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LIPIDS OF THE LEAVES OF *Elaeagnus angustifolia*
II. COMPOSITION OF THE NEUTRAL LIPIDS

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The compositions of the neutral lipids of the leaves of *Elaeagnus angustifolia* L. (fam. Elaeagnaceae) separated into acid and neutral fractions are given.

The surface lipids, the composition of which is given in [1], were eliminated from the intact air-dry leaves by brief immersion in chloroform. The residual plant material was comminuted and extracted with chloroform–methanol (2:1). The yield of extract was 8.3% of the original weight of the raw material. The total lipids obtained were separated into acid and neutral fractions by cold saponification with a 10% solution of KOH in MeOH. By acidification with dilute H_2SO_4 the sodium salts were converted into the free acids, which were methylated with diazomethane and separated in solvent system 1 into methyl esters (MEs) of fatty acids (FAs) and MEs of triterpene acids.

Composition of the FAMEs, % GLC: 9:0, 0.4; 10:0, 0.3; 11:0, 0.3; 12:0, 0.3; X_1, 0.9; X_2, 0.3; 14:0, 4.4; 15:0, 1.6; 15:1, 1.1; 16:0, 18.9; 16:1, 2.2; 17:0, 3.2; X_3, 1.5; 18:0, 6.2; 18:1, 10.1; 18:2, 10.8; 18:3, 30.0; 21:0, 1.3; 21:1, 1.0; 22:0, 5.3.

The FAs of the leaves of *E. angustifolia*, just like those of the other organs of this plant that have been studied [2, 3] were not distinguished by the high content of the 16:1(9) acid that is characteristic for another representative of the family Elaeagnaceae — *Hippophaë rhamnoides*. The main acids here were the 18:3, 16:0, 18:2 and 18:1 species.

The yield of the lipids of the neutral fraction was 57% of the weight of the extract. These lipids were fractionated on a column of silica gel followed by preparative thin-layer chromatography. The results of the separation are given in Table 1. According to these results, one third of the lipids of the neutral fraction consisted of isoprenols, which are known for their antiulcer, antitumor, and adrenergic activities [4]. In the MS of the isoprenols, peaks were detected of molecular ions (M^+) with *m/z* 834, 766, and 698, corresponding to dodeca-, undeca-, and decaisoprenols. These compounds have been found previously in the leaves of the sea buckthorn *Hippophaë rhamnoides* [5]. The relative intensities of the molecular ions (17, 43, and 4%, respectively) permitted the assumption that, as in sea buckthorn leaves, undecaisoprenol predominates in the mixture of isoprenols from *E. angustifolia* leaves.

TABLE 1. Composition of the Lipids of the Neutral Fraction of *E. angustifolia* Leaves

Class of lipids	Content, %	Composition of the individual classes, GLC, MS, UV
Hydrocarbons	4.9	C_{21}–C_{31}, mainly C_{29}
Carotenoids + unident.	2.9	UV: β-carotene
Esters of FAs with aliph. and cyclic alcohols	4.1	Acids: C_{14}–C_{28}, mainly C_{24} and C_{22} Alcohols: C_{20}–C_{32}, mainly C_{22} and C_{24} α-Tocopherol and its dimer, M^+ 858
Isoprenols	32.9	Undeca-, deca- and dodecaisoprenols
Fatty alcohols + triterpenols	11.2	Fatty alcohols: C_{16}–C_{26} Triterpenols: α- and β-amyrins, cycloartenol, 24-methylenecycloartanol
Triterpene aldehydes	1.0	MS: M^+ 440
Methylsterols	1.7	Citrostadienol
Sterols	5.5	β-Sitosterol
Unidentified	35.8	

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The next fraction obtained from the column in appreciable amounts was assigned to the triterpenoids from its chromatographic mobility and a qualitative reaction with H_2SO_4. The MS of this fraction gave grounds for assuming the presence of amyrins, cycloartenol, and 24-methylenecycloartanol in admixture with fatty alcohols [6]. The following aliphatic alcohols were detected ($[M - 18]^+$; I_{rel}, %): C_{26} (364; 7), C_{24} (336; 15), C_{23} (322; 1), C_{22} (308; 9), C_{21} (294; 1.5), C_{20} (280; 4), C_{19} (266; 2), C_{18} (252; 4), C_{17} (238; 3), C_{16} (224; 4). Thus, the main fatty alcohols in the fraction were the C_{24}, C_{22}, and C_{26} species. The same alcohols predominated in the fraction not subjected to the hydrolysis of esters under the given conditions. Their composition was identical with that of the alcohols in the surface lipids of the leaves of this plant studied previously [1].

Methylsteroids were represented by citrostadienol (M^+ 426, *m/z* 411, 393, 328, 310, 285), and sterols by β-sitosterol (M^+ 414, *m/z* 399, 381, 303).

The most polar of the fractions identified from its behavior in a thin layer was assigned to the triterpene aldehydes. The M^+ 440 peaks and those of fragmentary ions (*m/z* 232, 207, 203, 189) present in the MS may belong to oleanolic and ursolic aldehydes to an equal degree.

The hydrocarbons of the neutral lipids of the *E. angustifolia* leaves consisted of the paraffins from C_{21} to C_{31} (main peak in GLC identical with C_{29}) and carotenoids (the main one, according to UV, being β-carotene).

Thus, the lipids of the neutral fraction of *E. angustifolia* leaves form a valuable source of biologically active substances and may find use in practical medicine.

For general observations, see [3]. The solvent system was hexane–diethyl ether (1:1).

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