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Lipids of Melon Seeds

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Ibrahim Jon Rakhmonovich Askarov, Abdurakhimova Nodira, Isakov Khayatulla
Andijan State University, Republic of Uzbekistan, Andijan city, 129 st, Universitet, 170100,
Gmail.com: mirjalolmominjonov0@gmail.com

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Abstract:
In this article, determine the amount of lipids in melon seeds grown in Uzbekistan by physical and chemical methods.

1. Introduction

Melons are a nutritious and useful fruit that may be eaten both fresh and preserved. Melon pulp is used to make a wide variety of canned goods, including boiling puree, juice, candied fruits, jam, marmalade, jam, becomes (melon honey), and more. Inefficient processing of seeds results in waste during manufacture of the aforementioned goods [1]. On a dry basis, melon seeds contain 33–35% lipids and 35–36% proteins, making them a suitable oilseed raw material. The purpose of this research was to use physical and chemical techniques to quantify the lipid content of melons cultivated in Uzbekistan. Solet apparatus utilizing extraction gasoline (NL, oil) was used to separate neutral lipids from air-dry pulverized seeds [1].

The amount of unsaponifiable compounds (US) in the oil was calculated after it was hydrolyzed in a 10% KOH solution in methanol [2]. Concentrate of polar lipids (PL) including NL residues, glycolipids (GL), and phospholipids (FL) was recovered from the meal using a combination of chloroform and methanol (2:1) using the Filch technique [3]. In order to purify the raw PL extract of its non-lipid components, it was treated with a 0.04% CaCl2 aqueous solution. In addition, lipids were separated into their respective classes by using column chromatography (CC) on silica gel, with the NL fraction being eluted in chloroform, the GL fraction in acetone, and the FL fraction in methanol. The lipid fraction yield was determined gravimetrically. The results are shown in Table 1 [1].

TABLE 1. Characteristics of the melon seed lipids

Indicator	Content
Moisture and volatile substances, % by weight of seeds	8,25
Yield of neutral lipids (oil content) at actual humidity, % of seed weight	26,52
The yield of NL on absolutely dry matter, % of the weight of seeds	28,95
Acid number NL, mg KOH/g	1,46
Refractive index at 20°C	1,476
Density at 20°C, kg/m^3	923,0
The content of unsaponifiable substances, % by weight of NL	2,47
Carotenoid content in neutral lipids, mg%	0,91
Polar lipids (PL), % by weight, including: Glycolipids phospholipids	0,59 0,21 0,38

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Thin-layer chromatography (TLC) was used to analyze the NL, GL, and FL's qualitative composition on silica gel and Soulful plates. Solvent systems were employed as a means of transport to the NL. The benzene to heptane ratio is 9:1, the hexane to ether ratio is 6:4, and the acetic acid to hexane ratio is 0.1 percent. Paraffin hydrocarbons + carotenoids (Rf 0.97) and free fatty acids (Rf 0.37) were the most abundant components of melon seed NL. Plant sterols produced in a 50% H2SO4 solution with J2 vapors have a refractive index of 0.12. After subjecting the NL of the test item to alkaline hydrolysis, the unsaponifiable compounds (HB) were identified. Positive identification of HB was achieved by comparing HB with model samples separated from various natural sources and by observing the qualitative reactions on chromatographic mobility on a thin layer of silica gel in a system of hexane solvents: ether (7:3) and (6:4). HBS has a wide variety of biologically active compounds, including triterpenes, sterols, paraffin hydrocarbons, and carotenoids. Phytosterols made up the bulk of HB.

Using thin layer chromatography on silica gel with solvent systems of chloroform, acetone, methanol, acetic acid, and water (65:20:10:10:3), we were able to determine the precise chemical makeup of GL. Manohara ctosyldiacyl glycerides (Refractive Index: 0.75), sterylglycosides (Refractive Index: 0.57; the main component), digalactosyldiacylglycerides (Refractive Index: 0.28), and an unidentified component with Refractive Index: 0.31 were all found in the GL during a molecular mass spectrometry analysis. Alpha-naphthol creates.

Using two-dimensional chromatography on silica gel in a solvent solution, we were able to ascertain FL's chemical makeup, and our findings were as follows: I The formula is 13:37:1 for chloroform: methanol: acetic acid: water; 14:5:1:3 for II. Their manifestation required the reagent developed by Vislosky and Dragonwort. Phosphatidic acids (FC) (Rf 0.15) and phosphatidic acids (PC) (Rf 0.34) were found to be the most prevalent among the PH classes, which also included phosphatidylinositol (PHI) (Rf 0.17) and phosphatidylethanolamines (Rf 0.34).

To methylate the isolated LC, some NL, GL, and FL were hydrolyzed in an alcoholic alkali solution, and diazomethane was produced from scratch [5]. The methyl esters employed in the preparative TLC study were cleaned using silica gel and an 8:2 hexane to ether solvent mixture. After being exposed to J2 vapors, the sorbent is converted into the MEFC zone, the plate is cleaned, and the silica gel is desorbed by repeated chloroform elution. Chloroform eluate mixtures had the solvent evaporated out using a rotary evaporator. After dissolving the purified MEFC in hexane, the GC was used to analyze the methyl esters in the LC.

We did tests on methyl ester LC utilizing a flame ionization detector and an Agilent 6890 N apparatus with a 30-meter by 0.32-millimeter capillary column, HP-5 stationary phase, helium carrier gas, and an adjustable temperature of 150-270 degrees Celsius. In [6], it was stated that LC methyl esters had been found. Table 2 displays the findings of the research.

TABLE 2. Melon seed fatty acid composition (GC % by weight of acids) across neutral, glyco, and phosphor lipids

Fatty acid	Content		
	NL	GL	FL
Lauric acid,12:0	0,02	0,68	0,15
Myristic, 14:0	Сл.	1,63	0,32
Pentadecane, 15:0	-	0,69	0,30
Palmitic, 16:0	8,84	34,85	34,52
Palmitoleic acid, 16:1	0,06	1,18	0,74
Margarine, 17:0	-	0,57	0,37
Stearic, 18:0	6,18	7,07	9,67
* Oleic+ Linolenic, 18:1 ω9+18:3 ω3	15,84	22,66	13,76
Linoleic, 18:2 w6	68,68	22,23	37,17
Arachinovaya, 20:0	0,17	0,87	0,57
Eicosene, 20:1 ω11	0,07	0,16	-
Begenovaya, 22:0	0,04	2,14	0,76
Nervonova, 24:1	0,03	-	0,30
Lignocerine, 24:0	0,05	5,27	1,37
∑Saturated LCD	15,30	53,77	48,03
∑unsaturated LCD	84,70	46,23	51,97

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Under the experimental GC conditions, this pair of fatty acids appears as a single peak.

Lipid analysis techniques. Determination of seed moisture [7]. After careful mixing, the laboratory sample was scattered in a thin layer on a sample cutting board and about 5 g of samples were taken from different places for each determination. The selected samples were carefully ground on a coffee grinder, then transferred to pre-dried and weighed buckets and, closed with lids, weighed on analytical scales. The samples were dried in a drying cabinet at 100-105^{0}C, first for two hours, and then for 30 minutes to a constant weight. A constant weight was considered achieved when the difference between the weighing does not exceed 0.001 g.

Humidity in % (X) was calculated by the formula:

$$X = \frac{(P_2 - P_1) \cdot 100}{P_1 - P_3},$$

where, P_1 is the weight of the box with samples before drying in g;

P_2 - the weight of the box with samples after drying in g;

P_3 - is the weight of an empty box in g. The average of two parallel definitions was taken as the final result. The discrepancies between the parallel definitions did not exceed 0.3%.

Quantification of Carotenoids The photoelectric oximetric technique was used to quantify carotenoids. 1 g of the sample was taken (with an accuracy of 0.0001 g), hexane was dissolved in the mixture: ethanol (3:1) was transferred to a 50 ml volumetric flask and the volume was adjusted to the mark with the same mixture of solvents. If this solution was cloudy, then it was filtered. The optical density of this solution was determined at a wavelength of 440 nm (the thickness of the cuvette is 10 mm). A standard solution was prepared for comparison. To do this 0.090 g of potassium bichromate was dissolved in water in a measuring flask (250 ml). The mass fraction of carotenoids (X, mg %) in terms of β-carotene was determined by the formula

$$X = \frac{0{,}00208 \cdot D_1 \cdot 50 \cdot 100}{a \cdot D_0},$$

were

D_0 is the optical density of the standard sample solution;

D_1 is the optical density of the test solution;

50 – dilution, cm^3;

a – suspension, g

0.00208 – the amount of β-carotene corresponding to the color of 1 ml of a standard solution of a sample of potassium bichromate;

Isolation of unsaponifiable substances Sample weight 2±0.002 g was placed in a round-bottomed flask (50 ml), 20 ml of 2 n KOH solution in methanol was added, an air cooler was attached, and saponification of lipids was carried out during boiling for 1 hour. Then the contents of the flask (potassium salts of fatty acids) were cooled and distilled water was added to the soap until they were completely dissolved. The contents of the flask were transferred to the dividing funnel. Unsaponifiable substances (lipophilic substances) were extracted from the soap solution 5 times with diethyl ether (15-20 ml each). The ether extracts were combined and washed until the neutral reaction of the washing waters with a solution of phenolphthalein, then the ether was distilled and the yield of unsaponifiable substances was determined gravimetrically after drying the HB from the ether residues. The content of unsaponifiable substances as a percentage (X) was calculated by the formula:

$$X = \frac{P_1 \cdot 100}{P}$$

where P_1 is the weight of the residue after drying, in g;

P – sample hitch, in g;

Eliminating harmful fatty acids. To recover the LC, we first extracted the HB from the aqueous soap solution before treating it with a 50% H2SO4 solution to break down the soap. After being exposed to sulfuric acid, the methyl orange solution changed color. The LC was extracted from the resulting acidic solution using three successive extractions of 20-30 ml of diethyl ether. To acquire the final product, we neutralize the methyl orange medium by washing the combined ether extracts with distilled water, dry the combination over

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anhydrous sodium sulfate, and distill the ether. Methyl esters were synthesized by reacting the acids with freshly produced diazomethane. Preparative thin-layer chromatography (PTCC) using silica gel plates in solvent system 1 was used to isolate pure methyl esters of LC (MEFC). The final result is obtained by first washing the plate, then desorbing the silica gel in chloroform, and finally developing the MEFC zone on the sorbent the J2 vapors. The eluates from many different runs on the gas chromatograph were combined, evaporated in a rotary evaporator, dissolved in hexane, and then analyzed.

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[13] Ibrahimjon Rakhmonovich Askarov - Andijan State University, Doctor of Chemistry, Honored Inventor of the Republic of Uzbekistan, Chairman of the Academy of Medicine “TABOBAT” of Uzbekistan.

[14] Abdurakhimova Nodira - teacher of Andijan State University, Department of Chemistry.

[15] Isakov Khayatulla - Doctor of Chemical Sciences, Andijan State University, Andijan, Republic of Uzbekistan.