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ESSENTIAL OIL OF Eucalyptus macarthuri

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The chemical composition of the essential oil of Eucalyptus macarthuri Deane et Maid., cultivated on the territory of the USSR has not previously been studied. There is information [1] that this oil possesses a high biological activity.

We have investigated the essential oil obtained by the steam-distillation method from the leaves of plants gathered in the flowering stage at the Sukhumi experimental station of the All-Union Scientific-Research Institute of Plant Growing. Yield 1.6%; light yellow liquid with a pleasant smell; n_D^{20} 1.4730, d_{20}^{20} 0.9045.

The composition of the essential oil was determined by capillary gas chromatography and by chromato-mass spectrometry. This was carried out in a HP-5840 capillary gas chromatograph and a Hewlett-Packards HP-5995B quadrupole chromato-mass spectrometer. The mass spectrometer was linked to the gas chromatograph through a system of direct introduction with open discharge. In both cases, the components were separated in capillary columns with a chemically grafted-on phase (5% of phenylmethylsilicone). The thickness of the layer of this phase was 0.5 μ, the internal diameter of the column 0.32 mm and its length 25 m, with a rate of flow of carrier gas (helium) of 2.5 ml/min.

The analysis was performed with programming of the temperature from 100 to 250°C at the rate of 10°C per minute. The initial temperature was maintained for 2 min and the final temperature for 3 min. Mass spectra were recorded at the rate of 690 amu per second in the range of mass numbers of from 340 to 4000. Ionization was brought about by electron impact at the standard voltage of 70 eV.

The identification and structural assignment of the components to definite classes from their mass spectra was performed on the basis of the general laws of the fragmentation of the molecular ions of compounds of the terpene series known from the literature [2-4] and from the mass spectra of standard substances.

The amounts of the components present were determined by the internal-normalization and internal-standard methods [5].

The essential oil of Eucalyptus macarthuri contains (%) on the whole oil): α-pinene, 2.44; camphene, 0.26; β-pinene, 0.07; Δ^3-carene, 0.11; p-cymene, 0.18; 1,8-cineole, 30.21; α-terpineol, 3.22; terpenyl acetate, 8.91; a terpene alcohol, 15.93; a sesquiterpene hydrocarbon, 3.91; palustrol, 1.66; a sesquiterpene alcohol, 2.53; globulol, 8.62; ledol, 3.68; a sequiterpene alcohol, 17.56; and unidentified components not assigned to a definite class, 0.53.

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TRITERPENE ALCOHOLS FROM THE LEAVES OF Populus tremula

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In recent years, a tendency has been observed to the use for chemical processing not only of the woody verdure of the pine and the larch but also, in particular, that of the aspen. The composition of the extractive substances of the leaves and shoots has been studied inadequately in comparison with the extractive substances of the trunk part of the tree.

The petroleum-ether-soluble fraction (6.3% of the weight of the dry leaves) of an ethanolic extract was separated into neutral substances (49.5%), free acids, and waxes. The chromatography of the neutral substances on a column of silica gel led to the isolation of an ester fraction (9.85 g; 32.4%, here and below on the neutral substances; IR spectrum: 1730 cm^{-1}). After saponification of the fraction with 0.5 N KOH in ethanol and the usual working-up procedure, the bound acids and the unsaponifiable substances (3.58 g, 11.65%) were obtained. From the unsaponifiable substances, on a column of silica gel, a fraction (1.68 g) was isolated that contained mainly 4,4-dimethylsterols. After acetylation of the fraction with acetic anhydride in pyridine and the appropriate working-up procedures, the acetates of triterpene alcohols (0.35 g) were separated by chromatography on silica gel with the addition of 5% of silver nitrate (with elution by petroleum ether containing 5% of diethyl ether) from the accompanying components (acetates of aliphatic alcohols, phytol, and prenols).

The chromato-mass spectrometry of the triterpene alcohol fraction in a glass capillary column containing OV-17 showed the presence of six components in the fraction. The mass spectra of four of the compounds were identical with the mass spectra of β- and α-amyrins, cycloartenol, and lupeol [1, 2]. The main component of the fraction, with M^+ 468 (10%), 453 (53), 408 (2), 393 (57), 297 (4), 255 (7), 241 (8), 229 (8), and 69 (100), was not identified from its mass spectrum.

The residue of the fraction (0.34 g) was chromatographed on a column of silica gel with the addition of 30% of silver nitrate. Petroleum ether with the addition of 3-5% of diethyl ether eluted successively the combined acetates of α- and β-amyrins (35 mg; identified by chromato-mass spectrometry); the acetate of the main component of the fraction (158 mg); cycloartenol acetate (50 mg, mp 129-130°C; PMR); and lupeol acetate (53 mg; mp 215-217°C; mass spectrum; PMR).

The main component of the fraction (mp 147-148°C from hexane) was identified from its spectra (PMR, IR, mass spectrum) as butyrospermol acetate (5α-eupha-7,24-diene 3β-acetate). According to the literature [3]: mp 146-147°C. To confirm its structure, the compound isolated was treated in chloroform with hydrochloric acid, and the compound obtained was identified by its PMR and mass spectra as 5α-eupha-8,24-diene 3β-acetate (euphol acetate) [4].

Thus, it has been shown that in the leaves of the aspen Populus tremula five types of triterpenoids are synthesized – oleanolanic, ursanic, lupanic, lanostanic, and euphanic.

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