detector using helium as the carrier gas with a column (2.4 m × 0.5 cm) containing the stationary phase polyethyleneglycol (mol. wt. 20,000) in an amount of 15% on the solid support Chromosorb W. The column temperature was 100-130°C and the rate of flow of the carrier gas 50-75 ml/min; 2) Chrom-4 chromatograph with a flame-ionization detector and helium as the carrier gas (P = 0.54 atm), with a column (3.7 m × 3 mm) containing as stationary phase 3.1% of DEGS on Inerton, the temperature of the column being 170°C and that of the evaporator 230°C. The oils were analyzed with the aid of internal standards.

In the essential oil of *Ledum palustre* 20 components were detected, in that of *Ledum decumbens* 19, in that of *Ledum hypoleucum* 14, and in that of *Ledum macrophyllum* 17.

The oils investigated were characterized by the presence of ten components in the terpene fraction of which α- and β-pinenes, Δ^3-carene, limonene, cineole, and p-cymene were identified.

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ESSENTIAL OIL OF THE LEAVES OF *C. limon* BURM., VARIETY NOVOGRUZINSKII

N. A. Kekelidze, M. I. Dzhanikashvili, and V. V. Kutateladze

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In the Georgian SSR, among ordinary lemons *C. limon* Burm. a variety of local origin — Novogruzinskii — is common [1].

There is no information on the chemical compositions of the essential oils of the leaves of lemons growing in the USSR.

We give the results of an investigation of the chemical composition of the essential oil that was isolated by distillation with water from the leaves of the common lemon *C. limon* Burm., variety Novogruzinskii, in the period of forced dormancy of plants growing in the Batumi and Sukhumi regions of the Georgian SSR.

The components were identified by a comparison of the IR spectra of the substances isolated by preparative gas–liquid chromatography with literature information [2], and also by comparing the retention times of known pure terpenes in columns with stationary phases of different polarities.

The composition of the essential oil was determined by gas–liquid chromatography on a Varian Aerograph 1860 chromatograph using a flame-ionization detector. The best separation of the total essential oil was achieved on a 550 × 0.2 cm column with as stationary phase 10% of FFAR on Chromosorb G (AW-DMCS 80/100 mesh). The carrier gas was helium and its rate of flow 40 ml/min. The temperature was programmed from 100 to 200°C.

The essential oil was distilled in vacuum through a fractionating column into high-boiling and low-boiling fractions. The removal of the low-boiling fraction was monitored with the aid of gas–liquid chromatography.

The high-boiling fraction was saponified and the products were chromatographed on alumina (activity grade II-III) with successive elution by petroleum ether, benzene, and diethyl ether, leading to the separation of sesquiterpene hydrocarbons, carbonyl compounds, and

Institute of Plant Biochemistry, Academy of Sciences of the Georgian SSR, Tbilisi.

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ether, leading to the separation of sesquiterpene hydrocarbons, carbonyl compounds, and alcohols.

From the corresponding fractions obtained by fractional distillation and chromatography on alumina, substances were isolated in the individual state with the aid of preparative gas–liquid chromatography. The preparative separation of the component was carried out in three 800 × 0.9 cm aluminum columns filled with Chromosorb W 60/80 mesh. The monoterpene hydrocarbons were isolated on a column containing 30% of FFAP at 120°C with a rate of flow of the carrier gas of 120 ml/min, the sesquiterpene hydrocarbons and the carbonyl compounds on a column containing 20% of DEGS at 160°C and a rate of flow of helium of 150 ml/min; and the alcohols on a column containing 30% of Carbowax 20 M at 108°C and a rate of flow of carrier gas of 160 ml/min.

The amounts of the components of the essential oil of lemon leaves of the variety Novogruzinskii were as follows (% on the whole oil); α-pinene, 0.75; β-pinene, 14.0; sabinene, 4.2; myrcene, 1.8; d-limonene 30.2; ocimene, 4.6; γ-terpinene 2.4; p-cymene, 0.2; terpinolene, 0.2; decanal, 0.2; citronellal, 0.3; linalool, 1.8; linalyl acetate, 0.2; terpinen-4-ol, 1.1; caryophyllene, 0.3; citronellol, 1.7; neryl acetate, 1.2; neral, 6.0; β-selinen 0.3; geranial, 18.3; geranyl acetate, 4.1; nerol, 2.0; geraniol, 1.2. α-Thujene, camphene, α-terpinene, Δ^3-carene, octanol, heptanol, and nonanol were detected in the oil in trace amounts.

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TRITERPENOIDS AND FLAVONOIDS OF THE LEAVES OF *Betula fruiticosa* AND *Betula platyphylla*

N. D. Pokhilo, G. V. Malinovskaya, V. V. Makhan'kov, and N. I. Uvarova

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Five individual crystalline substances have been isolated from the unsaponifiable fraction of an individual extract of the leaves of *Betula fruticosa* collected at the end of June in Amur province by column chromatography with silica gel L (125-80 μ): (I) — $C_{17}H_{14}O_5$, light yellow crystals with mp 174-175°C (acetone); (II) — $C_{30}H_{52}O_4$, mp 238-239°C (acetone); (III) — $C_{30}H_{52}O_3$, mp 193-197°C (acetone); (IV) — $C_{30}H_{52}O_4$, mp 216-218°C (acetone); and (V) — $C_{30}H_{52}O_4$, mp 159-160°C (hexane).

On the basis of the results of IR, PMR, and ^{13}C NMR spectroscopy, substance (I) was identified as the 4',7-dimethyl ether of apigenin [1]. By a comparison of IR and PMR spectra and mixed melting points with authentic samples, substances (II)-(V) were identified as betulafolienetriol oxide [2], betulafolienetriol [3], 20(S),24(R)-epoxydammarane-3β,11α,25-triol [4], and 20(S),24(R)-epoxydammarane-3α,11α,25-triol [5], respectively.

From the unsaponifiable fractions of an ethereal extract of the leaves of *Betula platyphylla* Sukacz., collected at the end of June in the Amur province, seven individual substances have been obtained, of which betulafolienetriol, betulafolienetriol oxide, the 3-oxo derivative of betulafolienetriol, mp 196-199°C (acetone) (VI), and dammar-25-ene-3α,12β, 20(S),24-tetraol, mp 137-140°C (acetone) (VII) have been isolated previously from *Betula platyphylla* Sukacz. var. *japonica* Hara [2, 6]. Found in addition to these compounds were the 4',7-dimethyl ether of apigenin, a triterpene $C_{30}H_{52}O_4$ with mp 189-192°C (acetone) (VIII), giving no depression of the melting point in admixture with 20(S),24(R)-epoxydammarane-3α, 17α,25-triol [7], and a noncrystalline substance $C_{32}H_{54}O_5$ with $[\alpha]_D^{20}$ −7.6° (c 0.5; chloroform) (IX). The IR spectrum of the triterpene (IX) showed absorption bands at 3638 cm^{-1}

Pacific Ocean Institute of Bioorganic Chemistry, Far Eastern Science Center, Academy of Sciences of the USSR, Vladivostok.

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