FATTY OIL OF THE SEEDS OF *Ligularia macrophylla*

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We have investigated the fatty oils of the seeds of *Ligularia macrophylla* D. C. Prodr. (great-leaf golden ray) growing in the region of Lake Isyk, Alma-Ata province.

The ripe seeds of the golden ray were ground and extracted with petroleum ether (40-70°C) in a Soxhlet apparatus [1]. After the solvent had been driven off in vacuum, an amber-colored fatty oil was obtained with a yield of 17.3% n_D^{20} 1.4762, d_D^{20} 0.987, iodine No. 5,5 mg KOH/g, saponification No. 172.0 mg KOH/g, iodine No. 69.4% I_2, content of unsaponifiables 1.3%.

It was found by adsorption chromatography on silica gel [2] that the bulk of the oil — 93.3% — consisted of a neutral fraction, and only a small amount — 4.3% — of a polar fraction. In addition, derivatives of the furoeremophylane series (2.4%) were detected in the oil, and their compositions and structures are now being studied.

The fatty acid composition of the oil and its fractions (total and polar) were determined by gas–liquid chromatography. The fatty acids were analyzed in the form of methyl esters [3] on a Chrom-5 chromatograph with a flame-ionization detector in a 0.3 × 250 cm steel column filled with 10% of poly(ethylene succinate) on silanized Chromaton N-AW (0.20-0.25 mm); column temperature 185°C, evaporator temperature 200°C, rate of flow of the carrier gas, argon, 35 ml/min. The results of the analysis are given below (%):

Acid	Fatty oil	Neutral fraction	Polar fraction
12:0	Tr.	0.4	1.0
14:0	Tr.	0.1	1.5
16:0	4.5	3.2	4.3
16:1	2.5	5.5	8.0
17:0	0.8	2.4	16.7
17:1	Tr.	1.0	8.5
18:0	17.7	12.2	7.0
18:1	74.4	66.8	3.4
18:2	Tr.	4.8	12.3
18:3	Tr.	1.5	2.2
20:0	Tr.	2.0	3.8
20:1	Tr.	Tr.	31.3

The amounts of pigments and vitamins [4] were determined in the oil (mg/kg): total carotenoids 7.91; β-carotene 0.48; tocopherols 3.00.

Thus, it has been shown that the fatty oil from the seeds of the golden ray consist to the extent of 93.3% of a neutral fraction with only 4.3% of a polar fraction. The main fatty acids in the initial oil and the neutral fraction are oleic and in the polar fraction eicosenoic.

Derivatives of the furoeremophylane series have been detected in the oil. The amount of pigments and vitamins is low.

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TOCOPHEROLS OF *Olea europaea*

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The qualitative and quantitative compositions of the tocopherols of the olives grown in Azerbaidzhan have not been studied. In view of the increase in their planting, it is extremely urgent to set up a study of the total amount and the isomeric composition of the tocopherols in olives.

We have investigated the oils of the varieties Baki-25, Pikvales, and Gorvala from the 1986 harvest from plots of sovkhoz [collective farm] No. 2 of the Apsheron region of the Azerbaidzhan SSR.

The tocopherols (TPs) were isolated within the total lipid fraction of the olives and were analyzed by TLC [1]. All the operations on the isolation and separation of the TPs were performed in an atmosphere of argon. The TPs were freed from contamination with other lipids by hydrolysis in 12% ethanolic KOH in the presence of pyrogallol (80°C, 5 min). The unsaponifiable fraction was extracted with diethyl ether and was washed free from impurities.

The isomeric forms of the TPs were separated by TLC on silica gel in the petroleum ether–diethyl ether–diisopropyl ether–acetone–acetic acid (254:3:32:12:3) system [2], the advantage of which is the possibility of separating β- and γ-tocopherols (these position-isomers are scarcely separated in other systems [1]). The TP spots were detected with a 2% ethanolic solution of α-dimethylphenylenediamine. The Sonnenschein reagent* was used to differentiate the β- and γ-tocopherols, giving a brown spot with β-tocopherol and a blue one with γ-tocopherol [3]. With the aim of a quantitative determination of the TPs, the spots were eluted with the $FeCl_3$–α,α'-bipyridyl reagent and spectrophotometry was carried out at wavelength of 520 nm [4]. Calibration graphs were plotted with solutions of pure α-, β-, and δ-tocopherols, respectively. "Erevit" synthetic δ, α, and β isomers (Czechoslovakia) were used as control. γ-Tocopherols were determined on the basis of the graph for the β-tocopherols.

The results obtained are given in Table 1, from which it can be seen that the total amount of TPs is appreciably affected by the variety characteristics of the olives. At a total pro-

TABLE 1. Qualitative and Quantitative Compositions of Olive Tocopherols

Form of tocopherol	Amount, % on the total weight of the TPs		
	Baky-25	Pikvales	Gorvala
α-Tocopherol	39,3	41,4	59,4
β-Tocopherol	12,2	14,5	10,2
γ-Tocopherol	24,0	19,7	16,7
δ-Tocopherol	24,5	24,4	13,7
Total proportion by weight, mg/kg	197,4	223,2	271,7

*The reagent is prepared in the following way: 1 g of trichloroacetic acid is added to a suspension of 1 g of cerium sulfate ($Ce(SO_4)_2$) in 4 cm^3 of distilled water and the mixture is heated to the boil, and then concentrated sulfuric acid is carefully added in drops until a clear solution has been obtained.

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