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Sayer Variety, Seed Oil and Introduction of Fatty Acids into Certain Types of Therapeutic and Food Ration of The Fatty Acid Extraction from Iraqi Date Palm (Phoenix Dactylifera L.)

Nwaedh Mahdi Hanoon Nwaedh[1,2], Eugeniy A. Abizov[1], Aleksey Kovalenko[1], Olga Gennadievna Stepanova[1], Mazhuga A.G.[3], Averina Yulia Mikhailovna[4], Ilya Shlykov[1]

[1]Department of Expert Examination in Drug Testing and Narcoanalysis, Faculty of Technology of Organic Substances and Chemical Pharmaceutical Compounds, Russian University of Chemical Technology DI. Mendeleev. Miusskaya Square, 9. Moscow, 125047. Russia.
[2]Republic of Iraq - Ministry of Agriculture – Directorate Agriculture of Maysan
[3]Rector Mendeleev University of the Chemical Technology of Russia
[4]Department of innovative materials and corrosion protection, Russian University of Chemical Technology D. I. Mendeleev
E-mail:[1]mahdihanoonnwaedh@gmail.com

Abstract

This study was carried out in order to extract oil from date palm (Phoenix dactylifera L.). sayer variety, using Soxhlet extraction method. The content of the oil extracted from saturated and unsaturated fatty acids was examined and diagnostic tests were run with GC/MS (Gas Chromatography / Mass Spectrometry).

Keywords: *dates, sayer variety, palm seeds, date seed oil, oil extraction, fatty acids, mayonnaise product.*

1. Introduction

Sayer Iraq dates it is a semi-dry date variety and one of the most famous trading varieties and often cultivated in the Shatt al-Arab City - Basra Province. It is exported in crates to Europe, America, India and other eastern countries. This variety is called the Shatt al-Arab region under the name Ashuran, and in the central regions under the name Asta Imran.

Al-Sayer Iraqi dates are considered semi-dry and have commercial value. Recent statistics indicate the current regression of production of this variety in Iraq, where production fell from 153.5 thousand tons to 31.78 thousand tons and this statistics, which reflected the figures for 1983 and 2006. One can see a very significant and frightening difference, because this variety has undeniable commercial advantages, along with the fact that the countries neighboring Iraq began to produce this variety, especially the Persian Gulf countries, Iran and America [9].

The date seeds are also called pits, stones, kernels, seeds and are wastes in many branches of industry that are related to the processing of dates. the proteins of the dates contain many amino acids (clotamic acid, asparaginic acid and arginine which represent some amino acids in the dates). The dates also contain other acids (isoleucine, lysine, leucine) and due to the fact that these components are present in the date seeds, dates may be introduced to the animal and human diets.

The date seed oil is used in many branches of the food industry, like mayonnaise production.

[3] and [5] mentioned the use of date seed (pits) oil in many areas, including coal preparation for jewelry production and use for fuels in conventional copper-smelting furnaces. Seeds (pits) are also used as animal feed after grinding or water steeping as a source of carbohydrates, fats and proteins. A part of

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poor population uses them as food, they boil them like bean cultures to benefit from their high content of main nutritional substances, as well as from the fiber which protects the body from symptoms of poor digestion, constipations and large intestine dysfunction.

The oil extracted from the pits accounting for 8% of human consumption and soap production was used as a medicine for the treatment of some kidney and urinary tract diseases after roasting and further grinding and boiling in water. The oil extracted from the date pits was also used as a remedy against rheumatism, uretic arthritis and joint pains. The grinded pits mixed up with rose water were used for eyes treatment and after softening were also used as an alternative to antimonide (eye tinting antimony).

[3] mentioned that date seeds (pits) represent a certain percentage of the fruit weight and it should not be neglected if it contains a significant part suitable for oil extraction.

The date palm (or Phoenix dactylifera L.) is associated with Plantae vegetable reign, Magnoliophyte section, Monocotyledons class (Liliopsida according to Cronquist system), Palme order, Aceraceae family, Phoenix Date Palm generation, Dactylifera Date Palm type, and it is one of the oldest fruit trees in the world. This family incorporates nearly 220 generations and Palme (Palmales) order is one of the biggest and most important order of plants ever known to people [3,1].

2. Objective of The Study

2.1. Use local Iraqi dates as a food source by extracting oil from the seeds of the following local Iraqi date types: sayer variety.

2.2. Make quantitative determination and gain knowledge about types of short-chain fatty acids and saturated / unsaturated fatty acids using Gas Chromatography / Mass Spectrometry.

2.3. Introduce extracted oil (date pits oil) into food product systems, prepare a sample of the mayonnaise product.

3. Materials of This Study

3.1 Grinded Date Seed and Selected Varieties

Variety of the date fruit (*Phoenix dactylifera L*.) were selected for the study (sayer variety) at the bean stage. sayer date variety was collected from one of the gardens of Al-khasib City in the northern part of Basra Province. These varieties were selected from vigorous trees based on their maturity, freshness, uniformity and disease clearance, similar sizes, low cost and availability in the market. The seeds (pits) were cleaned and isolated manually, thoroughly washed with distilled water and were left for drying up for 10 hours at the temperature of 25 º. The dried pits (seeds) were grinded in a Chinese grinding machine (High-Speed Grinder SIZE 750 G). To get the date seeds grinded powder, the contents were stored in sealed plastic bags at 4-5 ° C prior to the start of their usage.

4. Methods of the Study

4.1 Oil Extraction

The oil was extracted from grinded date seeds (pits) variety of the date fruit (sayer variety) by ether oil solvent with boiling temperature of 40-60 º C in Soxhlet unit, and according to the data provided in [8]. 10 grams of grinded dry date seeds were used (as a powder-like mass). The moisture was removed prior to the extraction process to maintain high efficiency of the solvent during the extraction and to avoid its mixing with the moisture. The components were then placed into a thimble and a defatted piece of absorbent cotton was placed above the sample inside the thimble and inside the retort, and the retort was filled with sufficient amount of solvent (250 ml).

The extraction lasts for 6 hours until the solvent in the retort becomes colorless and no yellow color is observed in the retort at the end of the extraction.

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A measuring tube is taken and the solvent is boiled off, then it is dried in the air oven until the weight is stabilized. After boiling off of the solvent, the oil is collected into the dry glass containers and is preserved under cooling conditions. The oil obtained after such process is called Crude Oil and then it is handed over to the expert (oven man) to evaluate its properties.

$$\% \text{ of oil} = \frac{\text{Oil weight}}{\text{Sample weight (in grams)}} X100$$

5. Determination of The Oil Content in Fatty Acids

5.1 Esterification of Fatty Acids

Esterification of fatty acids of the date seed oil was carried out to run GS-MS using Kang and Wang method (2005), and an amount of 50 ml of extracted oil was taken and placed into a screw tube and 1 ml of regular hexane 1 was added. After that 1 ml of esterification solution was added to the tube and the solution was generated (14 g of BF_3 boron trifluoride in 100 ml of methanol). After thoroughly mixing the mixture with electrode at the maximum speed for 1 minute, it was placed into the hot oven at 90-100 ° C for one hour. Then the solution was left to cool off until the room temperature. Then 1 ml of distilled water was added and stirred well, and two layers appeared in the solution. Fatty extricated acids were extracted from the dissolved organic layer, dissolved hexane, and placed into the tube after reaching concentration of 2 ml in to run GS-MS by taking 1 mcl.

5.2 Separation and Diagnostics of Date Saad Oil Fatty Acids by Gas Chromatography / Mass Spectroscopy

Date seed oil from zahdi variety was analysed to determine types of fatty acids and evaluate the percentage of the peak area of each acid and its storage time in GS-MS using Gas Chromatography Mass Spectroscopy (GS-MS), type Shimadzu-Japan QP2010 Ultra connected with the computer and containing Library NISTO8-LIB with separation column DB-1 ms, length 30 m, internal diameter 0.25mm, fixed phase layer thickness 0.25 mm , with helium as the carrier gas with the flow rate of 1 ml / min and injection temp of 280 °C. Column Oven Temperature Program was adopted, with initial temperature of 50° C for one minute and further increase to 150 °C during one minute, with gradual and slow increase each minute by 4 °C, until it finally reaches 280 °C . The mass spectrometer was used in the Quadrupole Ions analyzer at the Ion source temperature of 200 ° C and eV70.

5.3 Mayonnaise Production

The Mayonnaise was prepared according to [7]. And an explanation is provided in Table 3.4 with regard to the percentage ratio of different ingredients used for mayonnaise production.

Table 1: Percentage ratio of ingredients used for mayonnaise production.

Components (ingredients)	Quantity (in grams)
Date seed oil	66,66
Whole egg	26,16
Edible salt	1,20
Sugar	0,80

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Mustard flour	0,33
Vinegar	2,02
Pepper	0,50
Mustard oil	2,33

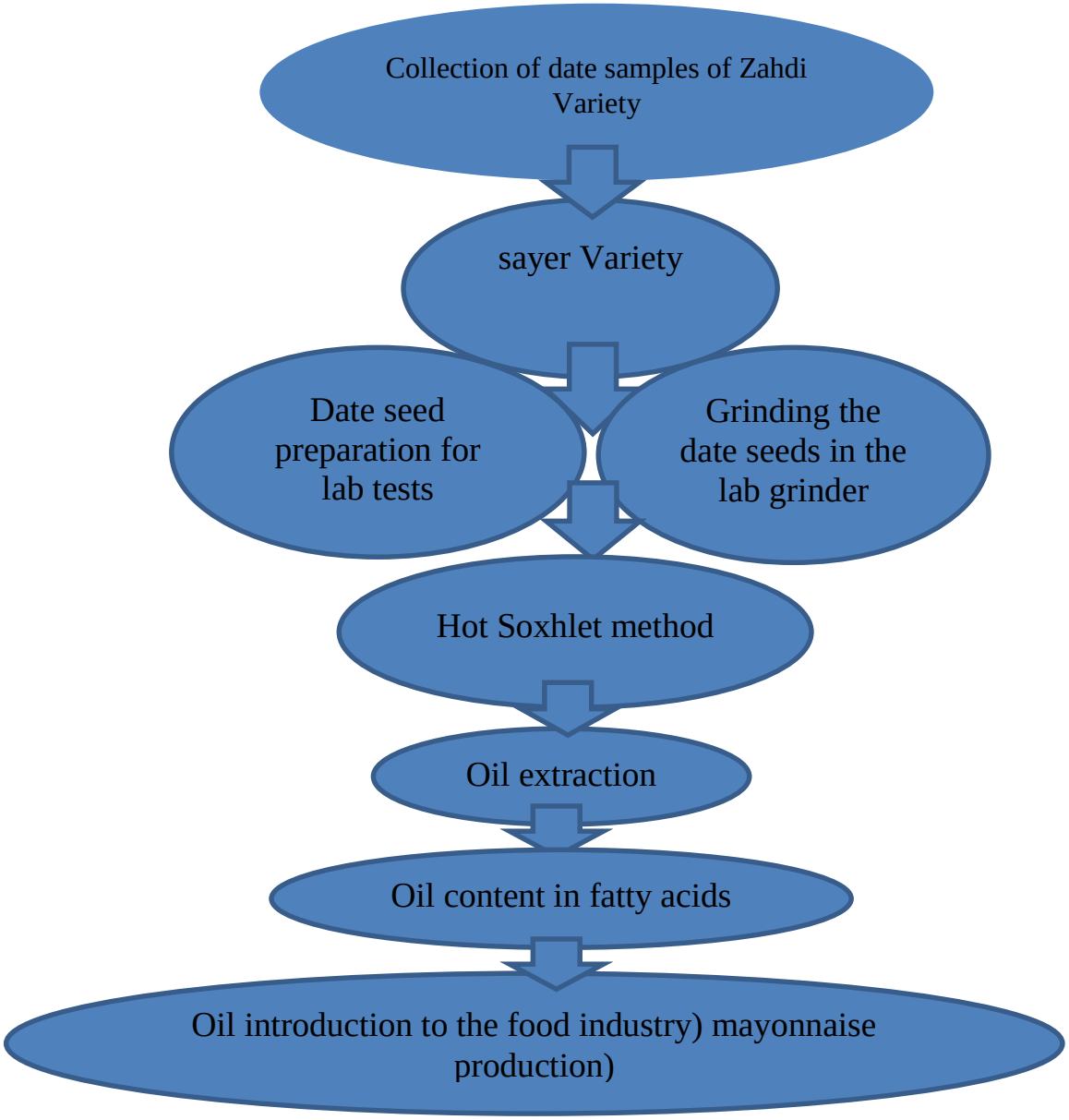

Figure 1: Summary plan for date seed grinding and oil extraction sequential procedure consisting of different stages.

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6. Experimental Section

Picture 1: Photo of the seed's preparation for grinding.

Picture 2: Photo of the laboratory grinder.

Picture 3: Photo of Iraqi dates powder (powder of sayer date seeds).

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Picture 4: Soxhlet extraction device.

Picture 5: Oil extracted from date seed oil sayer variety.

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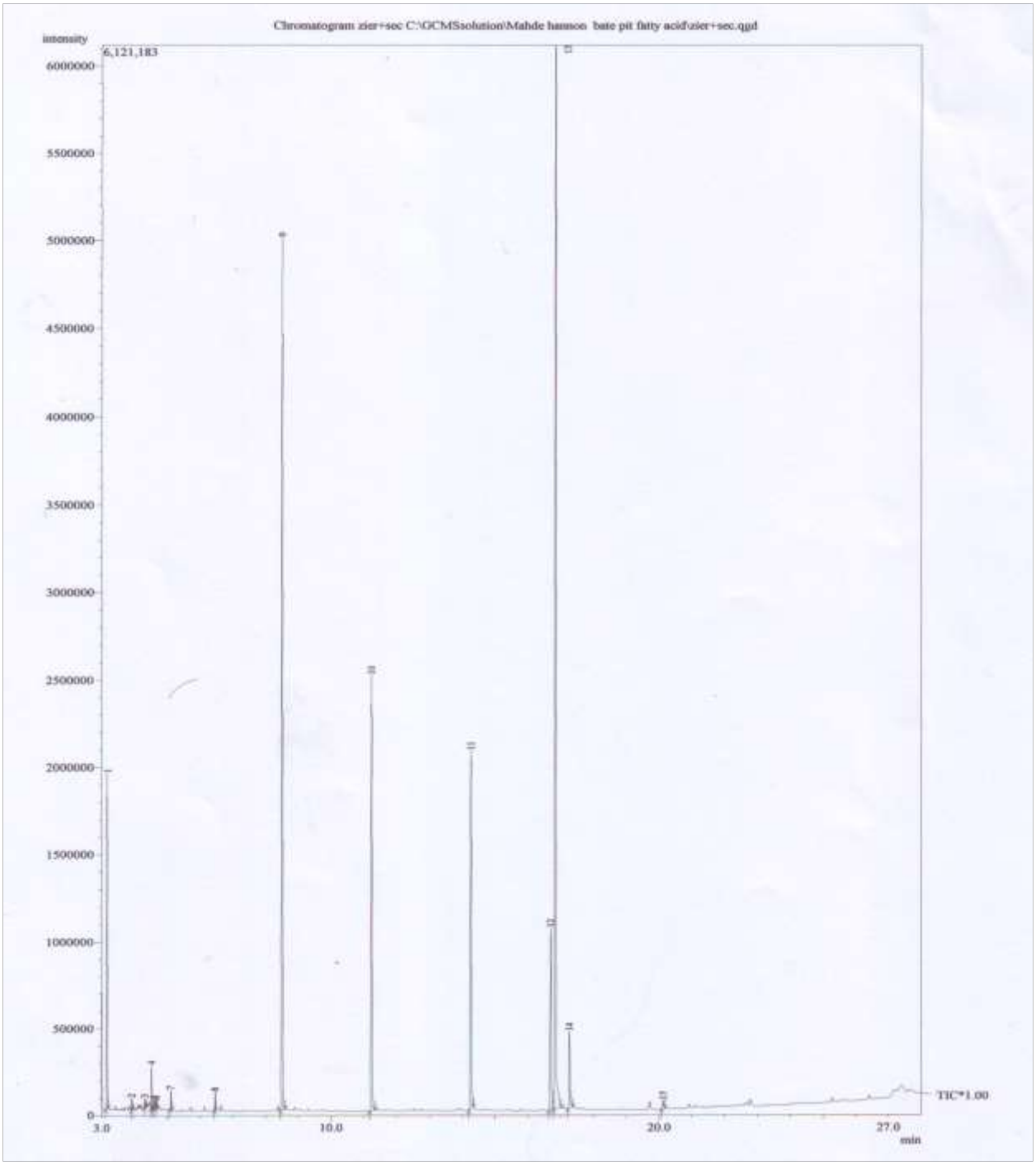
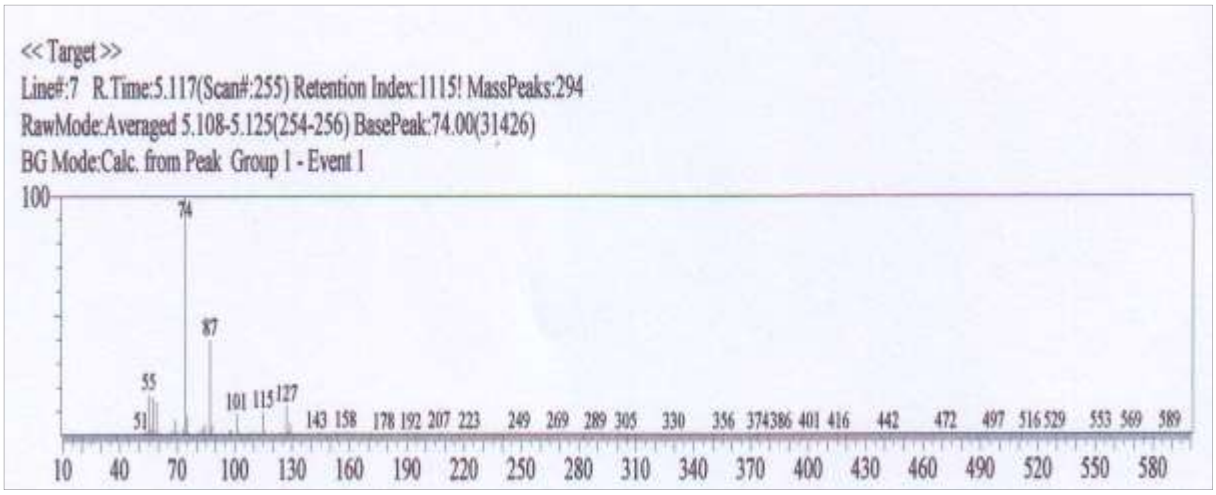
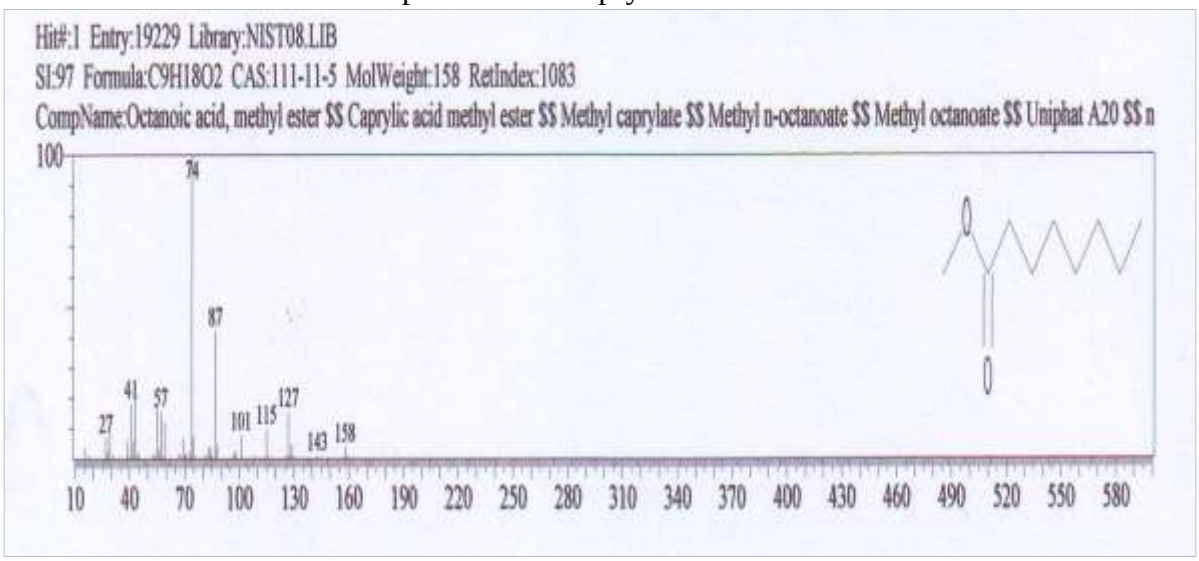


Figure 2: Total - ion chromatogram for fatty acids in seed oil dates sayer.



Mass spectrometer Caprylic acid C8H16O2



Library Caprylic acid

Figure 3: Mass / charge spectra (m / e e) for fatty acids of sayer seed oil.

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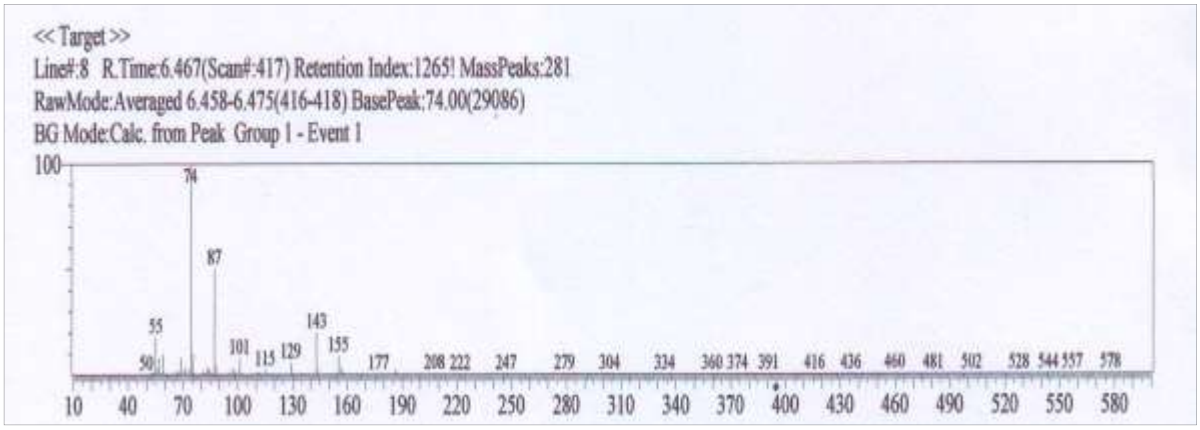
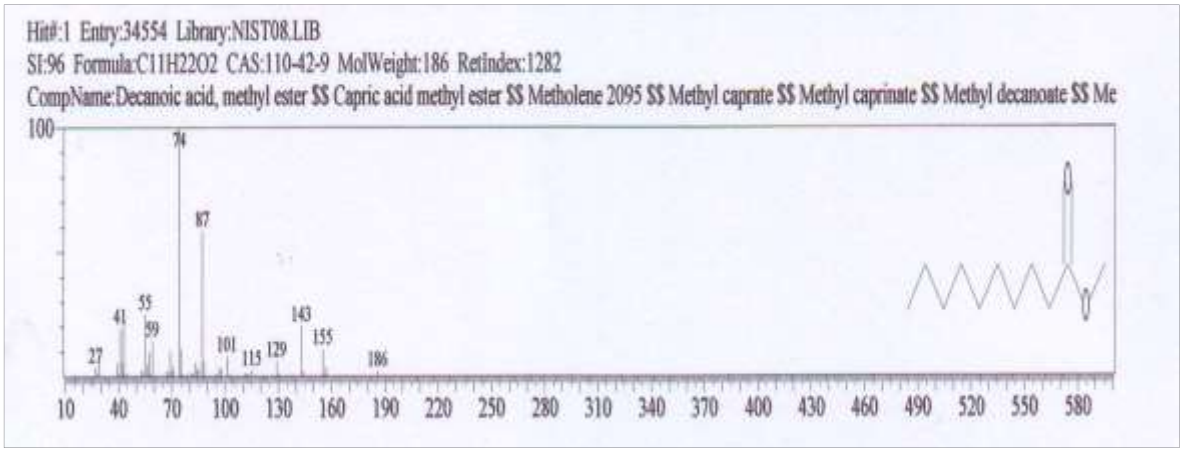
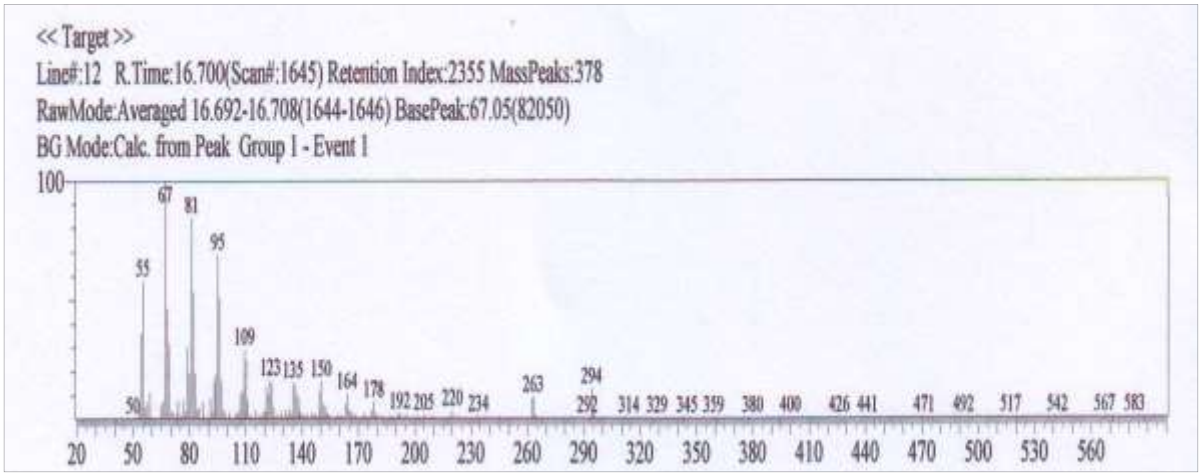


Mass spectrometer Capric acid C10H20O2

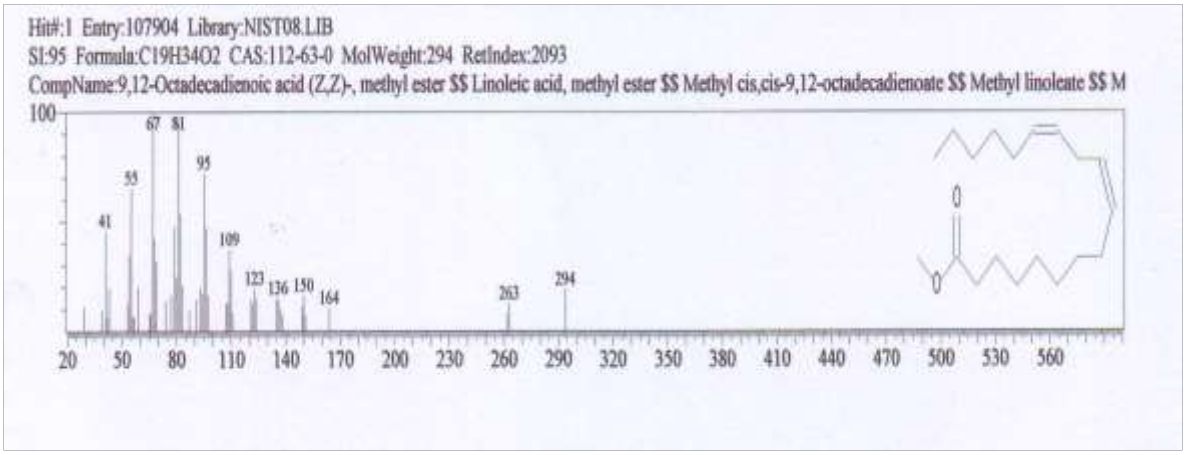


Library Capric acid

Figure 4: Mass / charge spectra (m / e e) for fatty acids of sayer seed oil.

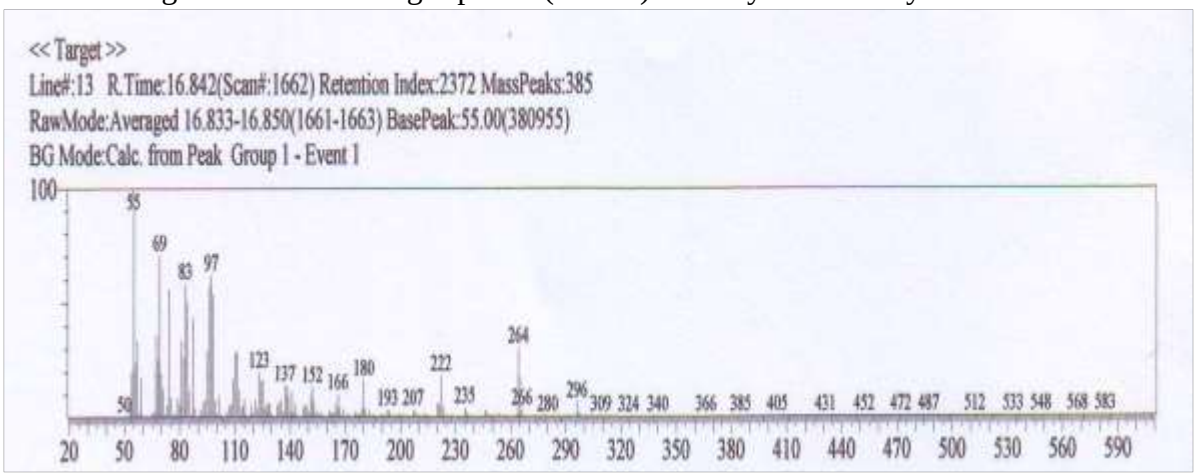


Mass spectrometer Linoleic acid C18H32O2

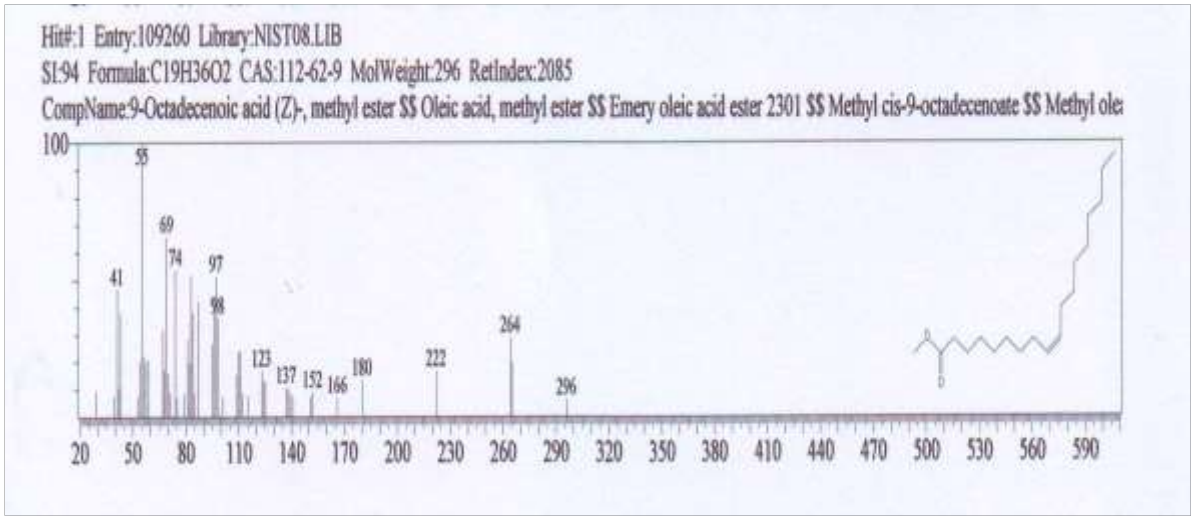


Library Linoleic acid

Figure 5: Mass / charge spectra (m / e e) for fatty acids of sayer seed oil.



Mass spectrometer Oleic acid C18H34O2



Library Oleic acid

Figure 6: Mass / charge spectra (m / e e) for fatty acids of sayer seed oil

7. Results and Discussion

7.1 Content of Fatty Acids in The Date Seed Oil

Forms 2 contain fatty acid chromatograms of date seed samples (sayer variety) obtained from Gas Chromatography/Mass Spectrometry (GC/MS). As for the forms 3,4,5 and 6, they illustrate mass-energy ranges for the analysis of fatty acids of date seed oil (from sayer variety). The specific diagnostics of separate fatty acids were performed through the integration of separate maximum values and obtaining of relevant data like delay time, square, growth and percentage ratio of maximum values, with further Similarity Search using existing tools via software linked with the device, as shown in Tables 2 , which explain the contents of date seed oil which was obtained (sayer variety) and which includes nine acids, of which seven are saturated acids (caprylic, capric, lauric, myristic, palmic, stearic, arachidonic acids). As for the oleic and linoleic fatty acids, these are unsaturated fatty acids which have significant importance. Oleic acid is represented as one of monounsaturated fatty acids called omega-9, which is necessary for the body, yet it is not the most important one, because the body can generate it, too. Oleic acid has many features useful for health, it reduces the cholesterol level by decreasing the amount of low-density lipoproteins (LDL) and this type of protein contains 25% of protein and 45% of cholesterol and it distributes across different parts of the body and sometimes it deposits itself on the blood vessel walls. Although it does not affect the number of high-density lipoproteins (HDL), this type of protein contains about 50% of protein and 20% of cholesterol. HDL contributes to the removal of the excessive amounts of cholesterol from the body (Alvarez& Rodriguez, 2000). Table 2 shows the content of fatty acids in the sayer variety date seed oil, it contains eight fatty acids, of which six are saturated acids (caprylic 0.71%, capric 0.63%, lauric 34.29%, myristic 13.89%, palmic 11.57%, stearic 3.42 %, respectively). It was noted that the content of lauric acid is higher that the content of other saturated fatty acids. As for the unsaturated fatty acids, the oleic and linoleic acids are one of the most important unsaturated fatty acids examined by Gas Chromatography/Mass Spectrometry (GC/MS), their percentage content in the oil was 32.96% and 6.83%, respectively.

Table 2: Specific analysis of fatty acids contained in sayer date variety seed oil, Using Gas Chromatography/Mass Spectrometry (GC/MS)

Peak	R.Time \min	Area	Area%	Height	Height %	Scientific name	Trivial name
7	5.114	143897	0.35	112801	0.71	Octanoic acid	Caprylic acid
8	6.463	159906	0.39	107987	0.63	Docanoic acid	Capric acid
9	8.508	8552031	20.66	4984964	34.29	Dodecanoic acid	Lauric acid
10	11.241	5164087	12.48	2502951	13.89	Tetradecanoic acid	Myristic acid
11	14.269	14.200	14.350	4641057	11.57	Hexadecanoic acid	Palmic acid

14	17.277	1143098	2.76	441349	3.42	Octadecanoic acid	Stearic acid
Unsaturated acids with one conjugated double bond							
13	16.845	15692553	37.91	6084307	32.96	9-Octadecenoic acid	Linoleic acid
Unsaturated acids with several conjugated double bonds							
12	16.702	2542380	6.14	1049924	6.83	9,12-Octadecadienoic acid	Linolenic acid

7.2 Organoleptic Evaluation of The Mayonnaise Produced from The Date Seed Oil of The Studied Date Varieties

The mayonnaise was produced from the date seed oil of the studied date varieties (sayer variety) instead of other vegetable seeds (soybean oil used in the commercial mayonnaise is being currently studied), as well as from corn oil and sunflower oil. The mentioned percentages were incorporated into the mayonnaise preparation methods, also chemical starch was used instead of the natural one (as a bonding agent, as well as to correct textures and to prepare the filler or the filling substance) [10]. When tests were carried out with regard to the commercial mayonnaise, the product was of better quality compared to the commercial trade nark mayonnaise in terms of its organoleptic properties (taste, flavor, color, texture, general acceptability). After running the tests, the product obtained good evaluation score from the tasting experts. sayer date seed oil gained the highest score, The use of nucleonic acid in the mayonnaise production is caused by the high content of unsaturated fatty acids and nutritious substances, like tocopherols, which play an important role in heart problem risk mitigation. Date seed oil may be used as unconventional oil in several branches of the food industry, like mayonnaise production [7].

8. Conclusion

1. The composition of the seed oil includes fatty acids: unsaturated fatty acids (oleic and linoleic) and saturated fatty acids (caprylic, capric, lauric, myristic, palmic, stearic, arachidonic).

2. Organoleptic tests of the mayonnaise produced with the date seed oil demonstrated significant advantage as compared to the commercial mayonnaise, especially in terms of general characteristics of public positive acceptability.

3. Use local Iraqi dates as a food source by extracting oil from the seeds of the following local Iraqi date types: sayer variety.

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