

I. Tolibaev, Kh. S. Mukhamedova,  
and S. T. Akramov

UDC 547.953:665.37

The total phospholipids of kenaf of variety Opytnyi-1847 and homogeneous fractions of them have been studied. A known law has been confirmed — positions 2 of the main fractions of phospholipids are esterified predominantly with unsaturated fatty acids and in N-acylated phospholipids the amide-bound acids are more saturated than the O-acyls.

Continuing an investigation of plant phospholipids, we have considered the phospholipids of the seeds of kenaf of variety Opytnyi-1847 grown on the Uzbek Experimental Station of Bast Crops. The total phospholipids have been obtained and purified by known methods [1-3]. The qualitative and quantitative compositions of the combined material were determined by two-dimensional chromatography. Six phosphorus-containing substances were detected, and these were identified as phosphatidylcholines (PC, 43.3%), phosphatidylinositols (PI, 22.7%), phosphatidylethanolamines (PE, 19.4%), N-acyl-PE (8.7%), N-acyllyso-PE (4.0%), and X-PL (1.9%). According to the results of two-dimensional chromatography, the main components of the combined phospholipids were PC, PI, and PE — i.e., the same situation is observed as in other seeds. Phospholipid fractions were obtained in homogeneous form by a combination of column chromatography and preparative thin-layer chromatography, and the structural analysis of the individual phospholipids was carried out by a method described previously [4, 5].

Table 1 gives the fatty acid compositions of the total phospholipids and of the homogeneous fractions and the position distributions of the fatty acids in the main fractions of the phospholipids of kenaf seeds of variety Opytnyi-1847. The individual fractions of the phospholipids from the following sequence of increasing saturation: PC → PE → N-acyl-PE → PI → N-acyllyso-PE. As in other cases, among the saturated acids palmitic predominates and among

TABLE 1

Phospholipids	Fatty acids									ΣP	ΣN
	10:0	12:0	14:0	16:0	16:1	18:0	18:1	18:2	18:3		
Combined phospholipids	Tr.	1.3	1.8	25.5	0.6	2.9	29.6	37.0	1.3	31.5	68.5
Phosphatidylcholines	Tr.	Tr.	0.6	15.4	1.3	2.4	37.3	40.6	2.4	18.4	81.6
totals	0.8	1.3	1.4	29.1	Tr.	5.7	33.2	28.5	Tr.	38.3	61.7
position 1	0.7	1.1	1.3	3.2	2.0	2.4	37.8	47.7	3.8	8.7	91.3
position 2	0.7	1.1	1.3	3.2	2.0	2.4	37.8	47.7	3.8	8.7	91.3
Phosphatidylinositols	1.7	3.6	1.1	20.0	2.2	2.4	24.5	42.1	2.4	28.8	71.6
totals	1.6	1.9	1.6	35.0	Tr.	3.7	18.8	37.4	Tr.	43.8	56.2
position 1	—	1.4	1.8	5.5	2.1	—	34.3	50.0	4.9	8.7	91.3
position 2	—	1.4	1.8	5.5	2.1	—	34.3	50.0	4.9	8.7	91.3
Phosphatidylinositols	—	3.4	4.0	28.0	1.0	3.5	18.2	39.2	2.3	39.3	60.7
totals	—	2.2	1.6	52.0	2.3	6.4	18.3	17.2	—	62.2	37.8
position 1	—	0.5	0.5	4.3	0.8	—	23.1	65.6	5.2	5.3	94.7
position 2	—	0.5	0.5	4.3	0.8	—	23.1	65.6	5.2	5.3	94.7
N-Acylphosphatidylethanolamines	—	2.8	1.7	29.2	1.7	3.6	29.4	31.6	Tr.	37.3	62.7
totals	—	2.8	1.7	29.2	1.7	3.6	29.4	31.6	Tr.	37.3	62.7
N-acyls	—	29.7	6.4	20.9	7.1	6.4	14.9	14.6	—	63.4	36.6
O-acyls	—	5.9	6.0	29.1	9.7	10.5	16.6	15.5	6.7	51.5	48.5
N-Acyllyso-phosphatidylethanolamines	—	11.2	3.1	36.5	4.0	8.5	20.3	16.4	Tr.	59.3	40.7
totals	—	11.2	3.1	36.5	4.0	8.5	20.3	16.4	Tr.	59.3	40.7
N-acyls	3.5	5.2	8.6	14.2	7.9	13.4	21.3	25.9	—	44.9	55.1
O-acyls	6.6	8.9	11.1	15.1	13.7	10.5	19.4	14.7	—	52.2	47.8

Institute of the Chemistry of Plant Substances of the Academy of Sciences of the Uzbek SSR, Tashkent. Translated from *Khimiya Prirodnykh Soedinenii*, No. 6, pp. 775-777, November-December, 1980. Original article submitted June 25, 1980.

the unsaturated oleic or linoleic. Position 2 of the glycerol moiety of the molecule of each of the main fractions of PLs is esterified predominantly with unsaturated acids.

The 12:0 acid predominates in the N-acyls of the N-acyl-PE molecule (29.7%). Attention is attracted by the double amount of 10:0 or 12:0 acid among the amide-bound fatty acids in the N-acylated phospholipids isolated from a number of plants [1, 6, 7]. This is possibly connected with a specific function of the N-acylated phospholipids in the vital activity of the plant organism. In the N-acylated phospholipids the N-acyls are more saturated than the O-acyls. On the basis of the results of the position distribution of the fatty acid radicals, the following possible molecular composition of the main fractions of the phospholipids have been determined by calculation:

	<u>PC</u>	<u>PE</u>	<u>PI</u>
Disaturated	3.8	4.2	3.0
Saturated-unsaturated	34.7	39.8	58.9
Diunsaturated	55.6	50.6	35.8
Unsaturated-saturated	5.9	5.4	2.3

The amount of phytin in the main phosphorus-containing compound in the meal was determined (3.2% on the weight of the air-dry seeds).

#### EXPERIMENTAL

For chromatography we used KSK silica gel: up to 125  $\mu$  for thin-layer chromatography and 160-250  $\mu$  for column chromatography. Acid, alkaline, and enzymatic hydrolyses, and also the partial deacylation of the N-acyl-PE and its lyso analog were carried out as described previously [4, 5]. Fatty acids were analyzed by GLC. GLC conditions: Khrom-41 chromatography with a flame-ionization detector using a steel column (2500  $\times$  3 mm) packed with Celite-545 impregnated with 17% of PEGS; the carrier gas was helium at a rate of 30 ml/min.

#### SUMMARY

Three main and two minor components have been isolated from kenaf seeds of variety Opyt-nyi-1847. The fatty acid compositions of the combined phospholipids and of homogeneous fractions of them have been determined.

#### LITERATURE CITED

1. I. Tolibaev, Kh. S. Mukhamedova, and S. T. Akramov, *Khim. Prir. Soedin.*, 559 (1978).
2. J. Folch, M. Lees, and G. H. Sloane-Stanley, *J. Biol. Chem.*, 226, 497 (1957).
3. M. E. McKillican and J. A. G. Larose, *J. Am. Oil. Chemists' Soc.*, 47, 256 (1970).
4. I. Tolibaev, Kh. S. Mukhamedova, and S. T. Akramov, *Khim. Prir. Soedin.*, 289 (1976).
5. I. Tolibaev, Kh. S. Mukhamedova, and S. T. Akramov, *Khkm. Prir. Soedin.*, 723 (1976).
6. I. Tolibaev, Kh. S. Mukhamedova, and S. T. Akramov, *Khim. Prir. Soedin.*, 485 (1977).
7. T. S. Kaplunova, Kh. S. Mukhamedova, and S. T. Akramov, *Khim. Prir. Soedin.*, 8 (1979).