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**COMPARISON OF FATTY ACIDS AND INDICES YIDDISH AND MIXED WITH
SESAME OIL, REFINED VEGETABLE OILS**

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ABSTRACT

Fraud control in vegetable oils, with the approval and determination of impurities is one of the important factors controlling plant oils. Sesame oil due to its high value and low value fraud case with conventional oils such as sunflower, soybean, corn, etc. placed. In this regard, this study Comparison of fatty acids using gas chromatography and index Yiddish and mixed with sesame oil, refined vegetable oils in triplicate deals. The results indicate that the index procedure to distinguish yiddish in sesame oil and sunflower oil, corn oil than modern methods (HPLC) is the method of determining the fatty acid composition of the fatty acids in the sesame oil and pure, fraud can be detected in it. The amount of fatty acids, palmitic, stearic, palmitoleic, oleic, linolenic acid, a mixture of corn oil and sunflower oil Gadoleic, Arachidic and reduce the amount of linoleic acid increased.

Keywords: Sesame Oil, Fatty Acids, Fraud, Sesame Oil, Corn Oil, Sunflower Oil

INTRODUCTION

Sesame (*Sesamum indicum* L.) belongs to the family Pedaliaceae an ancient crop plant is valuable. Sesamum genus of about 20 species of wild and cultivated in Asia, Africa, the Indian species (*Sesamum indicum*) is more valuable than an economic perspective. The

application of a sesame seed that nearly 75 percent of which consists of fat and protein [1]. Sesame seed as an oilseed containing a mixture of unsaturated fatty acids, linoleic acid and oleic acid and palmitic equally and stearic 75% protein and 25% fat, sesame

seeds, minerals, carbohydrates and fiber is formed. Sesame also contains phenols, phytosterols, phospholipids and vitamins, especially vitamin E, B vitamins and minerals such as calcium, magnesium, Zn, Cu and P. Sesame is a rich source of protein and has a high nutritional value. Each tablespoon sesame provides 14 percent of the daily requirement of calcium in the body. Consumption of 50 grams of sesame, 25 percent of the daily requirement of folic acid on the sides. The grain plant sources of iron that is useful to break the monotony of eating the seed for people who are suffering from iron deficiency anemia can be very effective [2]. Sesame oil is made from corn contains large amounts of polyunsaturated fatty acids of multiple (poly unsaturated Fatty Acid, PUFA) are, good for the body and also contains lignans with antioxidant vitamin E and monounsaturated fatty acids, significant amounts of (MonoUnsaturated Fatty Acid, MUFA) is, resistant to the oxidation of lipids and hydroxyl radicals as an antioxidant for disposal, proxy and therefore the control of lipid peroxidation [3]. Terms of Chromatography Today, an array of methods that can be isolated based on their relative tendency of each component to the stationary phase. Chromatographies separation methods can be very difficult in other ways that they

did. Because subtle differences in the detailed behavior of objects during their passage through a chromatography system can be multiplied. Gas chromatography (GC) is a chromatographic method for the isolation and study of volatile without decomposition, it can be used. In gas chromatography, gas phase, a phase inert (helium, nitrogen, argon and carbon dioxide) and the mobile phase is also called the carrier gas. The stationary phase is a solid adsorbent or a thin layer of a non-volatile liquid to the inner wall of the column or as a coating on the surface of glass or metal pellets has been given. The gas chromatographic separation of components in a mixture is proportional to the distribution of the components of a mixture of inert solid or liquid mobile phase and the gas phase occurs. The mixture of carrier gas through the column and the components of the mixture at equilibrium between the two phases (gas-liquid) are distributed. Therefore, the mobile phase component of the sample to the outside of the columns, and each column is a molecule that is absorbed more loosely coupled, earlier part of the greater absorption column, the column is later removed, thereby separating the components of mixtures. In general, gas chromatography to separate and identify the components of a mixture and their quantitative analysis is also used [4].

Calendula fatty acid composition obtained by gas chromatography and concluded that about 61 percent canola oil, monounsaturated fatty acid, Oleic acid is the most common (56%), respectively. In addition, canola oil contains a small amount of saturated fatty acids (8.1%) and polyunsaturated fatty political moderate amount (30.7%) as their main linoleic acid (21.5%) and linolenic acid (8%) [5]. Fraud control in vegetable oils, with the approval and determination of impurities of vegetable oils is one of the most important indicators of control. Sesame oil due to its high value and low value fraud case with conventional oils such as sunflower, soybean, corn and placed. For this reason, during the years, considerable research has been done on the sesame oil. A method to identify an oil in vegetable oil, the chemical and physical parameters that obtained by comparing the numbers in the standard. For this reason, you should consider several factors. For some values of the parameters for the different oils were similar and in some cases the difference between them is not significant and therefore it is difficult to detect fraud [6]. Physical and chemical indicators in the past (color, taste, smell, handwork index, saponification index, etc.) are used to determine the quality of sesame oil was very limited value because they are mixtures of oil adulterated with

similar characteristics pure sesame is relatively easy. In fact, the use of new devices and techniques such as GC, HPLC and spectrophotometry, which is currently used to identify the exact parameters (extinction coefficient, fatty acids, bioactive compounds, etc.) leads. While some of the old tests may be useful in certain cases of fraud [6]. In this regard, this study Comparison of fatty acids using gas chromatography and Yiddish index refined sesame oil and mix with vegetable oil deals.

MATERIALS AND METHODS

Sunflower and corn oil, sesame oil companies and Saman were collected from the Behshahr company. Tests were carried out to assess the quality of sesame oil and sesame oil from mixing with 3 replications. Based on the following test procedures were performed by national standards.

How to Determine the Fatty Acid Composition by Gas Chromatography

In this method, according to the national standard method 1771, the fat must be hydrolyzed to glycerol and fatty acids, and fatty acid derivatives in order to make their escape, their conversion to the corresponding methyl esters. The resulting derivative to isolate and measure the gas chromatograph injection and for this purpose the first drop of oil was weighed in a test tube. Then 1 ml of

hexane was added, and then 1 ml of methanolic KOH added, mixed for 5 minutes. Supernatant phase (Potash and samples) at a rate of 0.1 Macro L is injected into the chromatograph. To determine the exact type of fatty acids was analyzed by GC with the following conditions:

GC: Agilent 689060 m column, the column 0.25 mm diameter, 0.2 mm diameter stationary phases, the stationary phase Agilent HP₅MS, mobile phase purity hydrogen gas 99.999% and a flow rate of 1 ml per minute and Split Ratio 1 to 80. The oven temperature to 150 °C temperatures for 10 min to stop the program at a rate of 10 °C per minute and the temperature reached 180 degrees and 50 minutes at this temperature stopped. A temperature of 250 °C was injected. Chromatogram of sample injected was drawn by the device.

How to determine the Index of Yiddish

Index indicating the degree of non-saturation Yiddish oil is an oil. In practice, this is done based on the measured amount of oil absorbed by halogen technology. In conditions Halogen uptake of unsaturated fatty acids in oils is added to the halogen content of unsaturated shows the approximate number of connections. The index measures the number of double bonds Yiddish is fat. Yiddish index, g is the iodine absorbed by 100 grams of fat.

Determination of the iodine value method requires the addition of a halogen in excess of example, halogen revival excess potassium iodide and finally by titration with sodium thiosulfate in the presence of a starch solution as an indicator. There are various methods for measuring iodine value. The most common method is Wijs and Hanus. In this study, the contribution of fatty acids obtained by gas chromatography, handwork index number of samples according to AOCS Cd 1c-85 was calculated by the following equation.

$$\text{Iodine Value} = (\%c16:1 \times 0.95) + (\%c18:1 \times 0.860) + (\%c18:2 \times 1.732) + (\%c18:3 \times 2.616) + (\%c20:1 \times 0.785) + (\%c22:1 \times 0.723)$$

Finally, data from these tests analyzed using SPSS software and Duncan's multiple range test to compare means at the 5% level was used. Finally the data using Microsoft Excel software in the form of charts and tables were compared.

RESULTS

Fatty Acid Composition

According to the results obtained by gas chromatography of fatty acid found in most sesame oil contains Linoleic acid (about 43%) followed by Oleic acid (about 38%), Palmitic acid (about 11%) and Stearic acid (approximately 6%) groups (**Table 1**). The major fatty acids found in corn and sunflower

oils, respectively above (with different percentages of the total).

Mix the sesame oil and corn oil in all proportions decreased (at 95%) in the amount of acid was Myristic. The palmitic acid is the major saturated fatty acids in sesame oil, mixed with corn oil caused a significant change in the rate (**Table 2**). This change was evident in all proportions. Palmitoleic acid that occurs after a significant decline in the proportions of 10% and 15% corn oil, corn oil and add 5 percent statistically significant increase in the value of this did not cause any fatty acid (**Table 2**). Stearic acid with the addition of corn oil and sesame oil in the ratio decreased, the percentage of corn oil increased this difference was greater (**Table 2**). Mix up leads to a significant reduction in the amount of oleic acid in all proportions of corn oil was used, which decreases with the increase of corn oil was more severe at. The most important and the fatty acid linoleic acid is then mixed with the sesame oil, corn oil fatty acids behave unlike previous behavior was observed. In all cases, the ratios of corn oil, linoleic acid may be increased, this increase was more severe with increasing concentrations of corn oil (**Table 2**). Gadoleic and Arachidic fatty acids and have similar behavior and decreased with the addition of corn oil in all proportions. Mix sesame oil in

corn oil was no more than a negligible effect on the rate and Lignoceric and Behenic acids did not (**Table 2**).

According to the results obtained by mixing pure sunflower oil and sesame oil in all proportions will be detected by measuring the amount of palmitic acid (**Table 3**). Because palmitic acid content decreased with the addition of these oils were statistically significant. These decreases with increasing concentration of sunflower oil became more intense. But adding Myristic acid sunflower oil used in any of the ratios showed no significant change (**Table 3**). The palmitoleic acid sunflower oil if the mixture is 5%, the change in value of these fatty acids cannot be produced, but at higher ratios, the amount of the acid was reduced (**Table 3**). If sunflower oil is used for 15% of stearic acid changed significantly reduced because of the lower ratios of 5 and 10% of stearic acid remained unchanged (**Table 3**). The amount of oleic acid after mixing in the same proportion, means 5%, increasing to 15% decrease in the loss was too severe (**Table 3**). Linoleic acid as the major fatty acid in all proportions with the addition of sunflower oil was significantly increased (**Table 3**). With the addition of sunflower oil in sesame oil, the amount of Linolenic, Gadoleic and Arachidic acid declined. Behenic and Lignoceric acids

increased after mixing. About Behenic acid in all proportions and ratios of Lignoceric only 10 and 15% of this increase was significant (Table 3).

Yiddish Index

Yiddish figure oil used is an index to the degree of saturation. This index is unique for each oil. Figure 1 shows the values of the measured value for the Yiddish pure sesame oil and sesame oil mixed with corn oil shows. The maximum index of Yiddish, the samples containing 15% corn oil, sesame oil (110.58), respectively. Add corn oil, sesame oil caused a significant increase in the proportions of 10% and 15% in the index was Yiddish. But about 5% of this increase was not significant (Figure 1).

Yiddish Index Number sunflower oil used in this study was 128.25. The amount of the Codex Alimentarius standard range (141-118) compliance. According to this figure is expected to increase mixing sesame oil, sunflower oil index is Yiddish, that this increase should be even more severe than the previous one, which was a mixture of corn oil and sesame oil, is. According to the Figure 2 As expected the index Yiddish sesame oil mixed with sunflower oil has been increasing, with the increase in the proportion of 10 and 15% was statistically significant. But as corn oil, the increase was not significant at the 5% level.

Table 1: Compares the Fatty Acid Composition of Sesame Oil, Corn and Sunflower Oil Used in this Study With the Standard Values

Fatty acid	Sesame	Standard (sesame)	Corn	Standard (Corn)	Sunflower	Standard (Sunflower)
C 14: 0	0.08	0.1>	0.05	0.3>	0.09	0-0.2
C 16: 0	11.03	7.9-12	11.50	8.6-16.5	7.28	5-8
C 16: 1	0.19	0.01-0.2	0.09	0.5>	0.13	0.5>
C 18: 0	5.08	4.8-6.7	2.20	0.33>	4.07	2.5-7
C 18: 1	37.93	35.9-43	31.49	20-42.2	24.64	13-40
C 18: 2	43.21	39.1-47.9	52.39	34-65.6	61.19	40-74
C 18: 3	0.47	0.3-0.5	0.71	2>	0.30	2>
C 20: 0	0.70	0.3-0.7	0.56	0.3-1	0.31	0.5>
C 20: 1	0.21	0.3>	0.22	0.2-0.6	0.16	0.5>
C 22: 0	0.20	1.1>	0.09	0.5>	0.71	0.5-1
C 24: 0	0.10	0.3>	0.19	0.5>	0.25	0.2-0.3
Other	0.32	-	0.32	-	0.67	-
Total	99.67	-	99.67	-	99.32	-

Table 2: Fatty Acid Composition of Sesame Oil and Corn Mixture

15% corn oil	10% corn oil	5% corn oil	Pure Sesame oil (Controls)	Fatty acid
0.05±0.005 ^c	0.06±0.002 ^c	0.07±0.05 ^b	0.08±0.001 ^a	C 14: 0
11.24±0.06 ^c	11.55±0.13 ^a	11.25±0.05 ^c	11.37±0.03 ^b	C 16: 0
0.15±0.004 ^c	0.17±0.003 ^b	0.19±0.002 ^a	0.19±0.001 ^a	C 16: 1
4.56±0.04 ^c	4.73±0.14 ^b	4.85±0.14 ^b	5.08±0.04 ^a	C 18: 0
36.97±0.02 ^c	37.19±0.01 ^b	37.41±0.16 ^b	37.93±0.03 ^a	C 18: 1
44.78±0.08 ^a	44.27±0.05 ^b	43.91±0.15 ^c	43.21±0.15 ^d	C 18: 2
0.35±0.01 ^c	0.37±0.01 ^b	0.44±0.05 ^a	0.47±0.01 ^a	C 18: 3
0.65±0.01 ^b	0.66±0.02 ^b	0.67±0.01 ^b	0.70±0.02 ^a	C 20: 0
0.18±0.001 ^b	0.18±0.001 ^b	0.18±0.001 ^b	0.21±0.001 ^a	C 20: 1
0.19±0.001 ^a	0.19±0.001 ^a	0.20±0.001 ^a	0.20±0.001 ^a	C 22: 0
0.12±0.001 ^a	0.11±0.001 ^b	0.11±0.001 ^b	0.10±0.001 ^b	C 24: 0

* Different Latin Letters in Each Row Indicate Significant Differences at a Confidence Level of 95 Percent

Table 3: Fatty Acid Mixture of Sesame and Sunflower Oils

15% Sunflower oil	10% Sunflower oil	5% Sunflower oil	Pure Sesame oil (Control)	Fatty acid
0.08±0.005 ^a	0.08±0.002 ^a	0.08±0.001 ^a	0.08±0.001 ^a	C 14: 0
9.87±0.04 ^c	9.97±0.03 ^c	10.57±0.05 ^b	11.37±0.03 ^b	C 16: 0
0.18±0.001 ^b	0.18±0.003 ^b	0.19±0.002 ^a	0.19±0.001 ^a	C 16: 1
4.91±0.07 ^b	4.95±0.09 ^a	4.99±0.07 ^a	5.08±0.04 ^a	C 18: 0
35.92±0.07 ^d	36.83±0.30 ^c	37.29±0.01 ^b	37.93±0.03 ^a	C 18: 1
46.14±0.09 ^a	45.35±0.25 ^b	44.31±0.05 ^c	43.21±0.15 ^d	C 18: 2
0.26±0.01 ^d	0.34±0.01 ^c	0.39±0.01 ^b	0.47±0.01 ^a	C 18: 3
0.61±0.02 ^c	0.64±0.01 ^b	0.65±0.01 ^b	0.70±0.02 ^a	C 20: 0
0.18±0.001 ^b	0.18±0.001 ^b	0.18±0.001 ^b	0.21±0.001 ^a	C 20: 1
0.27±0.001 ^a	0.25±0.001 ^b	0.22±0.001 ^c	0.20±0.001 ^a	C 22: 0
0.13±0.001 ^a	0.12±0.001 ^a	0.11±0.001 ^b	0.10±0.001 ^b	C 24: 0

* Different Latin Letters in Each Row Indicate Significant Differences at a Confidence Level of 95 Percent

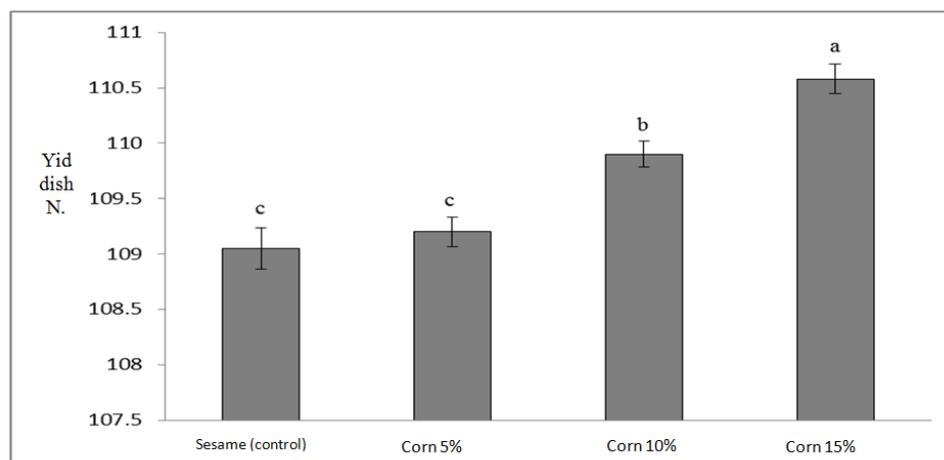


Figure 1: Yiddish Number Sesame Oil and Corn Mixture (Latin Letters in Each Column Indicate Significant Differences at a Confidence Level of 95 Percent)

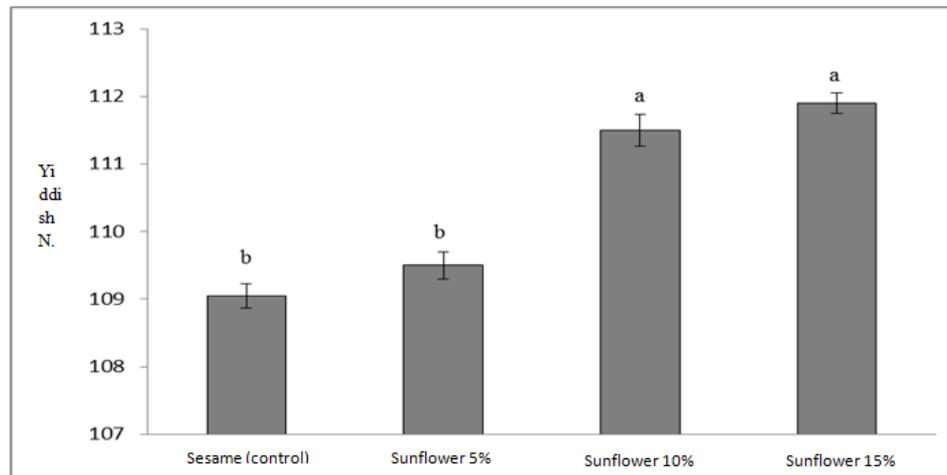


Figure 2: Yiddish Number Sunflower Oil and Sesame

DISCUSSION

Iodine value, the amount of unsaturated fatty material specifies [7]. Yiddish index of sesame oil used in this experiment was measured 109.05, the national standards of the Codex Alimentarius (104-120) correspond. The Yiddish index for corn oil used in this study was 119.97 of its Number, and the value measured by the standard of the Codex Alimentarius (110-121) and in compliance with the consequences of oil [8] are consistent. According to the values expected by mixing sesame oil, corn oil, thereby increasing the index of Yiddish and this increase was statistically proven. So you can use this method to detect fraud in sesame oil. The discovery of the incorporation of lower than 5% require more accurate and more advanced techniques such as chromatography is. In association with fatty

acids, as seen in the percentages of all fatty acids in each of the oils used in this study was based on the amount and scope of the standard. The amount of fatty acids, palmitic, stearic, palmitoleic, oleic, linolenic acid, a mixture of corn oil and sunflower Gadoleic and Arachidic acid reduces the amount of linoleic acid increased. Behenic and Lignoceric acid mixing with an increase of 10% and 15% sunflower oil, corn oil mixed with sesame oil increased but did not change. The results [9] and [10] in a direction. The results of the study in (2001) showed that most discerning of olive oil and olive pomace oil, vegetable oils and other Iranians have been mixed. Mix the olive oil with other oils can affect the fatty acid composition, [11] with a study on olive oil fraud is revealed. These results are consistent with experiments. Changes in the types of fatty acids and their

locations in the Triacylglycerol molecule can affect the quality and nutrition of oil [12].

CONCLUSIONS

If 5 percent or less is fraud, pure sesame oil, Yiddish index method can be realized. The effectiveness of this method to distinguish the sesame oil, corn oil and sunflower under modern methods (HPLC) is. Modern techniques can be used to detect cheating lowest. These results suggest defective ancient techniques with modern methods for cleaning the oils from each other. According to the results obtained with the method of determining the fatty acid composition of pure sesame oil fatty acid measurements in the fraud can be detected in it.

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