Chemistry of Natural Compounds, Vol. 41, No. 2, 2005

LIPIDS OF *Eminium Lehmannii* LEAVES AND TUBERS

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UDC 547.915.5

Lipids of Eminium Lehmannii *leaves and tuber casings and cores were studied. Their class and fatty-acid compositions were determined. Leaf pigments were investigated.*

Key words: *Eminium Lehmannii*, neutral lipids, glyco- and phospholipids, fatty acids, pigments.

Eminium Lehmanii (Bge) O. Ktze (Lehman eminium, Araceae Neck) is a perennial herbaceous plant [1]. The tubers have an unpleasant scent and contain poisonous alkaloids that may have medicinal value [2]. *Eminium* lipids have not been previously investigated.

Results from a study of lipids from leaves (I) and tuber casings (II) and cores (III) are reported in the present article.

The air-dried leaves contain 11.6% moisture; tubers, 12.8%. Leaves represent 59.4% of the dry plant mass; tuber casings, 13.4; tuber cores, 27.2; i.e., leaves are the principal plant part.

Ground plant parts (I, II, III) were extracted with $CHCl_3$:CH_3OH (2:1, v/v). Nonlipid components were removed from the extract by aqueous $CaCl_2$ (0.04%). The remaining extracted compounds were 4.1% of the dry plant mass for I; 2.6, II; and 1.8, III. Lipids were separated into neutral (NL), glycolipid (GL), and phospholipid (PL) by column chromatography (CC) over silica gel with elution successively by $CHCl_3$, $(CH_3)_2CO$, and CH_3OH (Table 1). The dominant fractions in all plant parts were NL and GL, which contained chlorophyll and carotinoid pigments.

We noted previously that the presence of pigments has a substantial effect on the content of separate lipid classes from *Hibiscus* leaves during their separation by CC over silica gel [3].

The contents of chlorophyll pigments in the lipid extract and in NL and GL from leaves, which were 15.6, 24.7, and 16.6 mg/g, respectively, were determined by the literature method [4]. This indicates that a large fraction of the chlorophyll pigments transferred into the NL fraction during separation of the total lipids by CC. The carotinoid content in the total lipids was 530.3 mg% and was found mainly in the NL. TLC of the NL and GL fractions over silica gel with added $CaCO_3$ (1:1) using system 1 [5] detected chlorophyll "a" and "b" with R_f 0.47 and 0.42 and pheophytins with R_f 0.65 and 0.56. It should be noted that mainly native chlorophyll pigments occur in the GL fraction whereas altered forms are found in the NL.

Carotinoids appeared as two spots with R_f 0.32 and 0.96 by TLC of the NL using system 1. The UV spectrum (λ_{max}, hexane) corresponded to neoxanthine (413, 438, 450 nm) and β,β'-carotene (427, 450, 473 nm) [5].

Lipid classes were identified by their chromatographic mobilities, qualitative reactions, and comparison with authentic samples using solvent systems 2 and 3 for NL, 5 and 6 for GL, and 7 and 8 for PL.

Lipids from the studied plant parts have identical qualitative compositions. The NL included paraffinic, olefinic, and aromatic hydrocarbons, sterol and triterpenol fatty-acid esters, triacylglycerides, tocopherols, free fatty acids, free aliphatic alcohols, triterpenols, and sterols.

Solvent system 4 was used to determine tocopherols in NL of leaves, casings, and cores. Three spots with R_f 0.65, 0.47, and 0.37, corresponding to the α, $\beta + \gamma$, and δ-isomers, were found by TLC. The standards were tocopherols isolated from soy oil.

The GL included sulfolipids (SL), digalactosyldiglycerines (DGDG), cerebrosides (CB), sterylglycosides (SG), monogalactosyldiglycerines (MGDG), and esters of sterylglycosides (ESG). The principal GL of leaves were SL, DGDG, SG; of tubers, SG and MGDG.

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0009-3130/05/4102-0141

TABLE 1. Quantitative Composition of Lipid Classes (% of Total Lipids)

Lipids	Leaves	Tubers	
		casing	core
NL	42.7	45.0	41.5
GL	42.1	38.8	39.0
PL	15.2	16.2	19.5

TABLE 2. Fatty-Acid Composition of Lipid Classes of *E. Lehmannii* Leaves and Tuber Casings and Cores (% GC)

Fatty acid	NL			GL			PL		
	I	II	III	I	II	III	I	II	III
12:0	0.1	0.4	0.2	0.2	0.8	1.0	0.5	0.7	1.2
14:0	0.4	0.4	0.4	0.6	1.0	1.8	1.3	0.4	1.1
15:0	0.9	0.6	0.8	0.2	0.9	3.4	0.8	0.3	-
16:0	20.6	17.5	17.4	22.6	25.4	26.3	38.5	28.0	42.9
17:0	Tr.	Tr.	Tr.	Tr.	Tr.	2.6	3.5	5.4	-
18:0	2.5	2.5	2.6	2.1	2.7	2.7	12.6	5.7	10.2
16:1	Tr.	Tr.	3.0	-	1.9	Tr.	5.7	3.2	7.5
18:1	9.4	10.5	13.7	4.3	9.2	12.4	8.0	10.8	11.8
18:2	25.6	43.7	44.7	12.3	36.3	29.2	17.2	36.1	14.5
18:3	40.5	22.1	13.6	55.8	17.5	17.4	11.9	9.4	10.8
22:0	-	2.3	3.6	1.9	4.3	3.2	Tr.	Tr.	Tr.
$\Sigma_{sat.}$	24.5	23.7	25.0	27.6	35.1	41.0	57.2	40.4	55.4
$\Sigma_{unsat.}$	75.5	76.3	75.0	72.4	64.9	59.0	42.8	59.6	44.6

The main PL from dry leaves and tuber casings and cores was phosphatidic acid. Phosphatidylcholines (PC), phosphatidylinosites, and phosphatidylethanolamines (PE), their lysocompounds, and two unidentified minor PL were present in small amounts. However, the principal components of PL from fresh leaves were PC and PE. This indicates that phospholipase D, which is present in the plant, has an effect [6].

Table 2 lists the fatty-acid composition of the acyl-containing lipid classes. It can be seen that lipids of the studied plant parts contain a set of fatty acids with 11 components that occur in various quantities in the separate classes.

A high concentration of 18:3 acid was observed in NL and GL from leaves (40.5 and 55.8%). A considerable amount of 16:0 acid was present in PL of leaves (38.3%) and tuber cores (42.9%). The content of 18:2 acid in NL of tuber casings (43.7%) and cores (44.7%) was rather remarkable. NL of all classes dominated with respect to total content of unsaturated acids. Lipids from I, II, and III were separated by TLC over silica gel using system 9. Triterpene glycosides that were absent in I were observed in lipids of tuber casings and cores by development of the chromatograms using phosphotungstic acid.

EXPERIMENTAL

GC of fatty-acid methyl esters was performed on a Chrom-5 instrument using a steel column (2.5 m) packed with Reoplex-400 (5%) on Inerton N-AW at 194°C.

UV spectra were recorded on a Perkin-Elmer Lambda-16 instrument in hexane.

Moisture of fresh leaves was 83.3%. The yield of extract was 6.8% of the air-dried mass.

The following solvent systems were used: hexane:acetone:benzene:isopropanol (69.5:25:4:1.5, 1), diethylether:hexane (3:7, 5:5, 2:98, 2), heptane:benzene (9:1, 3), $CHCl_3$ (4), $CHCl_3$:$(CH_3)_2CO$:CH_3OH:CH_3CO_2H:H_2O (65:20:10:10:3, 5),

acetone:toluene:acetic acid:water (60:60:2:1, 6), $CHCl_3$:CH_3OH:NH_4OH (7 N) (10:5:2, 7), $CHCl_3$:CH_3OH:CH_3CO_2H:H_2O (14:5:1:1, 8), $CHCl_3$:CH_3OH (25:1, 9).

NL were developed by I_2 vapor and H_2SO_4 (50%); GL, α-naphthol and H_2SO_4 (50%); PL, Vaskovsky's method, Dragendorff's solution, and ninhydrin. Tocopherols were developed using a mixture of α,α'-bipyridine (0.5%) and $FeCl_3$ (0.2%) in ethanol [7].

Plants were collected in August 2003 in Surkhandar′in region. Pheophytin "a" and "b" markers were prepared by pheophytinization of fresh cherry leaves by hot oxalic acid (5%) [4].

Lipids were hydrolyzed as before [8].

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