

## LIPIDS FROM *Capsicum annuum* SEEDS

D. T. Asilbekova

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*The composition of free and bound lipids from Capsicum annuum (Solanaceae) seeds was studied. Glycolipids, phospholipids, mono- and diacylglycerides, and free fatty acids were observed in the bound lipids.*

**Key words:** Solanaceae, *Capsicum annuum*, seeds, lipids, fatty acids.

In continuation of studies on lipids of *Capsicum annuum* (Solanaceae) [1], we investigated lipids of seeds from sweet red pepper of the Gift of Tashkent variety grown in Uzbekistan. Data on the physicochemical properties and lipid and fatty-acid compositions of hot pepper have been published [2]. Data on the lipid composition of seeds from sweet pepper have not appeared.

Free lipids from ground seeds were extracted repeatedly by hexane. Then, bound lipids were extracted from the pulp by  $\text{CHCl}_3:\text{CH}_3\text{OH}$  (2:1 by vol.) [3].

The yields of free and bound lipids were 11.9 and 3.1%, respectively, of the dry mass.

The individual lipid components were isolated by separating the extracts using column chromatography in combination with preparative TLC over silica gel. The contents of the neutral (NL), glyco- (GL) and phospholipid (PL) fractions were estimated gravimetrically. Components were assigned to the three lipid groups based on their chromatographic mobility in a thin layer of silica gel using solvent systems to analyze the lipids by comparison with known compounds that were isolated previously from the pulp of *C. annuum* [1]. Table 1 presents the results. The composition of the total lipids from pepper seeds was adjusted by us based on the compositions of free and bound lipids.

It was found (Table 1) that the free lipids consist mainly of NL in which triacylglycerines dominate. The fraction of free fatty acids and diacylglycerines is greater in the bound lipids than in the free ones. GL and PL are naturally found in the bound-lipid fraction. Of these two groups of polar lipids from pepper seeds, the PL fraction was greater than that of the GL.

According to TLC, the GL contained monogalactosyldiacylglycerines, digalactosyldiacylglycerines, and sterylglucosides and their fatty-acid esters. The main components of the pepper-seed GL were sterylglucosides.

PL consisted of six components that form the following series in order of increasing content: phosphatidylcholines > phosphatidylinosites > phosphatidylethanolamines > N-acylphosphatidylethanolamines > lysophosphatidylcholines > phosphatidic acids.

It is known that lipids bound to proteins by van-der-Waals hydrophobic interactions or H-bonds are extracted from plant tissues using extractants containing alcohol. GL, PL, diacylglycerines, monoacylglycerines, and the main fraction of free fatty acids (71% of the total) in sweet-pepper seeds are found among the bound lipids. The fraction of triacylglycerines detected in the bound lipids was about 3% of the total in the seeds.

The fatty-acid compositions of free and bound lipids of pepper seeds and the diacylglycerines, GL, PL, and free fatty acids isolated from bound lipids were determined using GC. Table 2 presents data for the fatty-acid composition of these lipids.

It can be seen that the lipids from sweet-pepper seeds contain 17 fatty acids. The acid composition of the free and bound lipids is qualitatively identical and similar to that of the main components. Bound lipids differ from the free ones only by a small predominance of saturated acids. Unsaturated acids dominate among the free and bound lipids, including PL and diacylglycerines. The principal acid is linoleic (18:2, >60%). In contrast with the lipids listed above, oleic acid is greater in the free fatty-acid fraction; 12:0-18:0 acids, in the GL.

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S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (99871) 120 64 75. Translated from *Khimiya Prirodnykh Soedinenii*, No. 6, pp. 437-438, November-December, 2003. Original article submitted November 3, 2003.

TABLE 1. Composition of Lipids from *Capsicum annuum* Seeds

Lipids	Lipid content, mass %		
	free	bound	total
Hydrocarbons + sterol esters of fatty acids	1.7	Tr.	1.5
Triacylglycerines	94.5	27.0	87.8
Free fatty acids + tocopherols	0.7	31.3	3.8
Triterpenols + sterols	3.1	1.5	2.9
Diacylglycerines	Tr.	5.2	0.5
Monoacylglycerines	-	Tr.	Tr.
Glycolipids	-	11.9	1.2
Phospholipids	-	22.9	2.3

Tr.: traces.

TABLE 2. Composition of Fatty Acids in Lipids from *Capsicum annuum* Seeds, % (GC)

Acid	Free lipids	Bound lipids				
		total	free acids	diacylglycerines	phospholipids	glycolipids
9:0	0.2	Tr.	Tr.	0.3	Tr.	Tr.
10:0	0.2	0.1	Tr.	0.7	Tr.	Tr.
12:0	0.2	0.3	Tr.	0.4	0.2	1.2
13:0	Tr.	0.2	-	0.1	-	1.6
14:0	0.3	0.3	1.5	0.5	0.3	6.2
15:0	Tr.	Tr.	0.8	0.1	Tr.	1.8
16:0	11.7	19.7	32.8	15.1	20.6	38.2
16:1	0.5	0.9	1.9	0.8	0.8	0.5
17:0	0.1	Tr.	5.1	Tr.	0.4	1.2
17:1	0.2	Tr.	Tr.	Tr.	0.2	0.4
18:0	3.3	2.6	12.2	2.5	6.2	10.1
18:1	14.5	19.4	26.2	13.3	10.8	9.8
18:2	68.5	55.6	13.5	65.7	60.3	27.9
18:3	Tr.	Tr.	-	Tr.	Tr.	-
20:0	0.3	0.9	2.8	0.5	0.2	1.1
22:0	Tr.	-	2.5	-	-	-
24:0	-	-	0.7	-	-	-
$\Sigma_{\text{sat.}}$	16.3	24.1	58.4	20.2	27.9	61.4
$\Sigma_{\text{unsat.}}$	83.7	75.9	41.6	79.8	72.1	38.6

Tr.: traces.

The study of the lipids from hot-pepper seeds found [2] that low-molecular-weight acids 6:0-14:0 are concentrated in the triterpenol- and sterol-ester fractions. However, low-molecular-weight acids 9:0-13:0 in seeds from sweet pepper are also esterified in diacylglycerines. They were detected only in trace amounts in free fatty acids and among the PL acids.

## EXPERIMENTAL

GC of fatty-acid methyl esters was carried out in a Varian Star 3400 CX chromatograph with a flame-ionization detector. A quartz capillary column of dimensions 4 m × 320 μm with DB-1 of thickness 1 μm was used. The separation conditions were: initial temperature 80°C for 1 min, programmed increase to 250°C at 10°C/min, 250°C for 30 min. The injector temperature was 200°C; detector temperature, 300°C; carrier gas, He.

The experimental conditions for the analysis and identification of lipids have been published in detail [1, 3].

## REFERENCES

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