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Effect of mixing ratio and heat treatment on chemical properties for some types of vegetable oil

ABSTRACT

The experiment was conducted in the laboratories of the Department of Food Science - College of Agriculture - Tikrit University , the study aimed to measure the effect of the mixing ratio of vegetable oils and heat treatment on some of the chemical properties ,Three mixing ratios were identified. The sunflower oils, Rice Brane, flax, and sesame were used , than mixing process were made with sunflower oil being the main oil, and the remaining oils were added separately, at rates of 15%, 30% and 45%. The heat factor was used as a second factor for the experiment, and the values of the chemical properties of the oils were read at room temperature (RT) and at 150 ° C for 1 hour . The effect of these factors was observed on the values of acidity number, free fatty acids, iodine number, peroxide number, saponification number of studied oils and their mixtures. The highest pH value of sesame oil was 1.56 mg KOH / gm, while the lowest value was 0.262 mg KOH / gm in the sample of the Rice bran, while the free fatty acids had the highest value in the sesame oil sample, it reached 0.784% and the lowest was in the rice bran sample It reached 0.132%, and the iodine number treatment reached the highest values In the sample of flax oil, which amounted to 190 and the lowest in the sample, 15% flax oil + 85% sunflower oil reached 64, and the characteristic of peroxide number was also recorded significant differences between the values and recorded the highest value in the treatment 30% flax oil + 70% flower oil Sun reached 1.44 O2 / Kg and the lowest recorded for treatment is 30% Rice bran + 70% sunflower oil and it reached 0.93 O2 / Kg. We also note that the value of saponification number recorded its highest value in the treatment of flax oil and reached 194 mg KoH / g. As for the lowest value it was recorded In the treatment of 15% rice bran oil + 85% sunflower oil and reached 101 mg KoH / g, the heating processes led to significant changes in the values.

INTRODUCTION

Plants are an important source of many substances that go into the food industry, and from these materials are extractable oils that are of commercial value, many edible vegetable oils such as palm oil, corn, soybeans and peanuts, in addition to sunflower oils Linen, sesame, and rice scales are used as table oils for their high nutritional value. Oils and fats are the most concentrated forms of energy, providing about 9 kcal of energy per gram compared to only 4 kcal per gram of protein and carbohydrates (Ali and et.al, 2005). This an addition to an application that different industrial (Yusuf, 2018).

The chemical properties are an important indicator for the study of oils and fats, and the value of free fatty acids is expressed in the value of acid, which is defined as the number of ml spent from

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KOH needed to neutralize the free fatty acids present in 1 gram of oils or fats (Albasher, 2012). Analytical rancidity is accompanied by the release of free fatty acids, so this indicator is used to measure the condition and suitability of oils and fats as an indicator of the quality and efficiency of oil or fat (Smith et al., 1958).

Iodine number is defined as the number of grams of iodine that are related to 100 grams of oil, and the iodine number is one of the chemical estimates that have a clear importance for determining the properties of oils and their suitability, and the iodine number expresses the degree of saturation of acids The fatty acids associated with triglycerides that make up oils and fats. The iodine number is proportional to the degree of direct saturation of fatty acids, and thus it is evidence of the number of double bonds that are present in the oils, that is, it represents the extent or degree of unsaturation of the oil (Pocklington, 1990).

Value of the peroxide number always reflects the degree of stability of oils against self-oxidation that occurs during the period of storage and storage of oil under the approved storage conditions without showing signs of rancidity and corruption (Kenneth, 1995), in other words, the peroxide value is also used as a measure of the occurrence of rancidity occurring during storage and is used As a good predictor of oil quality and stability forecasting (Nangbes et al., 2013), high values of peroxide number can result from a high degree of non-traceability and increase with storage time, temperature, light, and atmospheric oxygen contact (Mohammed and Ali, 2015).

Saponification value is the number of grams of potassium hydroxide needed to saponate one gram of oil or fat, and the value of saponification number represents the sum of free fatty acids from it and those associated with the cholesterol in the chlorides that make up the oil. This trait is an indication of the molecular weight equivalent to the oil (Khamar and Jasrai, 2013) and inversely proportional to it.

MATERIALS AND METHODS

1- Sources of samples used in the research:

1: Sunflower Seeds

Sunflower seeds (*Helianthus annuus*) were locally grown in Salah al-Din Governorate froe 2018-2019 agriculture season.

2: Rice Bran

Samples are secondary milling of rice (Rice Bran), (which is the products of secondary milling ie rice bleaching), was obtained for the agricultural season 2018-2019.

3: Flaxseed

Flax seeds (*Linum usitatissimum*) were obtained locally cultivated in the Salah al-Din Governorate and for the agricultural season 2018-2019.

4: Sesame Seeds

(*Sesamum indicum*) a local variety for the 2018-2019 agricultural season, was obtained from the local market of Baghdad.

The samples were used in the study, were kept in sealed plastic boxes at a temperature of 5-7 ° C until the use.

2- Preparing mixtures for study:

The mixtures were prepared for the study in order to identify the effect of the mixing process on the physical and chemical properties of the oils. Mixtures were developed for the oil, as shown in Table 1 as follows:

Table (1) Mixtures of vegetable oils under investigation

No;	Oils Mixing type	Code
1	Sunflower oil 100%	1
2	Rice Bran Oil 100%	2
3	Flaxseed oil 100%	3
4	Sesame oil 100%	4
5	85% Sunflower oil +15% Rice bran oil	5
6	70% Sunflower oil +30% Rice bran oil	6
7	55% Sunflower oil+ 45% Rice bran oil	7
8	85% Sunflower oil + 15 % Flaxseed oil	8
9	70% Sunflower oil + 30% Flaxseed oil	9
10	55% Sunflower oil + 45% Flaxseed oil	10
11	85% Sunflower oil + 15% Sesame oil	11
12	70% Sunflower oil + 30% Sesame oil	12
13	85% Sunflower oil + 45% Sesame oil	13

3- Chemical determination of oil and their mixtures :

Some chemical properties of extracted vegetable oils and their mixtures were estimated by two thermal treatments, namely room temperature and plants at 150 ° C. These characteristics included the following:

A- Determination of Acid Value :

The acidity number was estimated according to the method mentioned in AOAC (2004) by adding 50 ml of 95% ethanol to 5 g of oil, then the contents were heated to dissolve the fat and then titrated with 0.1 standard sodium hydroxide solution in the presence of a Phenolphthalein index and estimated the acid Value according to the formula next :

$$\text{Acid Value}=\frac{(ml\ of\ NaOH\ used\ for\ sample - ml\ of\ NaOH\ used\ for\ blank)x\ Normality\ x\ 40}{sample\ wight\ (\ gm\ )}$$

B- Determination of free faty acid (F.F.A):

Free acids were estimated according to the method mentioned in AOAC (2004) by taking 5 gm of oil and put it in 100 ml of the mixture of ethanol and diethyl ether alcohol in a ratio of 1: 1 (volume: volume) with the evidence of Phenolphthalein and the Titrate with 0.1 N standard solution of sodium hydroxide Until the solution turned pink, the free fatty acids were calculated according to the following formula:

$$\text{Free Fatty Acid} =\frac{NaOH\ used\ (\ ml)\ x\ 2.28}{sample\ wight\ (gm)}$$

C- Determination of Iodine Value:

Iodine number was estimated according to the method mentioned in AOAC (2004) by weighing 0.5 g of oil, dissolving it in 10 ml of chloroform, adding 30 ml of iodine, then shaking it well in the dark for 30 minutes 10 ml of 15% solution of potassium iodide was added and mixed well then add 100 ml of distilled water and titrate with 0.1 standard solution of sodium sulfate with a 2% starch indcator, repeat the same steps without adding oil to estimate the blankand according to the iodine number according to the following equation:

$$\text{iodine Value} = \frac{(ml\ of\ \text{Na2SO4 for sample}-ml\ of\ \text{Na2SO4 for blank})\text{x normality x 127 x 100}}{sample\ wight\ (\ gm\ )+1000}$$

D- Determination of peroxide value:

The peroxide value was estimated according to the method mentioned in AOAC (2004) by dissolving 5 g of oil in a dissolving mixture (galical acetic acid + chloroform (40: 60 volume: volume)) and adding 0.5 ml of saturated potassium iodide solution and then stirring in a circular motion for a period 15 minutes, then add 100 ml of distilled water to wash any free iodine the walls of the beaker and then calibrate the iodine with Standard solution of sodium thiosulfate with evidence of starch and intense shaking. Repeat the same steps without adding oil to blank treatment and then according to the size of the necessary thiosulfate To calibrate and estimate the peroxide number according to the following formula:

$$\text{Peroxide Value}= \frac{(ml\ of\ \text{Na2S2O3 for sample for sample}-ml\ of\ \text{Na2S2O3 for blank})x\ normality\ x\ 1000}{sample\ wight\ (gm)}$$

E- Determination of saponification number:

Saponification number was estimated according to the method mentioned in A.O.A.C (2004) by adding 5 mL of a standard 0.5 N solution of alcoholic potassium hydroxide to 5 g of oil in a beaker with condencer and then heated in a water bath at a temperature of 60 ° C for 15 minutes. Then the condenser is removed and after flask been cooled, the titration is carried out using a 0.5 N standard solution of hydrochloric acid in the presence of Phenolphthalein as a Indicator. The process is Repeated without oil to calculate the control treatment and then the saponification number is estimated according to the following formula:

$$\text{Saponification number} = \frac{(ml\ of\ HCl\ used\ for\ blank - ml\ of\ HCl\ used\ for\ sample)x\ normality\ x\ 1.56}{sample\ wight}$$

RESULTS AND DISCUSSION

1- Acid Value :

Table (2) Showed Acid value of the studied oils and their mixtures, which indicate the amount of free fatty acids present in the oil, an indicator that determines the extent of the purity of the oils and the degree of their degradation as a result of exposure to inappropriate conditions (Zahir and et.al, 2014), there are significant differences Among the treatments, We note the highest value in treatment (4) that represents sesame oil, which amounted to 1.56 mg potassium hydroxide / gm of oil, and this is close to the value reached by Katkade et al., (2018) which amounted to 2.84 mg potassium hydroxide / gm, while the lowest value was for treatment (2) Which represents rice bran oil, which was 0.262 mg hydroxide, This value was in Agree with Askar (2016), which Showed value of 0.26, and the result by Oluremi et al. (2013) were 0.5 while it did not agree with what Khamar and Jasrai (2013) find its among 1 to 3. The mean Acid Value of sunflower and flax oil is about 0.571 and 1.187, respectively, and these results were not consistent with what Askar mentioned (2016) and was 0.222 and approached Viorica (2012) 's findings of 0.80.

Effect of mixing ratios of the approved oils with sunflower oil, it had a very clear effect on the acidity number, as the Rice Bran oil reduced the acidity number of sunflower oil (treatments 5, 6, 7), noting decrease in Acid Value with an increase in the percentage of Added Rice bran oil, and the opposite case is for mixtures of flax oil with sunflower oil, as it led to an increase in the acidity number in a steady with the percentage of added flax oil (treatments 8, 9, 10). Also for sesame oil, acidity value decreased as a result of mixing with sunflower oil with decrease in percentage of sunflower oil (Treatments 11, 12, 13).

Thermal treatment has led to a rise in the acidity number values for all treatments, except for treatment (8) which represents (85% sunflower oil + 15% flax oil) and this may be due to the volatilization and loss of free fatty acids resulting from the decomposition and a low percentage in the heated oil After mixing, the chemical composition of the oil may change as a result of mixing, The increase in the acidity (value value) means the high level of free fatty acids that translate into low oil quality (Katkade), 2018), and the two treatments (1) that represent sunflower oil and (3) that represent flax oil that significantly outperform the rest of the treatments, were 1.6 mg. Potassium hydroxide / gm. As for the lowest value of treatment (8), which represents (85% sunflower oil + 15 flax oil), which is 0.156 mg potassium hydroxide / gm, the higher Acid Value effected by heat treatment which occurs rise in level of free fatty acids as a result of disintegration and decomposition. (Rajko et al., 2010; Fazal et al., 2015).

Table (2) Effect of mixing and heat treatment mixing ratio at (room temp. and 150º C /1 hour) on Acid Value of vegetable oils under study

		Temperature	
		RT	150
Treatments	1	0.57	1.6
	2	0.262	0.38
	3	1.186	1.6
	4	1.56	0.8
	5	0.524	1.42
	6	0.478	1.24
	7	0.431	1.05
	8	0.4	0.156
	9	0.8	1.41
	10	1.02	1.107
	11	0.4	0.842
	12	0.4	1.57
	13	0.8	1.36

$L.S.D_{Interactions}$ = 0.0194 $L.S.D_{Temp}$= 0.2275 $L.S.D_{Treat}$ = 0.6299

Where

1 = 100% sunflower oil, 2 = 100% rice bran oil, 3 = 100% flax oil, 4 = 100% sesame oil, 5 = 85% sun flower oil + 15% rice bran oil, 6 = 70% flower oil Sun + 30% rice bran oil, 7 = 55% sunflower oil + 45% rice bran oil, 8 = 85% sunflower oil + 15% flax oil, 9 = 70% sunflower oil + 30% flax oil, 10 = 55% sunflower oil + 45% flax oil, 11 = 85% sunflower oil + 15% sesame oil, 12 = 70% sunflower oil + 30% sesame oil, 13 = 55% sunflower oil + 45% sesame oil.

2- Free Fatty Acids :

Table 3 show significant differences in free fatty acid values among all samples, and the percentage of free fatty acids is directly correlated with the value of the acidity number, as the acidity number increases with the increase in the percentage of free fatty acids in the oil (Eze, 2012).

Table (3) shows the effect of mixing ratios of sunflower oil with selected oils under study. It is observed that when mixing with Rice bran in different proportions (treatments , 6, 7) there is an effect on the value of free fatty acids of the mixed oils, as it reduces rice bran oil From the percentage of free fatty acids to the oil, noting an increase in the percentage of added rice bran oil, this may be due to the content of rice bran oil from natural antioxidants and its ability to keep the oil from decomposing (Most et al., 2005). As for mixing sunflower oil with flax oil (Treatments 8, 9, 10), an increased oil content resulting from free fatty acids is observed due to the high content of the studied flax oil sample from free fatty acids. Likewise when mixing sunflower oil with sesame oil (coefficients 11, 12, 13), noting that the high content of mixtures of free fatty acids is noticed, and the increase increases exponentially with an increase in the percentage of added sesame oil.

It is also noticed that Treatment (4) represented 100% sesame oil significantly outperformed the rest of the values as it reached 0.784% and this value may be an indication of the strong enzymatic degradation of sesame seeds during harvesting, circulation or oil processing (Gharby et al., 2017). It was in the treatment (2) represented by 100% rice bran oil, which amounted to 0.132, which is close to the range reached by Krishna and et.al (2005) which ranged from 0.10-0.05%, that the percentage of the value of free fatty acids increases with the increase of the heat treatment as it is noticed a high Values of free fatty acids for almost all treatments, and we note the superiority of the coefficients (1), which represent The sun flower is 100% and (3) that represents 100% flax oil, which has a value of 0.804%. As for the lowest value in the heat treatment treatments, treatment (8) represented by the mixture (sunflower oil 85% + flax oil 15%) Which amounted to 0.078%, the presence of low levels of free fatty acids in oils indicates the presence of low levels of water activity, hydrolysis and oil degradation (Oderinde et al., 2009), and the effect on the value of free fatty acids may be due to the oil content It is a natural antioxidant and its ability to keep oil from decomposing with enzymes (Most and et.al, 2005). Suitableby subjecting the oil refining and this may also lead to improved quality for industrial purposes (Oderinde and et.al, 2009).

Table (3) Effect of mixing and heat treatment mixing ratio (room temp. and 150º C /1 hour) on free fatty acids of vegetable oils under study.

Treatments	Temperature		
		RT	150
	1	0.286	0.804
	2	0.132	0.191
	3	0.596	0.804
	4	0.784	0.4
	5	0.264	0.714
	6	0.24	0.623
	7	0.217	0.528
	8	0.2	0.078
	9	0.4	0.709
	10	0.513	0.557
	11	0.2	0.423
	12	0.2	0.789
	13	0.4	0.684

$L.S.D_{interaction} = 0.004$ $L.S.D_{Temp} = 0.116$ $L.S.D_{Treatments} = 0.277$

Where

1 = 100% sunflower oil, 2 = 100% rice bran oil, 3 = 100% flax oil, 4 = 100% sesame oil, 5 = 85% sun flower oil + 15% rice bran oil, 6 = 70% flower oil Sun + 30% rice bran oil, 7 = 55% sunflower oil + 45% rice bran oil, 8 = 85% sunflower oil + 15% flax oil, 9 = 70% sunflower oil + 30% flax oil, 10 = 55% sunflower oil + 45% flax oil, 11 = 85% sunflower oil + 15% sesame oil, 12 = 70% sunflower oil + 30% sesame oil, 13 = 55% sunflower oil + 45% sesame oil.

3- Iodine number:

Table 4 show significant differences in Iodine number among all samples, and this is normal because they are different in their origins and sources, and it is showed that value of the iodine number of oils was close to sources mentioned, as it appears that value of iodine number of flax oil is significant compare with rest of the oils and its value has reached 190, which is close to what Blin and et.al (2013) mentioned, which amounts to 180, and the lowest value was for rice bran oil, which amounted to 113, and this value is close to what Barnwal and Sharma (2005) mentioned, which ranges between 90-108.

As for mixtures of vegetable oils, it is showed in Table (4) that there are significant differences between the studied parameters and clear changes in the iodine number with the difference in the added oil and the added percentage of it, as the changes were inconsistent or gradual, and this may be due to the mixing taking place at a temperature There is a possibility of obtaining an internal esterification and redistribution of fatty acids in the triple clusters that make up the oil, and the highest value was for the iodine number in the sample (6) represented by the mixture as it reached 143, while The sample (8) representing a mixture gave lower Iodine number reached 64.

The thermal treatment did not record a significant effect on the iodine number of the study samples. It was noticed that the value of the iodine number of the treatment (3), which amounted to 185, and the treatment (11) recorded the lowest value of the iodine number among the studied values, was followed by the rice bran oil with a value of 152 and then the rice bran 113. Sesame with an iodine number of 110. The high iodine number may be explained by the heating to the chemical nature of the oil, the extent of the effect of the mixing process in its composition, the extent of the change in it and the nature of the new oil resulting from the mixing. The value of the iodine number is an indication or measure of the total number of double bonds in oils and fats (Gharby and et.al, 2015), the oil with a high iodine number is explained as having double bonds compared to the low-value oil, and it is usually more effective with stability (Zine et al., 2013), as well as the geographical factor that may affect the iodine value of Sabah elkhier and et.al(2008);Ogbonna and Ukaan (2013).

Table (4) Effect of mixing and heat treatment mixing ratio and (room temp. and 150º C /1 hour) on value of iodine number of vegetable oils under study.

	Temperature		
	RT		150
Treatments	1	152	100
	2	113	111
	3	190	185
	4	110	105
	5	94	91
	6	143	98
	7	84	121
	8	64	72
	9	77	189
	10	70	156
	11	86	65
	12	116	110
	13	109	86

L.S.D $_{Interactions}$ = 2.987 L.S.D$_{Temp}$ = ns L.S.D$_{Treatments}$ = 37.368

Where

1 = 100% sunflower oil, 2 = 100% rice bran oil, 3 = 100% flax oil, 4 = 100% sesame oil, 5 = 85% sun flower oil + 15% rice bran oil, 6 = 70% flower oil Sun + 30% rice bran oil, 7 = 55% sunflower oil + 45% rice bran oil, 8 = 85% sunflower oil + 15% flax oil, 9 = 70% sunflower oil + 30% flax oil, 10 = 55% sunflower oil + 45% flax oil, 11 = 85% sunflower oil + 15% sesame oil, 12 = 70% sunflower oil + 30% sesame oil, 13 = 55% sunflower oil + 45% sesame oil.

4- Peroxide Value:

Table (5) shows significant differences in the peroxide number values of the studied oils and their mixtures. From a comparison of the values of this characteristic of unmixed oils, it is noted that the value of the peroxide number of sunflower oil was 1.05 and it does not agree with what was mentioned by Crapiste et al. (1999) which amounted to 2.45 - 3.92, while the value of the peroxide number of the rice bran is1.21 with what found by Hasan and et.al (2016), which amounted to 1.43, and its value in flax oil, which amounted to 1 with Viorica et al. (2012), was 0.95, and its value in sesame oil, which amounted to 0.94, differed from what Katkade et al. (2018) reached 1.40.

Mixing process led to a slight increase in the peroxide number values for all treatments except for the treatment (6) represented (70% sunflower oil + 30% rice bran oil), which slightly decreased from the rest of the treatments, and the treatment (9) represented (70% sunflower oil + 30% flax oil) from the rest of the treatments and the value of the peroxide number in it was 1.44, while the lowest value was for the number of peroxide for the treatment (6) which represents (70% sunflower oil + 30% rice bran oil) and reached 0.93.

Heating process also led to a increase in the values of the peroxide number, as treatment (3) that represents flax oil exceeded 1.8 and the lowest value was in the treatments (5, 10) which represented (85% sunflower oil + 15% rice bran oil) And (55% sunflower oil + 45% flax oil) respectively and reached 0.99. Variation in the peroxide number values for oils may be due to cultivaries and extraction methods Mishra et al. (2012). And that the low values of the peroxide number are indications of the fact that the oils may not be easily subject to oxidation (Izugie et al., 2008). The value of the peroxide number can rise above a high degree of unsaturation and increase with storage time, temperature, light, and air oxygen contact (Muhammed and Ali, 2015).

Table (5) Effect of mixing and heat treatment mixing ratio and (room temp. and 150º C /1 hour) on the peroxide number values of vegetable oils under study.

Treatments		Temperature	
		RT	150
	1	1.05	1.44
	2	1.21	1.22
	3	1	1.8
	4	0.94	1.01
	5	1.12	0.99
	6	0.93	1.26
	7	1.02	1.01
	8	1.11	1.11
	9	1.44	1.61
	10	1.12	0.99
	11	1.05	1.03
	12	1	1.08
	13	1.21	1.16

$L.S.D_{Interactions}$ = 0.0309 $L.S.D_{Temp}$ = 0.1126 $L.S.D_{Treatments}$ = 0.2247

Where

1 = 100% sunflower oil, 2 = 100% rice bran oil, 3 = 100% flax oil, 4 = 100% sesame oil, 5 = 85% sun flower oil + 15% rice bran oil, 6 = 70% flower oil Sun + 30% rice bran oil, 7 = 55% sunflower oil + 45% rice bran oil, 8 = 85% sunflower oil + 15% flax oil, 9 = 70% sunflower oil + 30% flax oil, 10 = 55% sunflower oil + 45% flax oil, 11 = 85% sunflower oil + 15% sesame oil, 12 = 70% sunflower oil + 30% sesame oil, 13 = 55% sunflower oil + 45% sesame oil.

5- Saponification Number:

Table (6) shows the presence of highly significant differences between all studied treatments for the values of saponification number, and notes the superiority of treatment (3) represented by flax oil significantly from the rest of the treatments. The value of saponification number is 194 as it approaches with what was reached by Viorica and et.al (2012), followed by treatment (4) Which represents sesame oil of 190 which is close to what was mentioned by Katkade et al. (2018) and Karmakar et al. (2010) as they reached 191.30 and 196.50 respectively, while sunflower oil has a saponification value of 187 and thus It is close to what the Asian Manual for Food Analysis (2011) defines as 188-194. While the lowest value in rice bran oil was 179, which corresponds to what Ramachandran (2001) mentioned, which amounts to 180 - 195.

Mixing process also led to a significant effect on the value of saponification number and for all treatments, The values were clearly graded, and the treatment (6) represented (70% sunflower oil + 30% rice bran oil) was significantly superior to the rest of the values and the saponification number value reached 122, while the lowest in treatment (5) represented (85% sunflower oil + 15% rice bran oil) was significantly and it reached 101. The thermal treatment also affected the experience factors clearly, as the use of the thermal treatment led to an increase in the values of saponification number and the highest value for the saponification number in the treatment (6), which amounted to 232, while the lowest values for this attribute of the treatments (8 and 12), which amounted to 115 for each of the two values. The high saponification number values indicate that it needs more alkaloids to be able to neutralize the available free fatty acids pumped into the oil. Notable differences may be the result of differences in the extraction method, and therefore oils that have a saponification number may be used in the range of 195 and 261, for example. In the manufacture of soap, shampoo and shaving creams (foam) (Oderinde et al., 2009).

Table (6) Effect of mixing and heat treatment mixing ratio and (room temp. and 150º C /1 hour) on the saponification number values of vegetable oils under study.

		Temperature	
		RT	**150**
Treatments	1	187	193
	2	179	195
	3	194	200
	4	190	201
	5	101	116
	6	122	232
	7	107	166
	8	108	115
	9	114	183
	10	107	164
	11	114	194
	12	102	115
	13	108	122

$L.S.D_{\text{Interactions}} = 2.553$ $L.S.D_{\text{Temp}} = 21.137$ $L.S.D_{\text{Treatments}} = 39.955$

Where

1 = 100% sunflower oil, 2 = 100% rice bran oil, 3 = 100% flax oil, 4 = 100% sesame oil, 5 = 85% sun flower oil + 15% rice bran oil, 6 = 70% flower oil Sun + 30% rice bran oil, 7 = 55% sunflower oil + 45% rice bran oil, 8 = 85% sunflower oil + 15% flax oil, 9 = 70% sunflower oil + 30% flax oil, 10 = 55% sunflower oil + 45% flax oil, 11 = 85% sunflower oil + 15% sesame oil, 12 = 70% sunflower oil + 30% sesame oil, 13 = 55% sunflower oil + 45% sesame oil.

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تأثير نسبة الخلط والمعاملة الحرارية لأنواع من الزيوت النباتية على بعض خصائصها الكيميائية

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المستخلص

اجريت التجربة في مختبرات قسم علوم الاغذية – كلية الزراعة – جامعة تكريت وهدفت الدراسة الى دراسة تأثير نسبة الخلط للزيوت النباتية والمعاملة الحرارية على بعض الصفات الكيميائية للزيوت النباتية وقد تم تحديد ثلاث نسب للخلط، استخدمت زيوت زهرة الشمس وسحالة الرز والكتان والسمسم، وتمت عملية الخلط بأن يكون زيت زهرة الشمس هو الزيت الرئيسي وتضاف اليه باقي الزيوت كل على حدة وبنسب 15 % , 30 % , 45 %. تم استخدام عامل الحرارة كعامل ثاني للتجربة وتم قراءة قيم الصفات الكيميائية للزيوت على درجة حرارة الغرفة (RT) وعلى درجة حرارة 150 م° ، لوحظ تأثير هذه العوامل على قيم رقم الحموضة والاحماض الدهنية الحرة و الرقم اليودي ورقم البيروكسيد ورقم التصبن للزيوت المدروسة ومخاليطها، وقد بلغت اعلى قيمة رقم الحموضة لزيت السمسم وبلغت 1.56 ملغم KOH / غم اما ادنى قيمة فقد بلغت 0.262 ملغم KOH / غم في عينة سحالة الرز، اما الاحماض الدهنية الحرة فقد بلغت اعلى قيمة لها في عينة زيت السمسم وبلغت 0.784 % وادناها كانت في عينة سحالة الرز وبلغت 0.132 % , ومعاملة الرقم اليودي فقد بلغت اعلى قيمة في عينة زيت الكتان والبالغة قيمتها 190 وادناها في عينة 15% زيت كتان + 85 % زيت زهرة الشمس وبلغت 64 ، وسجلت صفة رقم البيروكسيد ايضاً فروقات عالية المعنوية بين القيم وسجلت اعلى قيمة لها في المعاملة 30% زيت كتان + 70% زيت زهرة شمس وبلغت 1.44 O_2/Kg وادناها سجلت للمعاملة 30% سحالة الرز + 70 % زيت زهرة الشمس وبلغت 0.93 O_2/Kg ، كما نلاحظ ان قيمة رقم التصبن سجلت اعلى قيمة لها في معاملة زيت الكتان وبلغت 194 mg KoH/g اما اقل قيمة فقد سجلت في معاملة 15% زيت سحالة الرز + 85 % زيت زهرة الشمس وبلغت 101 mg KoH/g ، وادت عمليات التسخين الى حدوث تغيرات معنوية في القيم .

الكلمات المفتاحية: زيوت نباتية، مخاليط زيوت، معاملة الزيوت حراريا، رقم اليودي، رقم التصبن، رقم البيروكسيد، رقم الحموضة، الاحماض الدهنية الحرة.