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ASPECTS OF STUDYING THE PHYSICO-CHEMICAL PROPERTIES OF LOCAL AMARANTH OILS OF HIGH-CONTAINING SQUALENE

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Annotation
In the course of the work, it is supposed to find out the amaranth of local origin. the study of the physico-chemical and pharmacological properties of amaranth oil, as well as consideration of the prospects for the introduction of the product in the field of functional nutrition and cosmetology.

Keywords: amaranth oil, neutral lipids, fatty acids, extraction oil, press oil.

INTRODUCTION

Vegetable oils, which are high-calorie products of daily nutrition, are of great physiological importance. They are used in various branches of industrial production, including the food and pharmaceutical industries, in particular for cooking culinary dishes, the production of canned food, directly into food. In the pharmaceutical industry, oil emulsions are prepared from vegetable oils, they are included in the composition of ointments, liniments and suppositories. The assortment filling of the oilseed segment is constantly expanding, and manufacturers have also mastered the production of oils from various non-traditional varieties of fruits, seeds, nuts and embryos. At the same time, special attention is paid to the examination of vegetable oils, their quality and safety indicators.

In recent years, amaranth, which has a long tradition of use in food and medical practice, has aroused great interest among specialists. Analysis of the chemical composition of the main food crops shows that amaranth grains contain an average of 14.0–20.0% protein, 5.8– 9.7% lipids and 3.9–16.5% dietary fiber, which is higher than most cereals [11].

Amaranth oil, obtained from two amaranth seeds of different varieties, is combined with any fortified oils.

It eliminates side effects after the use of medications; improves liver function; normalizes blood counts; removing their toxic products from the body; thus helps restore resistance to viruses in the body.

In addition, amaranth seed oil by itself or in combination with other means is an effective dietary product that helps strengthen the immune and hormonal systems, eliminate metabolic disorders, remove toxins, radionuclides and heavy metal salts from the body, improve anemia, normalize the gastrointestinal tract and other body functions.

The main feature of amaranth oil, which distinguishes it from all known oils, is the high content of such physiologically active components as phytosterols and squalene [4]. Phytosterols have the property of reducing cholesterol in the blood. The squalene content in amaranth oil reaches 8% (olive oil contains 0.7% squalene, rice bran oil – 0.3%, wheat g erm oil and corn oil - 0.1%).

Squalene ($C_{30}H_{50}$) is a natural acyclic triterpene with six double bonds, namely 2,6,10,15,19,23-hexamethyl-2,6,10, 14,18,22-tetracosahexaene. Currently, squalene in its pure form is obtained from the liver of deep-sea sharks, where, depending on the type of shark, its content can reach up to 90%. Amaranth oil also contains squalene derivatives - phytosterols, the content of which reaches 2%. Squalene acts as a regulator of lipid and steroid metabolism in the body, being a precursor to a number of steroid hormones, cholesterol and vitamin D. Squalene is an essential component of the sebaceous glands of human subcutaneous tissue, when damaged, its concentration increases sharply, which indicates its protective role [7].

The most important component of amaranth oil is tocopherol (vitamin E). Amaranth oil contains up to 10% phospholipids, the predominant component of which is lecithin. The biological role of lecithin is well known [9]. Amaranth oil belongs to the linoleic acid group, which accounts for up to 50% of the amount of fatty acids contained in the oil [6].

Extraction of vegetable oils is carried out by pressing and extraction (extraction) methods with organic fat solvents [12].

The purpose of the study

Obtaining amaranth oil and studying its physico-chemical characteristics. Materials and methods. To extract the oil, amaranth seeds of the Amaranthus species grown in the Toytepa district of the Tashkent region were used.

Extraction was carried out by the method of obtaining oil extracts from vegetable raw materials. This method provides for the use of any refined or deodorized vegetable oil as an extractant.

Before receiving the oil, the seeds were previously cleaned of husks and impurities, dried and crushed (they received crashed). Crashed was subjected to hydrothermal treatment before extraction, moistened and warmed up in a thermostat at a temperature of 75°C. As a result, a pulp was obtained from crashed, from which oil is more easily extracted, as well as amaranth oil was obtained in parallel by pressing.

To determine the physico-chemical characteristics of the resulting oil, several methods were used: chromatographic, a method for determining moisture and volatile substances, a method for determining the mass fraction of ash and unsaponifiable substances, methods for determining acid, peroxide and iodine numbers, as well as a method for determining the neutralization number [1-5].

Results and discussion

The results of physico-chemical parameters of Amaranthus seed lipids are given in Table 1.

The lipid content in amaranth grain, depending on its type and variety, ranges from 2.0 to 17.0% in terms of dry matter. With a light color of amaranth grains, their oil content averages 7.5-9.7%, with a dark color - less - 5.8-6.8%.

The oil extracted from two types of amaranth grains by pressing has a yellow color and is characterized by a specific composition.

Saturated fatty acids of the lipids of pressed amaranth oil are presented in Table-1.

Table-1

№	The name of the fatty acids of the pressed oil	%	
1	myristic	C14:0	0,4-0,6
2	palmitic	C16:0	20,0-27,0
3	stearic	C18:0	0,5-1,0
4	arachinic (eicosan)	C20:0	0,4-0,8
5	begenic	C22:0	0,1-0,2
6	monounsaturated oleic acid	C18:1-9-sic	2,1-3,9
7	polyunsaturated:		
8	linoleic	C18:2-9-sic, 12-sic	21,8-23,3
9	linolenic	C18:3-9-sic, 12-sic, 15-sic	44,1-51,4
10	unidentified	-	14,5-17,1

Neutral lipids (NL, oil) were isolated from air-dry crushed seeds in the Soxlet apparatus using extraction gasoline (t. kip. 72-80°C). The acid number of NL was determined, and the content of free fatty acids (LC) in them was calculated according to this indicator, as described in [Manual on Research Methods, technochemical control and accounting of production in the fat and oil industry, 1, Leningrad, 1967, cc.888, 815].

Unsaponifiable substances were isolated from oil by hydrolysis with a 10% KOH solution in methanol [Manual on research Methods, technochemical control and production accounting in the Fat and oil Industry, 1, Leningrad, 1967, p. 815].

Table-2

Indicator	Content	
	№1	№2
Moisture and volatile substances, % by weight of seeds	10,62	11,02
Yield of neutral lipids (oil content) at actual humidity, % of seed weight	6,14	6,86
The yield of NL on absolutely dry matter, % of the weight of seeds	6,86	7,70
The content of unsaponifiable substances, % by weight of NL (neutral lipids)	6,85	7,41
Acid number NL, mg KOH/g	1,96	2,08
Free fatty acids, % by weight NL	0,98	1,04

The component composition of NL was established by TLC method on Silufol plates. in solvent systems hexane: ether: Acetic acid 7:3:0.1.

Solvent systems heptane: benzene 9 were used to identify stains, including squalene:1. NL spots were manifested in J_2 vapors and by spraying the plates with 50% sulfuric acid, followed by their combustion.

According to the results of the analysis of thin-layer chromatography (TLC), NL consist mainly of triacylglycerides, which are accompanied by paraffin hydrocarbons, triterpene isoprenoid hydrocarbon squalene, free phytosterols and free fatty acids.

To determine the composition of fatty acids (LC), the test samples were hydrolyzed with an alcoholic alkali solution and the isolated fatty acids were methylated with freshly prepared diazomethane.

LC in the form of methyl esters was analyzed by GC method on an Agilent 6890N device with a flame ionization detector using a 30m x 0.32mm capillary column with a stationary phase HP - 5, carrier gas - helium, programming temperature 150-270°C. The results of the analysis are presented in Table 2.

The composition of fatty acids of seed oils of two types of amaranth, GC, % by weight of acids

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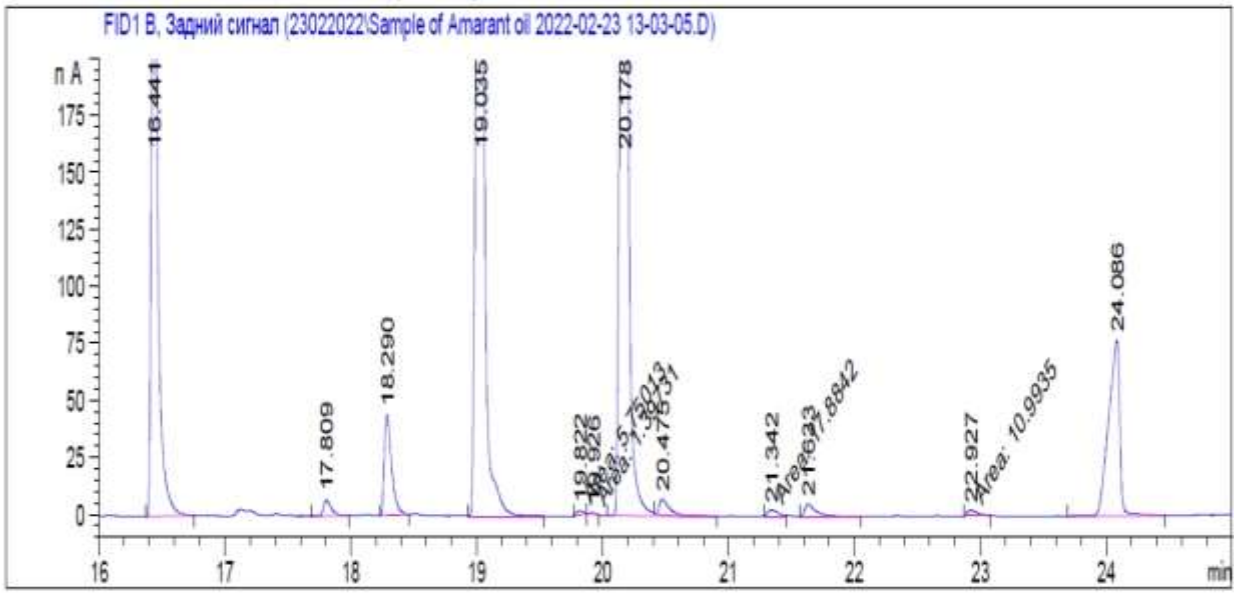
Table 3

№	Fatty acid	Samples	
		No. 1 (white)	No. 2 (black)
1	Tetradecane	14:0	0.21 Sl.
2	Hexadecane 16:0	20.92	11.88
3	Hexadecene 16:1	0.16	0.14
4	Heptadecane 17:0	0.15	-
5	Octadecane 18:0	4.05	2.57
6	Octadecene 18:1 + Octadecatriene 18:3	33.51	26.41
7	Octadecadiene 18:2	39.08	57.79
8	Eicosan 20:0	0.91	0.64
9	Eicosene 20:1	0.31	0.34
10	Docosan 22:0	0.38	0.23
11	Tetracosan 24:0	0.32	-
12	∑Saturated FAc	26.94	15.32
13	∑unsaturated FAc	73.06	84.68

From the data given in Table 2, it can be seen that the physico-chemical characteristics of amaranth oil obtained under experimental conditions are in no way inferior to those of amaranth oil. This allows us to recommend the production of this crop in the conditions of the Republic.

Next, a chromatographic analysis of the amaranth oil obtained during the experiment was carried out.

The results are shown in Fig. 4.



From the results of the analysis of the amaranth oil obtained by us, it can be seen that it has in its composition a plural of saturated, monounsaturated, polyunsaturated fatty acids and, most importantly, a high content of squalene in the oil.

Conclusion

In the course of the work done, the production of amaranth oil was determined, the physico-chemical parameters of the obtained amaranth oil were studied. From the obtained physico-chemical characteristics, it can be seen that the amaranth oil obtained by us meets all the requirements in all parameters.

In connection with the above, it can be concluded that the amaranth grown in our republic can be used as a therapeutic and prophylactic and therapeutic cosmetic product, since the content of vitamins, macro- and microelements in it is the most balanced. The high content of squalene allows us to recommend amaranth oil as a substance with bactericidal, antihematomic and other properties.

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