SUMMARY

In a study of one of the samples of a seed oil of *Artemisia absinthium* low-molecular-weight triacylglycerides, one acyl radical of which is formed by one of the eight homologs of normal saturated fatty acids with even and odd numbers of carbon atoms from $C_{2:0}$ to $C_{9:0}$, were detected and their presence was proved.

Of the components isolated, 75% contained the short-chain fatty acids. Mainly acetic, in position 2, and 25% contained them in positions 1 and/or 3 with a predominance of acetic and propionic acids.

LITERATURE CITED

1. M. O. Bagby and C. R. Smith, Biochem. Biophys. Acta, 137, 475 (1967).
2. R. W. Miller, C. R. Smith, D. Weisleder, R. Kleiman, and W. K. Rohwedder, Lipids, 9, 928 (1974).
3. C. R. Smith, R. V. Madrigal, D. Weisleder, and R. D. Plattner, Lipids, 12, 736 (1977).
4. C. R. Smith and R. V. Madrigal, J. Am. Oil Chem. Soc., 54, No. 2, 157A (1977).
5. A. Hashimoto and S. Kitaoka, Nippon Oyo Dobutsu Konchu Gakkai-Shi, 18, 121 (1974); Chem. Abstr., 82, 53033.
6. W. E. Fallon and J. Shimizu, Lipids, 12, 765 (1977).
7. R. J. Ackman, C. A. Eaton, J. Kinneman, and C. Litchfield, Lipids, 10, 44 (1975).
8. S. G. Yunusova, I. P. Nazarova, S. D. Gysakova, and A. I. Glushenkova, Khim. Prir. Soedin., 319 (1980).

SEED OIL OF *Cousinia severzovii*

N. T. Ul'chenko, E. I. Gigienova, U. A. Abdullaev, K. L. Seitanidi, and A. U. Umarov

UDC 543.915.665.3

The composition of the seed oil of *Cousinia severzovii* has been studied; about 20 types and classes of compounds were isolated from the oil, including 6% of triterpenes with a molecular weight of 426 in the free state, as the acetylated derivatives, and as derivatives acylated with higher fatty acids of the 34:0-13:0 group in a ratio of 1:1:2, respectively; and 3.8% of oxidized acylglycerols (seven types). The classes of lipids were represented by no individual compound but only by a series of homologs or isomers.

Lipids of complex composition have been detected in the seed oil of *Cousinia severzoii*, family Asteraceae growing on the western slopes of the Chatkal range. While with the aid of analytical thin-layer chromatography in systems a, c, e, and j only 6-8 zones of substances were detected in the seed oil, by means of column chromatography (100 g of oil) and preparative thin-layer chromatography in systems a-k 20 classes and types and lipids were isolated from it. The assignment of each of these components was based on a comparison of their chromatographic mobilities with those of model substances isolated from oils investigated by us previously, and it was confirmed by qualitative reactions 1-4 in a thin layer of silica gel and by spectral characteristics. The esters were subjected to alkaline and enzymatic hydrolysis. The ratio of the numbers of oxidized and unoxidized acyl radicals isolated from the products of the alkaline hydrolysis of the acylglycerols was determined gravimetrically after their separation in a thin layer of silica gel in system e and *l*.

The separation and identification of the fatty acids isolated was carried out by preparative chromatography in a thin layer of silica gel (systems e and j) by qualitative reac-

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Uzbek SSSR, Tashkent. Translated from Khimiya Prirodnykh Soedinenii, No. 1, pp. 38-44, January-February, 1981. Original article submitted July 1, 1980.

0009-3130/81/1701- 0033$07.50

TABLE 1. Composition of the Fatty Acids of Some Lipids from the Seed Oil of *Cousinia severzovii*, % of the Total

Acids	According to GLC/Reoplex										According to TLC	
	12:0	14:0	15:0	16:0	17:0	18:0	18:1[9]	18:2[9,12]	20:0	22:0	epoxy acids	hydroxy acids
Oil												
Total	—	0,3	—	6,7	—	1,7	19,5	69,7	1,2	0,9	—	—
Saturated	—	2,6	0,9	64,7	1,3	21,7	—	—	6,4	2,4	—	—
Triacylglycerides												
Total	—	0,2	—	6,3	—	3,6	20 8	69,1	—	—	—	—
In position 2	—	0,5	—	4,8	—	1,5	29,3	63,9	—	—	—	—
Epoxyacyldiacylglycerols												
Unoxidized	—	0,3	—	9,5	—	3,3	25,9	61,0	—	—	—	—
Total	—	0,2	—	6,3	—	2,2	17,3	40,7	—	—	33,3	—
Hydroxyacyldiacylglycerols												
Unoxidized	0,4	0,4	—	9,0	—	0,2	26,3	63,7	—	—	—	—
Total	0,3	0,3	—	6,0	—	0 1	17,5	42,5	—	—	—	33.3
Diacylglycerols												
Unoxidized	—	0,7	0.7	18,7	0,6	3,8	38,4	36,6	0,5	—	—	—
Epoxyacylmonacylglycerols												
Unoxidized	3,2	4,2	4,6	47,0	—	4,6	27,1	8,9	—	—	—	—
Total	1,6	2,3	2,3	23,5	—	2,3	13,6	4,4	—	—	50,0	—
Hydroxyacylmonoacylglycerols												
Unoxidized	1,6	2,2	1,6	22,4	—	4,9	17,7	49,6	—	—	—	—
Total	0,8	1,1	0,8	11,2	—	2,5	8,8	24,8	—	—	—	50,0
Monoacylglycerols												
Unoxidized	—	0,4	—	13,1	0,7	2,3	18,1	65,4	—	—	—	—
Free fatty acids												
Unoxidized	—	0,3	0,3	11,0	0,4	2,9	18,6	63,4	1,7	1,4	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	100,0

tions 1-5, and by GLC/Reoplex, and also on the basis of spectral characteristics. Spectra of substances analogous to those isolated from other oils and some of the methods of analysis have been given previously [1]. The composition of the fatty acids of the acyl-containing lipids is given in Table 1.

As a result of the investigation performed, the following classes and types of lipids were detected in the oil (% on the total): hydrocarbons (0.3); acyltriterpenols (3.0); acylsterols (tr.); acetyltriterpenols (1.5); triacylglycerols (86.5); epoxyacyldiacylglycerols (1.5); free fatty acids, unoxidized (1.7) and oxidized (tr.); hydroxyacyldiacylglycerols (1.1); triterpenols (1.5); epoxyacylhydroxyacylmonoacylglycerols (tr.); 1,3-diacylglycerols (1.0); 1(3),2-diacylglycerols (0.6); sterols (0.4); 1.3- and 1(3)-2-epoxyacylmonoacyl glycerols (0.2); 1.3- and 1(3),2-hydroxyacylmonoacylglycerols (0.4); 1(3)- and 2-monoacylglycerols (0.2); and pigments and unidentified components (~1.0).

In order to establish the position of the ethylenic bonds in the unoxidized fatty acids, the latter were isolated and subjected to oxidative degradation. For this purpose, the oil was subjected to esterification with methanol in the presence of sodium methanolate. The methyl esters were separated on a "silver column" [2] according to their degrees of unsaturation. Three fractions of methyl esters were obtained — "saturated," "monoenic," and "dienic." The methyl esters of the second and third fractions were subjected to oxidative degradation with periodate-permanganate according to von Rudloff, and it was found that the ethylenic bonds were located between carbon atoms 9-10 and 12-13 of the unbranched aliphatic chain (Table 1). The IR spectra showed that the ethylenic bonds had the cis configuration.

Consequently, of the "monoenic" and "dienic" acids the seed oil contained only oleic (cis-18:1, Δ^9) and α-linoleic (cis, cis-18:2, $\Delta^{9,12}$) acids.

Pigments. β-Carotene was identified and quantitatively determined from the adsorption in the ultraviolet region of a mixture of it with other components of the oil transparent in the corresponding regions of the spectrum (13 mg %, λ_{max}^{hexane} 270, 340, 424, 446, 474 nm). Chloro-

phyll a was detected in one of the fractions of the oil (λ_{max}^{hexane} 412, 452, 508, 536, 616, 650, 676 nn).

The hydrocarbons consisted, according to mass spectroscopy, of the 16 homologous C_{19}-C_{34} paraffins and five homologous series of olefins: the $C_{19:1}$-$C_{30:1}$ monoenes, the $C_{19:2}$-$C_{30:2}$ dienes, the $C_{19:3}$-$C_{30:3}$ trienes, the $C_{19:4}$-$C_{30:4}$ tetraenes, and the $C_{19:5}$-$C_{29:5}$ pentaenes. Among them the hydrocarbons with odd numbers of carbon atoms predominated: the C_{19}-C_{27} paraffins (with a maximum at C_{21}) and the C_{19}-C_{27} olefins. It is possible that in addition to the homologs mentioned hydrocarbons with shorter chains were present. However, in the region of low masses the assignment of the peaks to molecular ions is difficult.

Free triterpenols were obtained after repeated recrystallization with acetone of the fraction of the oil richest in them.

Analytical chromatography on microplates with a fixed layer of silica gel in system o [3] showed that the alcohols isolated had an R_s value of 1.5, which corresponds to the migration of triterpenols. In the mass spectrum of the combined triterpenoids, a molecular ion with a mass of 426 was found.

The combined triterpenols were acetylated. The reaction products were separated in a layer of silica gel with 10% nitric acid in systems m and n. When system m was used for preparative separation of the triterpenol acetates in a thin layer of silica gel, four fractions of substances (I), (II), (III), and (IV) were obtained with R_f 0.65, 0.6, 0.55, and 0.5 in amounts of 0.7, tr., 0.3, and 0.5% on the oil, respectively.

The terpenoids (I) were amyrins according to the mass, PMR, and IR spectra of the acetylated derivatives. The melting points of the acetates of (I) (193-195°C) and of the free alcohols (I) (169-169.5°C) showed that they did not consist of an individual amyrin. By GLC/OV-17 two peaks were detected with relative retention times (RRTs) in relation to β-sitosterol corresponding to α- and β-amyrins. Their relative amounts were 52 and 48%, respectively.

The triterpenols II were not identified because they were present in the oil in only trace amounts.

The triterpenols II can be assigned on the basis of a spectrometric analysis of their acetyl derivatives and RRTs on GLC/OV-17 to the group of α-amyrins with terminal methylenes. Their mass-spectrometric fragmentation, and the melting points of their acetates and of the free alcohols crystallized from acetone (231-236°C and 196-199°C, respectively) show the presence of a mixture of isomers of the type of taraxasterol [4-6], pyrethrol [7], and others.

Triterpenols IV were identified from their bond vibrations, proton resonances, and mass-spectrometric fragmentation of the acetyl derivatives as consisting of lupeol [8]. The RRT of the alcohol (IV) on GLC/OV-17 coincides with that of lupeol [4, 8, 9] and also with that of cycloeucalenol [9]. The melting points of the acetate of (IV) and of the free alcohol crystallized from acetone (198-199°C and 185-186°C) showed that the substance was isolupeol [10].

The acyltriterpenols were freed from accompanying substances in a thin layer of silica gel (system c) and by repeated recrystallization from acetone. In the mass spectrum of the homologs of these esters 22 molecular ions were found with masses of 916-622 and a peak with m/e 408 (100%) which is characteristic for esters of triterpenols with a molecular weight of 426. Furthermore, the 22 fragments with m/e 508-214 corresponded to fragments of RCOOH's from 34:0 to 13:0.

The total fatty acids were isolated from the ether-soluble products of the alkaline hydrolysis of the acyltriterpenols, and in these, after methylation only the eleven 23:0 to 13:0 acids were found by GLC/Reoplex. However, with the aid of mass spectrometry the same combined material revealed the 22 homologous methyl esters of the 34:0-13:0 acids.

From the products of the alkaline hydrolysis of the acyltriterpenols pentacyclic alcohols were also isolated by the method used for "unsaponifiables." The main components of these triterpenols according to mass spectroscopy (m/e 218, 100%) were amyrins [11].

The acetyltriterpenols, purified by the TLC method in system c, consisted of the acetates of alcohols with a molecular weight of 468 (mass spectrum), mainly amyrins (m/e 218, 100%). As impurities in them we detected the acetates of alcohols with a molecular weight of 482.

The free sterols from one of the fractions of the oil were separated from contaminating acylglycerols by TLC in system j and by recrystallization from acetone. In the mass spectrum of the free sterols the main molecular ion corresponded to β-sitosterol — 414; as an impurity we found campesterol with M^+ 400 and traces of a sterol with M^+ 412.

Acylsterols were detected in trace amounts from the ions M^+ 414 (0.7%) and M^+ 400 (0.1%) in the mass spectrum of the products of the hydrolysis of the acyl triterpenols.

EXPERIMENTAL

The spectra were recorded on UR-10, MKh-1303, MKh-1310, and M-4H-100/100 MHz instruments [1]; GLC/Reoplex was carried out in a Khrom-4 instrument at 204°C and a rate of flow of helium of 700 ml/min using a column 2.5 m long and 3 mm in diameter filled with 15% of Reoplex on Chromaton N-AW. GLC/OV-17 was performed on a Khrom-41 instrument at a column temperature of 230°C and an evaporator temperature of 270°C with a pressure of nitrogen at the inlet of 2.3 atm, the column, with a length of 3.5 m and a diameter of 3 mm, being filled with 3% of OV-17 on Chromosorb Q.

Thin-layer chromatography and column chromatography were performed on silica gels L 5/40 μ and L 100/250 μ, respectively [1].

Solvent Systems. Hexane—ether: a) (10:0); b) (9.5:0.5); c) (9:1); d) (8.5:1.5); e) (8:2); f) (7:5:2.5); g) (7:3); h) (6.5:3.5); i) (6:4); j) (5:5); k) (0:10); l) (1:9); chloroform—carbon tetrachloride: m) (5:5); hexane—benzene: n)(6:4); hexane—ethyl acetate: o)(4:1).

Qualitative reactions: 1) 50% sulfuric acid followed by carbonization of the organic substances; 2) iodine vapor; 3) picric acid; 4) 2,4-dinitrophenylhydrazine; 5) thiocyanate reagent.

The repeated extraction of the oil was carried out by the method of steeping with petroleum ether at room temperature.

Alkaline hydrolysis of the acylglycerols was performed with 1 N caustic potash at room temperature, and enzymatic hydrolysis with pancreatic lipase.

The alkaline hydrolysis of the acyltriterpenols was performed in a tenfold excess of 30% caustic potash in methanol in the boiling water bath for 16 h.

Acetylation of the triterpenols was carried out in pyridine with the aid of acetic anhydride at room temperature for 16 h [12].

The amount of total carotenoids was determined by the procedure of FS-42-1011-75 and that of Itoh et al. [13].

Hydrocarbons. Mass spectrum (120°C, 18 V) m/e (% rel.) — C_n (where n is the number of carbon atoms): paraffins — M^+ 478 (tr) — C_{34}, 464 (tr) — C_{33}, 450 (tr) — C_{32}, 436 (1.0) — C_{31}, 422 (tr) — C_{30}, 408 (2.0) — C_{29}, 394 (1.0) — C_{28}, 380 (5.0) — C_{27}, 366 (2.0) — C_{26}, 352 (8.0) — C_{25}, 338 (6.0) — C_{24}, 324 (12.5) — C_{23}, 310 (11.0) — C_{22}, 296 (15.0) — C_{21}, 282 (13.0) — C_{20}, M^+268 (8.0) — C_{19}, monoenes — M^+ 420 (tr), 406 (tr), 392 (tr), 378 (2.0), 364 (4.8), 350 (5.5), 336 (12.0), 322 (20.0), 308 (28.0), 294 (40.0), 280 (32.0), 266 (36.0) — $C_{30:1}$—$C_{19:1}$, dienes — M^+ with an intensity close to that of the monoenes, 418, 404, 390, 376, 362, 348, 334, 320, 306, 292, 276, 264 — $C_{30:2}$-$C_{19:2}$, trienes — M^+ with an intensity as for the dienes, 416, 402, 388, 374, 360, 346, 332, 318, 304, 290, 276, 262 — $C_{30:3}$-$C_{19:3}$, tetraenes — M^+ with an intensity as for the preceding group of homologs, 414, 400, 386, 372, 358, 344, 330, 316, 302, 288, 274, 260 — $C_{30:4}$-$C_{19:4}$, pentaenes — M^+ with an intensity analogous to that of the molecular ions of the tetraenes, 398, 384, 370, 356, 342, 328, 314, 300, 286, 272, 258 — $C_{29:5}$-$C_{19:5}$.

Acyltriterpenols. Mass spectrum at 150°C, 40 V, m/e (% rel.) M^+ 916 (11.0), 902 (5.5), 888 (33.0), 874 (10.0), 860 (15.0), 846 (6.0), 832 (8.5), 818 (5.0), 804 (7.0), 790 (3.4), 776 (15.0), 762 (6.6), 748 (6.5), 734 (4.0), 720 (9.0), 706 (4.0), 692 (6.6), 678 (6.4), 664 (10.0), 650 (4.0), 636 (4.0), 622 (3.8), $[M-15]^+$, $[M-15-14n]^+$, $[M-RCOOH]^+$, $[RCOOH]^+$. Mass spectrum of the triterpenols isolated from the hydrolysis products of the acyltriterpenols (150°C, 40 V), m/e (% rel.): M^+ 426 (40.0), 414 (0.7), 400 (0.1), $[M-15]^+$ 411 (16.0), $[M-18]^+$ 408 (7.0), $[M-29]^+$ 397 (2.0), $[M-33]^+$ 393 (6.8), $[M-69]^+$ 357 (6.0), 344 (2.0), $[M-11]^+$ 315 (7.0), $[M-111-18]^+$ 297, 299 (2.5), $[M-138]^+$ 286 (1.2), $[M-154]^+$ 272 (5.0), $[M-154-15]^+$ 257 (6.2), 243, 247, (0.5; 1.0), $[M-154-43]^+$ 229 (6.0), 218 (100.0), 207 (34.0), 203 (50.0),

189 (44.0), 175 (20.0), 161 (16.0), 149 (19.0), 147 (20.5), 135 (39.0), 121 (38.0), 109 (29.0), 95 (40.0), 81 (39.8), 69 (48.0), 57 (29.0), 55 (38.0), 43 (29.0), 41 (20.0).

Mass spectrum of the methyl esters of the homologous fatty acids isolated from the products of the hydrolysis of the acyltriterpenols at 150°C, 40 V, m/e (% rel.): M^+ 522 (6.0) — $C_{34:0}$, 508 (0.3), 494 (23.0), 480 (0.2), 466 (34.2), 452 (3.3) 438 (19.0), 424 (3.4), 410 (3.2), 396 (1.1), 382 (2.9),368 (4.8), 354 (1.6), 270 (3.2), 256 (2.4), 242 (2.4), M^+ 228 (2.9) — $C_{18\ 0}$, $[5-15]^+$ McLafferty ion 74 (100).

Characteristic fragments in the mass spectrum of the acetyltriterpenols at 150°C, 40 V, m/e (% rel.): M^+ 468 (10.0), 482 (0.5), $[M-15]^+$ 453 (3.0), 467 (4.0); $[M-42]^+$ 426 (0.3), 440 (0.15); $[M-60]^+$ 408 (4.0), 422 (0.3) RO^+ 425 (0.5), 439 (0.4); R^+ 409 (2.0), 423 (0.2); 218 (100.0), 203 (33.0). 189 (50.0).

1,3-Diacylglycerols. PMR spectrum, δ, ppm; t 0.87, m 1.24, m 1.57, d 1.98, t 2.24, m 2.67, combined s 4.01 and 4.12, m 5.24, s 5.4 (OH), IR spectrum, ν_{max}^{film}, cm^{-1}: 3450 m, 3015 m, 2960 s, 2935 s, 2865 s, 1740 s, 1660 w, 1460 m, 1420 m, 1245 s, 1175 s, 1060 m,730 m.

1(3),2-Diacylglycerols. PMR spectrum, δ, ppm: t 0.86, m 1.26, m 1.56, d 1.96, t 2.25, m 2.67, d 3.55, m 4.20, m 5.0, m 5.22, IR spectrum, ν_{max}^{film} cm^{-1}: 3450 m, 3015 m, 2960 s, 2935 s, 2870 s, 2865 s, 1745 s, 1660 w, 1465 m, 1440 m, 1420 m, 1380 m, 1245 s, 1175 s, 1100 s, 1060 m, 730 m.

1(3)-Epoxyacylmonoacylglycerols. PMR spectrum, δ, ppm: t 0.86, m 1.28, m 1.53, d 1.96, t 2.26, m. 2.68, s 4.03, m 5.24. The sum of the 1(3)- and 2-epoxyacylmonoacylglycerols had in its PMR spectrum signals additional to those given above: m 5.1 (>CH—OCOR) and d 3.67 ($-CH_2OH$).

Hydroxyacylmonoacylglycerols. PMR spectrum, δ, ppm: t 0.84, m 1.25, m 1.54, d 1.98, t 2.26, m 2.68, s 3.52, s 4.01, m 5.1, m 5.23 broad, s 4.1 (OH), IR spectrum, ν_{max}^{film}, cm^{-1}: 3450 m, 3010 m, 2960 s, 2935 s, 2870 s, 2865 s, 1745 s, 1660 w, 1465 m, 1440 m, 1420 m, 1380 m, 1245 s, 1175 s, 1100 s, 1060 m, 730 m.

2-Monoacylglycerols. PMR spectrum, δ, ppm: t 0.8, m 1.24, m 1.55, d 1.95, t 2.23, m 2.7, d 3.69, m 5.10, m 5.24, s 3.40 (OH), IR spectrum, ν_{max}^{film}, cm^{-1}: 3400 m, 3010 m, 2960 s, 2935 s, 2870 s, 2865 s, 1745 s, 1670 w, 1465 s, 1440 m, 1420 m, 1380 m, 1245 s, 1180 s, 1120 s, 1060 s, 730 m.

In the PMR spectrum of a mixture of 1(3)- and 2-monoacylglycerols there were, in addition, combined multiplets at 4.01 and 4.12 (—CHOH and $-CH_2OCOR$).

Triterpenols I. The mass spectrum of the acetate of I was taken at 150°C, 40 V, m/e (% rel.): M^+ 468 (13.0) $[M-15]^+$ 453 (4.0), $[M-CH_3COOH]^+$ 408 (4.0), $[M-15-ROH]^+$ 393 (1.4), 249 (1.9), 218 (100.0), 203 (21.0), 189 (9.0), PMR spectrum of the acetates of I: s 0.74, d 0.80, s 0.9, 0.96, 1.04, 1.08, 1.23, s 1.94 (AcO—), 4.48 (>CH—OAc), 5.15 (>C=CH—).

IR spectrum of the acetates of I, ν_{max}^{KBr}, cm^{-1}: 2990, 293, 2875, 2860 s, 1465-1466 s ($-CH_3$ and $-CH_2-$), d 1380-1370 s (geminal dimethyl), 1730 s, 1250 s, 1200, d 1150-1140 m, 1100 and 1080 m (—CH—$OCOCH_3$) 990 s and 975 s, d 1030 s and 1010 s, 940, 910 m, 865 w (cyclohexane), 3040, 815 and 830, 1655 m (trisubstituted ethylenic bond).

Triterpenols III. The mass spectrum of the acetate was taken at 145°C, 40 V, m/e (% rel.): M^+ 468 (17.0), 453 (0.2), 439 (0.3), 425 (0.15), 408 (10.0), 392 (7.0), 393 (5.0), 386 (4.0), 365 (0.2), 357 (5.0), 339 (0.15), 325 and 315 (0.1, 0.1), 327 (3.0), 289 (1.5), 272 (1.5), 257 (3.0), 249 (15.0), 229 (3.0), 218 (15.0), 204 (25.0), 203 (23.0), 189 (100.0), 175, 176 (16.0), 161 (15.0), 147 (18.0), 135 (33.0), 121 (35.0), 109, 107 (35.0), 95 (37.0), 81 (40.0), 69 (46.0), 57, 55 (24.0), 43 (5.0), 41 (27).

In the mass spectrum of (III), the maximum peak was that with m/e 207, as for a taraxasterol isomer [7]. PMR spectrum of the acetate of (III), δ, ppm: 0.6, 0.8, 0.86, 0.9, m 1.22, 1.35, 1.48, 1.58, s 1.92 (CH_3COO^-, 3 H), d 4.5 (terminal methylene, 2 H), m 4.4 (hemiacetyl proton, 1H).

IR spectrum of the acetate (III), ν_{max}^{KBr} cm^{-1}: 3070 w, 1640 m, 880 m, 765 w (terminal ethylenic bond), 2990 s, 2960 s, 2935 s, 2875 s, 2855 s (CH_3- and $-CH_2-$), 1730 s, 1250 v. s, (CH_3COO-), d 1470 and 1460 m ($-CH_2-$), 1370 and 1380 m (geminal dimethyl), 1140 s and 1130, 970 m, 985, 1020 and 1030 m, 910 w, 930 w, 940 w (cyclohexane).

Triterpenol IV. The mass spectrum of the acetate of IV was taken at 150°C, 40 V, m/e (% rel.). M^+ 468 (33.0), 453 (7.0), 439 (3.0), 412 (7.0), 408 (30.0), 399 (2.0), 393 (9.0), 386 (2.0), 365 (6.0), 357 (11.0), 339 (5.0), 325 (2.0), 315 (1.0), 397 (7.0), 289 (6.0), 272 (5.0), 257 (7.0), 249 (15.0), 229 (12.0), 218 (32.0), 203, 204 (36.0), 189 (100.0).

PMR spectrum of the acetate of IV, δ, ppm: s 0.8, s 0.9, s 1.18, s 1.3, and s 1.4 (CH_3— and —CH_2—), s 1.58, s 1.9 (AcO—), m 4.4 (hemiacetyl proton), d 4.55 or d 4.59 and 4.48 (terminal methylene).

IR spectrum of the acetate of IV, ν_{max}^{KBr}, cm^{-1}: 3070 w, 1640 m, 880 m (>C=CH_2) 2960 v.s, 2930 s, 2875 s, 2870 m, 2855 m, 1470 m and 1455 m (CH_3— and —CH_2—), 1735 v.s, 1250 v.s (AcO—), d 1385 and 1370 m (geminal dimethyl), 1200 w, 1150 w, 1110 w, 1030 and 1020 m, 985, 945 and 905 m (cyclohexane).

SUMMARY

The composition of the seed oil of *Cousinia severzovii* has been studied and in it a mixture of about 20 classes and types of lipids represented by more than 120 compounds, including homologs and isomers but without taking into account types of acylglycerols differing in their fatty acid compositions, have been found; 6% of the oil consists of a combination of triterpenols in the form of free alcohols, and their derivatives acetylated with the 34:0-13:0 normal saturated fatty acids, in a ratio of 1:1:2, respectively. The skeletons of the triterpenols have been established, which has assigned them to the amyrin group, the lupeol group, and the group of α-amyrins with terminal methylenes. The remaining components of the oil consist of the usual lipids and oxidized acylglycerols in amounts of 89.8 and 3.2%.

LITERATURE CITED

1. N. T. Ul'chenko, E. I. Gigienova, K. L. Seitanidi, and A. U. Umarov, Khim. Prir. Soedin., 699 (1978).
2. E. I. Gigienova, N. T. Ul'chenko, and A. U. Umarov, Maslo-zhir. Proms., No. 11, 12 (1976).
3. I. I. Zaretskaya, L. M. Kogan, O. B. Tikhomirova, and I. V. Torgov, Khim. Prir. Soedin., 321 (1966).
4. B. Wilkomirski and Z. Kaspryk, J. Chromatogr., 103, 376 (1975).
5. A. G. Pagosyan and V. A. Mnatsakyan, Khim. Prir. Soedin., 59 (1977).
6. S. V. Serkerov and I. T. Tairov, Khim. Prir. Soedin., 811 (1978).
7. T. K. Devon and A. I. Scott, Handbook of Naturally Occurring Compounds, 2. Terpenes, Academic Press, New York (1972), pp. 329 and 339.
8. R. V. Madrigal, R. D. Platner, and C. R. Smith, Lipids, 10, 208 (1975).
9. G. Willuhn and W. Richter, Planta Med., 31, 328 (1977).
10. T. G. Halsall, E. R. H. Jones, and G. D. Meakins, J. Chem. Soc., 2862 (1952).
11. T. Itoh, T. Tamura, and T. Matsumoto, Lipids, 9, 173 (1974).
12. T. Y. Jeong, T. Itoh, T. Tamura, and T. Matsumoto, Lipids, 9, 921 (1974).
13. Handbook on Methods of Investigation, Technical and Chemical Control, and the Accounting of Production in the Oils and Fats Industry [in Russian], Vol. 1, Book 2 (1967), p. 827.