LIPIDS FROM LEAVES OF *Hippophae rhamnoides*

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Leaves of seabuckthorn (*Hippophae rhamnoides* L., Elaeagnaceae) are a source of valuable biologically active substances [1]. They are used in folk medicine for diseases of the skin, gastrointestinal tract, etc. [2]. Lipids from leaves have been recommended as antiburn and wound-healing agents [3].

Lipids from seabuckthorn leaves have been investigated previously [1, 4-6].

A systematic study of various seabuckthorn varieties has been started at Samarkand forestry plant in order to find those with the highest oil and carotinoid contents. We investigated lipids from leaves of one of these varieties: red, small, and oval.

Air-dried leaves with 6.1% moisture on the absolute dry weight contained 3.5% titrable acids calculated as malic acid and chlorophyll pigments (230.0 mg/100 g).

The moisture of the leaves and the acid number of the free lipids were determined by the literature methods [7].

Free (FL) and bound (BL) lipids isolated from leaves by the literature method [8] were dark green with an odor characteristic of seabuckthorn. The chemical characteristics of seabuckthorn leaf lipids are given below:

Characteristic	Content
Free lipids, mass %	5.1
Bound lipids, mass %	5.4
Acid number of FL, mg KOH	17.3
Carotinoids of FL, mg %	247.6
Tocopherols of FL, mg %	250.0

The studied leaves contained practically equal amounts of FL and BL. The acid number and tocopherol content was greater than that of the fruit lipids [8] and slightly less than that in leaf lipids of other seabuckthorn varieties [4].

The composition and content of individual FL classes were determined after separation by CC and rechromatography of mixed fractions by PTLC on silica gel. Column chromatography was performed over silica gel with elution by hexane:diethylether mixtures with gradually increasing concentration of the latter from 0 to 50 and 100%.

Lipids were identified using qualitative reactions and chromatographic mobilities on TLC (silica gel) and comparison with authentic specimens of the corresponding compounds.

TLC was performed on silica gel and Silufol plates using diethylether:hexane (3:7, 1:1, 1:4) solvent systems.

The contents of identified lipid classes were established gravimetrically and were (mass %): hydrocarbons, 3.9; fatty acid esters with aliphatic and cyclic alcohols + carotinoids, 21.1; acetates of triterpenols and sterols + phthalates, 14.4, triacylglycerides + tocopherols, 11.0; free fatty acids, 4.3; aliphatic alcohols, isoprenols, and triterpenols, 25.4; sterols + chlorophyll pigments, 16.7; sterols, 3.2.

It can be seen that the FL consisted mainly of high-molecular-weight alcohols and their esters. Triacylglycerides were eluted with tocopherols and were detected using a qualitative reaction [9]. The presence of phthalates was confirmed by analytical TLC on silica gel and comparison with authentic samples obtained from carrot tops [10] and by GC. For this, the phthalate fraction was hydrolyzed. The released phthalic acid was methylated and analyzed as dimethylphthalate by GC. The presence of phthalates in FL from seabuckthorn leaves has not previously been reported.

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TABLE 1. Fatty Acids of Lipids from Seabuckthorn Leaves, GC, mass %

Acid	Esters	TAG	FFA	BL
12:0	1.3	0.5	0.6	0.4
13:0	-	-	-	0.1
14:0	8.9	3.8	3.1	2.0
15:0	0.8	0.8	0.8	0.3
16:0	17.8	18.6	16.9	26.2
16:1	2.5	9.8	3.8	11.8
17:0	1.2	0.6	1.6	2.0
18:0	4.0	4.1	3.9	6.2
18:1	7.6	11.9	6.8	10.6
18:2	18.6	15.2	10.4	10.5
18:3	19.6	28.6	44.7	29.9
20:0	7.7	2.1	3.8	Tr.
22:0	10.0	4.0	3.6	Tr.
$\Sigma_{sat.}$	51.7	34.5	34.3	37.2
$\Sigma_{unsat.}$	48.3	65.5	65.7	62.8

Table 1 gives the composition and content of fatty acids of acyl-containing lipids that were established by GC [8] as the methyl esters.

Table 1 shows that the esters were enriched in saturated acids, mainly 20:0 and 22:0, that were present in all FL classes but in a smaller amount and practically absent in BL. Despite the fact that the total masses of saturated and unsaturated acids were practically identical in the fatty acids of TAG, FFA, and BL, the content of some fatty acids in them differed significantly.

Linolenic acid dominated in all FL and BL classes. It was especially rich in FFA. The 18:2 acid dominated in esters and TAG; 18:1, in TAG and BL.

The high content of 16:1 acid that was characteristic of seabuckthorn fruit lipids was low in leaves in some FL classes and in BL.

Hydrolysis of lipids, isolation of fatty acids, and methylation of them were performed as before [11]. The carotinoid content was established using the literature method [12].

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