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STUDYING THE OIL CONTENT OF SWEET ALMOND KERNELS IN THE SYRIAN ENVIRONMENT

Abstract: *The fatty oils from sweet almonds (Prunus amygdalus Dulis) from Rosaceae family, were studied. A light yellow oil was obtained using a classical Soxhlet apparatus. The yields were about 47.73% of the dried kernels weight, while it yielded about (33.07%) of the dried kernels weight when obtained through Commercial Screw Press method. The qualitative and quantitative analysis using a GC-MS instrument permit to identify five components in the oil. The major components were Palmitoleic acid (0.29%), Palmitic acid (8.00%), Linoleic acid (21.12%), Oleic Acid (68.57%), Stearic acid (2.12%).*

Keywords: *Rosaceae Family, Prunus species, sweet almonds, Fatty acids, Screw Press, Soxhlet, GC - MS.*

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ИЗУЧЕНИЕ СОДЕРЖАНИЯ МАСЛА В ЯДРАХ СЛАДКОГО МИНДАЛЯ В СИРИЙСКОЙ СРЕДЕ

Аннотация: *Были изучены жирные масла сладкого миндаля (лат. Prunus amygdalus Dulis) из семейства розоцветных. получали Светло-желтое масло с использованием классического аппарата Сокслета. Результат составил около (47,73%) от веса сушеных ядер, в то время как это было около (33,07%) от веса сушеных ядер, методом коммерческого винтового пресса. Качественный и количественный анализ с использованием прибора ГХ-МС позволяет идентифицировать пять компонентов в масле. Основными компонентами были пальмитолеиновая кислота (0,29%), пальмитиновая кислота (8,00%), линолевая кислота (21,12%), олеиновая кислота (68,57%), стеариновая кислота (2,12%).*

Ключевые слова: *Семейство Розоцветные, виды (лат. Prunus), сладкий миндаль, жирные кислоты, винтовой пресс, Сокслет, газовая хроматография - масс-спектрометрия.*

1. Introduction:

Almonds belong to the Rosaceae family which includes a number of trees, shrubs, shrubs and herbs. [1] The plants of this family grow mostly in cold regions and have economic importance due to the excellent nutritional value and taste. [2] The genus Prunus includes 150-250 species, including peaches, almonds, peaches, apricots, cherries and cherry cluster. Many species of the Prunus genus exhibit analgesic, anti-inflammatory, lipid-reducing, anti-tumor and anti-oxidant properties. [3] Moreover, most of their kernels contain: Amygdalin and Prunasin. These two compounds dissolve in water to give cyanic acid, which works in low concentrations to stimulate breathing and improve digestion [2]. Fruits and nuts are known to contain a wide range of phenolic acids and flavonoids which are mostly associated with other sugars or polyols via glucosidase or esteric bonds. The main ingredients that can be found in almond seeds are: the fraction fat / fatty Oil (which is our focus in this paper), the protein fraction, the soluble sugars, the mineral fraction, and the fibrous fraction. It also attaches to a group of compounds called phytochemical (phytochemicals). They appear in low quantities, but have a great impact on the quality of almonds (in terms of color, aroma, and flavor in addition to their nutritional benefits). Their presence varies according to the variety and the type of cultivation. [4] With regard to almond oil, despite its low current global production, it must be taken into account that the almond crop is universally popular for its sensory and nutritional value and its special physiochemical and economic properties locally and internationally that make it a high-end product with marketing potential High in the short to medium term and long term. [5] The process of obtaining almond oil is very similar to the processes for obtaining oils from the seeds of other nuts. Almonds are harvested before the start of the autumn season (August-September). Then the peel is removed, and the fruits are usually exposed to sunlight for two or three days for drying (or they are subjected to a hot air stream), as the moisture content is significantly reduced, reaching 5-8%.

2. Plant Description:

A small, deciduous tree, symmetrical in shape. It has long, curved, pointed leaves, usually 3-4 meters high. The almond tree is distinguished by its beautiful pink flowers. These flowers appear and bloom in early spring, and when these flowers are pollinated, each one of them turns into a fruit that grows inside a soft and delicate skin. Almond fruits have three distinct parts: the inner core (the seed may contain two kernels), the middle part (which turns into a woody shell when the fruit dries out), and the green outer covering or structure.[1]

Figure 1 Prunus Amygdalus Communis [17]

3. Experimental section:

3.1. Apparatus and materials

- soxhlet apparatus.
- Gas Chromatography - GC-MS mass spectrometer from Agilent Technologies, equipped with Quadrupole detector with DB5 separator column.
- Heidolph rotary evaporator, VV1 type.

3.2. Extraction of fatty oil by cold pressing:

The outer woody skin of the fruits was removed by hand, then the fruits were dried in a dry and hot air stream (70 ° C). Oil extraction obtained by squeezing the kernels fruits in a spiral press. Spinning was carried out when the piston temperature reached 50 ° C and spiral speed was adjusted on 20 rpm. [6] Fine particles were removed from the oil by filtration and kept in airtight containers at 4 ° C until analysis.

3.3. Analysis of the extracted fatty oil:

The sample was esterified and then the percentage and chemical composition of the total fatty acids in the oil were determined using the gas chromatography-Mass Spectrometry (GC-MS) techniques available in the central laboratory of the Department of Chemistry at the Faculty of Science, Damascus University. The sample was passed into a non-polar HP-5MS column [6].

4. Results and Discussion:

4.1. extracted oil yield:

The weight of the sweet almond sample was 1200g, the weight of the squeezing oil after filtering is (325.8g), thus yield of the squeeze becomes (27.15%).

4.2. The composition of the extracted fatty oil:

The oil content was determined by comparing the MS spectra of each chromatogram peak and their returns in accordance with the device library.

The analysis of the oil sample of the sweet almond form extracted by cold press revealed the presence of 5 well-known fatty acids, which are: palmitoleic acid the least abundant by 0.29%, palmitic acid, Linoleic acid, oleic acid most abundant, at 68.57%, stearic acid. As showed in Table Below.

Fatty Acid	Formula	R.T (min)	Ratio %	Reference Ratio
palmitoleic acid	C16H30O2	18.581	0.29	0.3 – 0.6
palmitic acid	C16H32O2	19.030	8.00	5.2 – 6.7
Linoleic acid	C18H32O2	22.842	21.12	12.0 – 33.9
oleic acid	C18H34O2	23.061	68.57	57.5 – 78.7
stearic acid	C18H36O2	23.678	2.12	0.2 - 1.7

Figure 2 Fatty acids present in sweet almond oil and their proportions

5. Conclusions:

I. The oil content of sweet and bitter almonds ranged between (43 - 48%), and thus it had higher yields than almonds in Portugal and Iran, and less yielded than almonds in Spain and Argentina [6] [7] [10].

II. Although the yield is higher for the hexane extraction method, the references are not recommended due to the poor quality of the resulting oil as a food product. [8] [11]

III. The yield of oil decreases in the pressing process, as part of it remains in the remainder of the juice (juice cake). Therefore, the remainder of the juice can be used in the production of fodder or in subsequent extraction processes, and the oil maintains better quality according to the references. [9] [11]

IV. The fatty acids that make up the oil in sweet and bitter almonds match the references and converge in their proportions. Except for a slight increase in the percentage of palmitic acid and wax acid in the sweet and bitter forms in the local samples.

6. Acknowledgments:

The authors express their thanks to the central organic laboratory organic chemistry faculty of science at Al-Baath University.

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