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The Fortification of Sunflower oil with Oryzanol and its effect on Chemical Characteristics

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ABSTRACT

Sunflower oil was fortified with the anti-oxidant oryzanol .The supported samples were placed inside a socket at 120 ° C and the results showed a decrease in iodine number (131, 130, 129, 127) and an increase in the acidity number (0.22, 0.24, 0.27, 0.30), and the peroxide number showed an increase (2.37, 2.42. , 2.46, 2.51), and the results also showed an increase in the percentage of free fatty acids (0.08, 0.08, 0.09, 0.10)% as well as an increase in saponification number (190, 192, 197, 200).

1. Introduction

Terms such as "fortifying" and "fortified" foods are currently used to describe the process of adding nutrients to foods [1] and this process is defined as follows: the term fortifying or fortifying foods means adding one or more essential nutrients to Foods, whether or not naturally present in this type of food, in order to prevent or correct a deficiency in one or more nutrients in the population in general or certain groups of the population. The important thing to note in this global definition is that the goal of fortifying foods is to prevent or correct a proven deficiency - which gives "fortification" its critical role in public health conservation [2]

Food fortification spread during the First and Second World Wars to help prevent undernourishment in the population, and to replace nutrients lost during the food processing process 2. Several countries in Europe (including Ireland, the United Kingdom, Spain, and Denmark) and the United States have imposed food fortification to increase the intakes of Vitamin A and D and the B group of vitamins, and these practices are still ongoing today [3]

Gamma-oryzanol is an important bioactive compound of rice that comes forward with its cholesterol lowering effect [4]. It was reported that c-oryzanol has four times higher antioxidant activity than that of vitamin E, in vitro [5]. Also, it has been used to treat hyperlipidemia, disorders of menopause and to increase the muscle mass [4]. Rice bran is the main source of oryzanol and the content of oryzanol in other by-products of paddy or rice milling fractions was not researched in detail. Although there are studies reported the phenolic and antioxidant content of different rice varieties and rice milling fractions, investigations on the free and bound extracts and the contribution of them to total phenol content and antioxidant activity are still lacking

2. Materials and Methods

The sunflower oil was fortified with extracted oryzanol according to the method mentioned by [6] as 10 mg of each of the antioxidant was placed in a 150 ml glass baker, then 100 ml of sunflower oil was added to it and mixed Well using the magnetic mixer at a temperature of 65 ° C until mixing occurs, then take 15 ml of each oil mixed with antioxidants in Petri dishes and placed in an incubator at a temperature of 120 ° C for different periods included (0, 6, 12, 24) hours to follow the effect Supports some properties.

2-1: Iodin Number: The iodine number was estimated according to the method mentioned in the [7] at a weight of 0.5 g of oil free and supported with antioxidants under study and dissolved in 10 ml of chloroform and add 30 ml of iodine then closed the beaker and shaken well in the dark for 30 minutes, Then add 10 ml of a 15% solution of potassium iodide and mix the contents well, then add 100 ml of distilled water and titrate with 0.1 standard solution of sodium sulfate in the presence of a starch guide with a concentration of 2%. Repeat the same steps

without adding oil to estimate the plank, according to the iodine number. According to the following formula:

Ml of sodium sulfate for sample - ml for sodium sulfate for plank) x standard x 127 x 100

Weight of the sample used is in grams + 1000

2-2:Acid Value : The acidity number was estimated according to the method mentioned in the [6] for the specified samples, by adding 50 ml of ethanol with a concentration of 95% to 5 g of oil, then the contents were heated to dissolve the fat and then titrated with 0.1 N of sodium hydroxide solution in the presence of a phenonphthalene index and estimated number Acidity according to the following equation:

(Sodium Hydroxide for Sample - Sodium Hydroxide for Blanc) x Standard x 40

Weight of the sample used is in grams

2-3: Peroxide Value: The peroxide number was estimated according to the method mentioned in the [7] by dissolving 5 g of oil free and fortified with antioxidants under study in a dissolving mixture (snowy acetic acid: chloroform (60:40 volume: volume)) and adding 0.5 ml of solution The saturated potassium iodide then closed the beaker and stirred in a circular motion for 15 minutes, after which 100 ml of distilled water is added to wash any free iodine on the walls of the beaker, and then titrate the iodine with a 0.1 N solution of sodium thiosulfate with a strong starch and shaking guide, Repeat the same steps without adding the oil to the plank estimates and then according to the size of thiosulfate needed for calibration And estimate the peroxide number according to the following equation.

(Ml sodium thiosulfate for sample - ml sodium thiosulfate for plank) x standard x 1000

Weight of the sample used is in grams

2-4: Saponification Value: The saponification number was estimated according to the method mentioned in the [7] by adding 5 mL of a 0.5 standard solution of alcoholic potassium hydroxide to 5 g of oil samples specified in a beaker fixed to its nozzle as a reflective condenser, then heating in a water bath at a degree Heat 60 ° C for 15 minutes. Then raise the condenser and direct cooling of the beaker, then the titration is carried out using a 0.5 standard solution of hydrochloric acid and in the presence of phenonvthalene evidence, the process is repeated without the presence of oil to calculate the control (plank) and calculate the saponification number according to the following equation:

(HCL consuming the blank - HCL consuming the sample) x Standard x 1.56

Weight of the sample

2-5: Free Fatty Acids: Free fatty acids were estimated according to the standard method mentioned in [7] by taking 5 g of oil free and fortified with specific antioxidants under study and adding 100 ml of the mixture of ethanol and diethyl ether in a ratio of 1: 1 (volume: volume) With the evidence of phenphthalene and correction with 0.1 standard solution of sodium hydroxide until the solution turned pink and the free fatty acids were calculated according to the following formula:

$$\frac{\text{Amount of consumed base (ml) x 2.28}}{\text{Weight of the sample}} \text{ X 100}$$

3. Result and Discussion

The study shows a decrease in the iodine number of the Fortified sunflower oil is observed, with an increase in the duration of the heat treatment at 120 ° C. It is noted that the iodine number of sunflower oil supported by the anti-oxidant oryzanol without heat treatment reached 131 and reached 130, 129 and 130 after being heat treated for a period of (6,12,24) hours respectively.

Table 1: Extraction best Condition

Tim.	I.	pH	Perox.	F.F	S.
Control	127	0.22	2.37	0.08	190
6	129	0.24	2.24	0.08	192
12	130	0.27	2.46	0.09	197
24	131	0.30	2.51	010	200

The number of sunflower oil fortified with the antioxidant oryzanol reached is consistent with what [8] indicated, as they indicated that the iodine number of sunflower oil fortified with the antioxidant is 130 and is close to [9] indicated when they indicated that The iodine number of sunflower oil ranges between 135-137 while it was higher than stated by [10] which indicated that the iodine number of sunflower oil ranges between 127

Oils are classified according to the iodine number, to dehydrated, semi-dry and non-dry oils. From the observation of the iodine number of these oils, they are all classified as semi-dry oils, in which the iodine number ranges between and the higher the iodine number, it may give an indication of a high percentage of multiple acids. The decrease in the iodine number due to thermal treatment may be attributed to the possibility of exposure to oxidation reactions, as high temperature or increased duration

leads to oxidation of the double bonds of unsaturated fatty acids and this is what [11] also indicated.

The effect of different periods of thermal treatment at 120 ° C included periods (6-12-24) hours in the value of the acidity number of the sunflower oil fortified by the antioxidant oryzanol and the fortified sunflower oil and as noted that the acidity number of the oil The sunflower fortified with the antioxidant oryzanol was 0.22 compared to unfortified sunflower oil 0.21, and when following the effect of thermal treatment on the three oils under study, a very slight increase in The acidity number of the uniform The sun flower, supported by the anti-oxidant, oryzanol, reached as a result of heat treatment (0.24,0.27,0.30) for periods of (6,12,24) hours, respectively.

The acidity number of oryzanol-fortified sunflower oil reached in this study is close to [10] who indicated a value of 0.25 for sunflower oil fortified with antioxidants while it does not agree with what [9] stated. Show that the acidity number of sunflower oil ranges between 0.35-0.40, and the difference in the acidity number from previous studies may be due to the method used to inhibit the lipases, since not completely eliminating their effectiveness can lead to the degradation of the oil into free fatty acids and glycerol, which works to raise Acidity number and the difference in humidity levels for pain samples Rousse which can stimulate action in the analysis of oil lipases the presence of heat in addition to conducting the accuracy of the process of the equation for oil during the process of purification can affect the value of pH [11].

Results shows an increase in the peroxide number of both sunflower oil fortified by the antioxidant oryzanol and sunflower oil not fortified with an increase in the duration of the heat treatment, as it was found that the peroxide number of sunflower oil supported with the antioxidant is oryzanol The coefficient amounted to 2.37, then a gradual and progressive rise occurred with the temperature rising to (2.42,2.46,2.51) at thermal treatment for (6,12,24) hours, respectively.

The number of peroxide reached in this study is close to that of [8] who stated that the number of peroxide for sunflower oil ranges between 2.30-2.35 while it was lower than indicated by [10] when they indicated the number of peroxide reached 2.40 when extracting the oil using enzymes and ultrasound.

The difference in the results compared to what was mentioned in previous studies may be due to the possibility of a decrease in the percentage of natural antioxidants contained in the oil as a result of the extraction process and the technology used when manufacturing exclusively and the decrease that may occur during these oil storage operations and this is what [12] indicated.

The percentage of free fatty acids rises with the increase in the duration of the thermal treatment, as it is observed that the percentage of free fatty acids in sunflower oil supported by the anti-oxidant oryzanol has increased from 0.08% for untreated oil to 0.083, 0.09, and 0.10% after heat treatment for a period of (6, 12, 24) hours in a row.

The percentage of free fatty acids in sunflower oil supported by the anti-oxidant oryzanol reached in this study is within the rate attained by [10] as it indicated a percentage ranging between 0.05-0.1%. .

The difference in the percentages of free fatty acids for each of the sunflower oil supported by the anti-oxidant oryzanol and the comparison oil used may be due to the difference in the effectiveness of the lipase enzymes in the oil, as the low efficiency of the antioxidants present in the oil affects the process of inhibiting the enzymes and remaining part of their effectiveness and lead to degradation Oil to free fatty acids and glycerol, thereby increasing its percentage. Just as the thermal treatment and its duration can affect the effectiveness of these enzymes [10] the reason may also be due to the oil content of natural antioxidants and their ability to keep the oil from hydrolysis by enzymes [9].

About the Saponification number , the untreated oil reached 190 and the. Then the saponification number has increased with the increase in the duration of the thermal treatment, as the saponification number of the sunflower oil fortified with the antioxidant oryzanol increased after 6 hours of treatment To 192 and after heat treatment for 12 hours, increased to 197, then to 200 after treatment for 24 hours.

The saponification number reached in this study falls within the rate mentioned by [7] as they indicated a number between 185-190 and it is close to the result reached by [11] who indicated that the saponification number for sunflower oil It is 185 while it was less than the range mentioned by [8] as it indicated the saponification number of the sunflower oil fortified ranged between 195-200.

The saponification number is defined as the number of milligrams of potassium hydroxide needed for saponification of one gram of oil. The saponification number depends on the molecular mass of the fatty acids as it expresses the average molecular weight of the fatty acids present in the oil. Thus, there is an inverse relationship between the value of saponification number and the molecular weight of the fatty acids that make up an oil. If the fatty acids are low molecular weight, then the number of molecules in one gram of the oil will be greater and the soaping number will be higher, and the opposite is true as indicated by [12].

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تدعيم زيت زهرة الشمس بمضاد الاوريزانول و دراسة تأثيره على الخصائص الكيميائية للزيت

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كلية الزراعة ، جامعة تكريت ، تكريت ، العراق

الملخص

تم تدعيم زيت عباد الشمس بمضاد الأكسدة الاوريزانول، وتم وضع العينات المدعمة داخل حاضنة عند 120 درجة مئوية و تم اخذ قياسيات عند المدد (0, 6, 12, 24) ساعة وأظهرت النتائج انخفاضًا في الرقم اليودي (131، 130، 129، 127) وزيادة في رقم الحموضة (0.22، 0.24، 0.27، 0.30)، وأظهر رقم البيروكسيد زيادة (2.37، 2.42، 2.46، 2.51)، وأظهرت النتائج أيضًا زيادة في نسبة الأحماض الدهنية الحرة (0.08، 0.08، 0.09 ، 0.10)٪ وكذلك زيادة في رقم التصبن (190، 192، 197، 200).