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PHYSICOCHEMICAL PROPERTIES AND COMPOSITION OF LIPIDS FROM *Capsicum annuum* SEEDS

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The mass of 1000 Capsicum annuum *(Solanaceae) seeds and their moisture, oil and ash contents were determined. The lipid composition and acid components were studied. Low-molecular-weight fatty acids, concentrated in the ester fraction, were detected.*

Key words: hot pepper *Capsicum annuum*, lipids, low-molecular-weight fatty acids.

Two pepper varieties, sweet and hot, come from *Capsicum annuum* (Solanaceae), known also as paprika [1]. Numerous varieties and cultivated forms of red pepper can be found in the world. About 90 varietal names have been proposed for them, not considering the enormous number of isolated varieties and forms.

Red pepper is used as a preservative, in liquor and vodka production, and as a spice [2] in addition to production of food dye [3, 4].

The alkaloid capsaicin, the content of which varies from 0.2 to 0.8%, is responsible for the hot and spicy taste of red pepper [2, 5].

Peppers have been studied mainly for the presence of dyes [6-9]. It was found that the red color is due to hydrocarbon plant pigments, carotenoids, the intense coloration of which comes from highly conjugated double bonds. Peppers contain unique ketocarotenoids (capsanthin, capsorubin, cryptoxanthin).

More than 40 carotenoids were found in the unsaponified part of pepper extract using HPLC [10].

The lipid content of hot pepper has not been reported.

We determined the properties of seeds (mass of 1000 seeds and moisture, oil and ash content) of several samples of hot pepper grown in Uzbekistan (Table 1). Their seeds have about the same oil content (8-9%) and a high ash content. The ash of hot pepper is known to contain significant quantities of P, Ca, and K salts that are valuable to humans [2].

Lipids of the seeds were studied by selecting the variety with the highest oil content (sample No. 3, Korean).

The seed oil was obtained by extraction and was light yellow with a hot taste. The carotenoid content was 3.8 mg%.

The lipid composition was studied by column chromatography and analytical and preparative TLC. It indicates that pepper seed has a lipid content typical of plant oils with a slightly elevated content of cyclic alcohols and their esters (Table 2).

Saponification of seed oil produced the total fatty acids (FA) and unsaponifiable components (8.4%).

The FA composition of the starting oil and its acyl-containing components were determined by GLC as the methyl esters and are listed in Table 3.

Linoleic acid is the principal acid in seed lipids of hot pepper. Its content in the TAG reaches 70%. The sum of 18:1 and 18:2 acids is 81.9%.

The FA in seed lipids of hot pepper characteristically contain low-molecular-weight acids of chain length 6-14 C atoms. This imparts a unique aroma to fractions containing their esters.

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TABLE 1. Properties of Seeds from Certain Varieties of *Capsicum annuum*

Sample	Mass of 1000 seeds, g	Seed oil content, mass %	Seed moisture, mass %	Wet ash, mass % (per actual moisture)	Seed ash, calc. per dry wt., mass %	Ash, insol. in HCl, %	Pure ash, %
1	5.09	9.10	12.4	8.99	10.26	0.72	9.54
2	4.88	8.17	11.5	7.44	8.41	0.81	7.60
3	5.05	9.53	11.1	6.02	6.77	0.65	6.12
4	4.85	7.89	9.4	11.2	12.36	1.23	11.13

TABLE 2. Lipid Composition of *Capsicum annuum* Seeds

Lipids	Content, % of lipid mass
Hydrocarbons (including carotenoids)	0.9
Esters of cyclic and higher fatty alcohols with FA	1.5
Triacylglycerols (TAG)	87.5
Free FA + tocopherols	4.5
Triterpenes	1.2
Sterols + diacylglycerols	3.2
Monoacylglycerols + unidentified	1.2

TABLE 3. FA Composition of Total Lipids of *Capsicum annuum* Seeds and Their Acyl-Containing Components

Sample	Acids, GLC %										
	low-mol-wt*	14:0	16:0	16:1	16:2	17:0	18:0	18:1	18:2	18:3	20:0
Total FA	2.2	0.4	12.6	1.7	0.9	-	8.8	19.4	54.0	-	-
Esters	9.0	1.6	15.5	2.3	1.6	0.8	9.5	23.2	33.4	3.1	-
TAG	-	Tr.	12.6	-	-	-	5.5	12.3	69.6	-	-
FFA	3.5	1.0	21.2	3.2	2.5	1.3	5.7	17.2	38.1	4.8	1.5

*Total low-molecular-weight acids detected by GLC with chain length from 6 to 14 C atoms.

EXPERIMENTAL

Physicochemical properties of seeds, the mass of 1000 seeds and the moisture, oil and ash contents were determined by known methods [11].

Seeds of Korean pepper *Capsicum annuum* were ground in an electric grinder and repeatedly extracted by hexane with standing at room temperature.

Fractions enriched in individual lipid components were prepared using column chromatography with elution by known solvent systems [12].

Pure lipid components were prepared for further modification by using preparative TLC as before [13].

Compounds were identified by accepted methods [12, 13].

The carotenoid content was determined on a spectrophotometer by comparison with standard $K_2Cr_2O_7$ solution.

Starting seed oil and triacylglycerols were hydrolyzed by KOH solution (10%) in CH_3OH at room temperature; esters of FA and alcohols, KOH (30%) in CH_3OH with boiling. The completeness of hydrolysis was monitored by TLC using hexane:diethylether (9:1).

GLC of FA methyl esters was carried out as before [14].

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