STUDY OF SOME PHYSICAL, CHEMICAL AND NUTRITIONAL PROPERTIES OF SUNFL OWER OILS DURING FRYING OF FINGER CHIPS IN LOCALLY RESTAURANTS.

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ABSTRACT

The objective of this study was to investigate quality and safety of deep-fried oils collected from two types of locally restaurants; fast food and family style at four times. The results included physiochemical properties of sunflower oil used for deep-frying and their biological consequences. The results showed that the highest viscosity, refractive index (RI), and peroxide value (PV) were 63 cP, 1.4892, and 11.3 mEq/kg respectively, while the lowest smoking point 220 ^{o}C was observed in the fried-oil family restaurant. Furthermore, the highest acid value (AV) 0.96g/100g was found in fried-oil for fast food restaurant. The level of linoleic fatty acids was 56.14 mg/100 mg oil in the un-heated sunflower oil decrease to 53.33 and 52.55 mg/100 mg in the fast food oil and to family restaurant oil respectively. Blood serum of rats fed with diet containing oxidized oil, from family and fast food restaurants compared with un-heated oil-fed group. The biochemical parameters analyzed indicated higher levels ($P \leq 0.05$) of plasma Total cholesterol(TC) 96.16 mg/dl were observed in fast food fried-oil fed group of rats compared to corresponding family restaurant oil groups 89.72 mg/100ml. Significantly low levels ($P \leq 0.05$) of Triglyceride(TG) 59.72 mg/100ml, High Density Lipoprotein Cholesterol (HDL-c) 17.92 mg/100ml and raised Low Density Lipoprotein Cholesterol (LDL-c) 61.47 mg/100ml were noted in family restaurant fried-oil groups. Serum Malondialdehyde(MDA) level was 4.33 nmol/ml in the family restaurant group compared to the 3.77nmol/ml in the fast food oil group, Although increment of liver enzymes; alkaline phosphatase (ALP), Alanine transaminase (ALT), Aspartate transaminase(AST) when compared with rats fed unheated oils.

Keywords: Deep frying, Finger Chips, Sunflower oil, Nutritional

دراسة بعض الصفات الفيزيائية والكيميائية والتغذوية لزيت زهرة الشمس خلال قلي أصابع البطاطا في المطاعم المحلية

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المستخلص

الهدف من هذه الدراسة هو فحص جودة وسلامة زيوت القلي العميق التي تم جمعها من نوعين من المطاعم المحلية؛ الوجبات السريعة والعائلية، من خلال دراسة الاختبارات الفيزوكيميائية لزيت زهرة الشمس في القلي وكذلك تاثيراها البيولوجي. أظهرت النتائج أن أعلى قيمة لزوجة، معامل انكسار، ورقم بيروكسيد كانت **cP** 63 ، 1.4892، 11.3 ميلمكافئ/ كغم على التوالي، مع أدنى نقطة تدخين 220م لوحظت في عينات المطعم العائلي و أعلى قيمة حامضية 0.96 غم/ 100 غم في مطاعم الوجبات السريعة. انخفاض مستوى الحامض الدهني اللينوليك من 56.14 ملغم/ 100 ملغم زيت في زيت زهرة الشمس غير المستخدم إلى 53.33 و 52.55 ملغم/ 100 ملغم زيت في زيت المستخدم لعملية القلي في مطعم الوجبات السريعة ومطعم العائلي على التوالي. مقارنة مصل دم مجموعتين من الجرذان تم تغذيتهما بنظام غذائي يحتوي على زيت مؤكسد، من المطعم العائلي و الوجبات السريعة بمجموعة اخرى تم تغذيتها بنظام غذائي يحتوي على الزيت الطازج. أشارت الاختبارات البيوكيميائية ارتفاع معنوي (**P** ≤ 0.05) في مستوى الكوليسترول الكلي في البلازما في مجموعة الجرذان التي تتغذى بالزيت للوجبات السريعة 96.16 ملغم / 100 مل مقارنة بمجموعات زيت المطاعم العائلية 89.72 ملغم / 100 مل. انخفاض معنوي (**P** ≤ 0.05) في الدهون الثلاثية 59.72 ملغم / 100 مل ، **HDL-c** 17.92ملغم/ 100 مل وارتفاع **LDL-c** 61.47 ملغم/ 100 مل في مجموعة زيت المطاعم العائلية. مستوى مالونالديهايد ارتفعت في مصل الدم للحيوانات التي غذيت على الزيوت التي تم تسخينها، 4.33 نانومول/مل في مجموعة المطعم العائلية مقارنة مع 3.77 نانومول/مل في مجموعة التي غذيت على زيت الوجبات السريعة ، و

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كانت هنالك زيادة معنوية (**P** ≤0.05) في إنزيمات الكبد ، القلوية الفوسفاتيز (**ALP**)، ناقلة أمين الألانين (**ALT**)، ناقلة أمين الأسبارتات (**AST**) عند مقارنتها بمجموعة التغذية بالزيت غير المستخدم .

INTRODUCTION

Deep-frying is an extensively utilized cooking method in food production either at home or in restaurants and food production due to its low price and high request, since it yields appropriate food of high suitability. Its popularity is associated to the simple and food preparation speed and sensory properties, for instance special taste and flavor (34). The procedure is based on the dipping food in oils or fats at elevated temperatures, relying upon the fresh materials, in that way leading to alterations of physical and chemical (35). Alterations in food and oil rely on the food properties, kind of the oil and state method, which cooks and dehydrates the food, throughout frying procedure the chemical reactions that happen in oil are not only include thermal and auto-oxidations, they are more complicated (12). The oil is in connect with the air and food at elevated temperature and this provide an increase to the oxidative occurrence, hydrolytic and thermal changes in the oil throughout deep frying process. These coincident complex reactions reason the creation of some complexes which alteration the oil quality (46). Additionally, potentially poisonous compounds advanced in the oxidized oil (17). Therefore, the oil frying quality is a major significance because of those compounds absorption into the food throughout frying, thus influencing the final products quality (36). Totally these lead fried food relies on the frying oil quality since the majority of the compounds, harmful to health, produced in the oil throughout frying process has been presented to be absorbed via the food (49). The by-product's production for example polar compounds, dimeric and polymeric (26), substances which can be detrimental to health (20). The major constituents of a diet are oils whose suitable usage can be useful in stopping specific diseases. Several compounds formed during the deterioration procedures activated via frying are probable human carcinogens. Instances of such complexes involve polycyclic aromatic hydrocarbons, acrylamide, and alkyl furans (48).

Various toxic compounds generated in the heated oil that may cause the deleterious influences noticed when ingested via rats throughout deep fat frying like acrylamide, Polymers, Cyclic fatty acid monomers are potentially toxic. (40, 21 and 12). Even though prior investigations have concentrated on serum biochemical indicators, however less attention has been paid to the influences of fats utilized for frying foodstuffs under restaurant conditions on the some metabolic enzymes' activity in rat liver. The relationship between diet and plasma lipid concentration and atherosclerosis have been well documented and studied (43). Atherosclerotic lesions in men and in animals show to be associated to raised plasma TG, LDL-c, HDL-c and excess fat eating (29).

One of the most common has popular is frying finger potato chips, which frying food potato chips alterations the potato color into golden-yellow and improve flavor and aroma as well as crisply texture is frying finger potato chips. The common oils utilized in Kurdistan region- Iraq are sunflower and corn. Though most vegetable oils are high in unsaturated fatty acid, they are prone to thermo oxidative alteration and much quicker than in oils including high quantity of monounsaturated and saturated fatty acids (13). Extended and repeated heating causes many physical and chemical alterations in oil that consequences in serious biological injures on consumption, may have detrimental impact on blood pressure, serum glucose and lipids, inflammatory and oxidative stress markers, and liver histology (22).

The objective of this study was to evaluate the influence of deep-fat frying conditions on the physiochemical properties of oil during finger chips fries preparation from

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family and fast food restaurants in Erbil city, and investigating the effects of frying oils used in these restaurants on oxidative stress markers in rats.

MATERIAIS AND METHODS

A total 45 of oil samples were collected and analyzed daily, from the Control(un-heated sunflower), fast food and family style restaurants in Erbil city-Iraq. Both restaurants used the same brand of sunflower oils and fryer type (design). As well as, same working hours, 16 pm to 23pm, with 2 hours in between sampling and heating 185±5°C. Five replicates were taken in five days (Sunday to Thursday). The samples were then placed in sanitized and unbreakable glass containers. Sampling containers did not change chemically or affected by oil samples. The samples were then transferred to the approved laboratory of the province's health center as quickly as possible and under the temperatures of 5°C–15°C for further analysis.

Physicochemical analysis of oil:

Brookfield viscometer (Brook Field, DV-E Viscometer) was used to measure the viscosity of oil samples at 25 °C according to the method described by (41). Refractive index was determined using a digital refractor meter (RFM330) at 25 °C according to AOAC official method No.921.58 (4). Smoke point was identified according to AOCS official method No. Ca ga-48 (5). The acid value and the percentage of fatty acid was expressed as following, acid value (mg KOH/g oil) = FFA*1.99 (4). Peroxide value (PV) was also measured according to AOAC method No. 965.33 (4). The fatty acid composition was assessed at the USKIM-Kahramanmras sutcu Imam University/Turkey, using gas chromatography (GC) and using the fatty acid methyl ester (FAME) following AOAC Official method NO.969.33 (4). P-Anisidine value (P-AV) of oil sample was analyzed according to the AOCS Official Method Cd 18-90 (6).

Animal experimental design

A total of eighteen male albino rats were employed in the investigation. All rats were male Albino rats, 6-8 weeks of age, weighing between 130-150 grams at the time was started. Animals were bred and housed in the animal house of Agricultural Engineering Sciences College, Salahaddin University-Erbil. The rats were divided into 3 equal groups, group I were fed fresh sunflower oil, group II received fast food fried sunflower oil, and group III was fed family style sunflower oil and garlic.

Climate regulated conditions were maintained and temperature was set as (22 ± 2 ^{o}C). Regular 12-hours daily cycles were kept utilizing an automated light-switching devise The rats distributed into three groups, first one of received standard rat chow including 0.5% NaCl, 10% dietary fat (un heated sunflower oil) and 22% protein (25and 30), and tap water ad libitum. The second group also received standard rat chow but substitute fresh sunflower oil with 10% of fried sunflower oils obtained from fast food restaurant, and third group substitute with 10% of fried sunflower oils obtained from family style restaurant. The animals were fed for Six weeks. After six weeks, blood sample was immediately obtained from every animal of the untreated (control), treated groups, in clean centrifuge tubes, and centrifuged at 3000 rpm for 20 minutes. Serum stored at -20^{o}C until utilized for biochemical tests.

Serum biochemical analyses

The biochemical parameters which included serum lipid profiles; TC, TG, LDL-c and HDL-c were determined on the sera specimen by using the Cobas diagnostic kit with fully automated chemical analyzer (Cobas C 311) (27). The level of MDA in blood serum was measured by the spectrophotometric method (47)

Biochemical analysis of liver functions

Serum Aspartate Transaminase (AST), and Alanine Transaminase (ALT) activities were determined spectrophotometrially,

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(Technicon RA-1000) automated biochemistry analyzer. Alkaline phosphatase (ALP) activity was determined according to the method described by Belfield and Goldberg (11).

Statistical analysis:

Statistical analysis was conducted using the property program SAS software (42), to analysis data by the experiment of the factorial in a completely randomized design. The means were compared using Duncan's multiple range tests at ($P \leq 0.05$).

RESUITS AND DISCUSSION

The deep-frying effect at two various restaurants on the sunflower oil physiochemical characteristics was analyzed, where it is finger potato chips frying throughout 8 hours was investigated, were results compared to those samples heating the oils from restaurants and un-heated oil (Control) every two hours. Deep-fat frying is a complex physicochemical proceedings which is concurrently influenced with several factors for example time, temperature, frying oil and fried substance character, stable or periodic heating, fryer model, filters application and supplement of oil (15 and 30).

The results that the viscosity of the oil used in the fast food restaurant increased significantly (P≤0.05) in the first two hours, then the changes in viscosity values are not significant (P≤0.05) because Replenishing the frying oils with fresh ones increased the viscosity but they were still (Figure 1), while compared to the oil in the family restaurant, where the increase was significant even to a higher value at the end or the passage of eight hours.

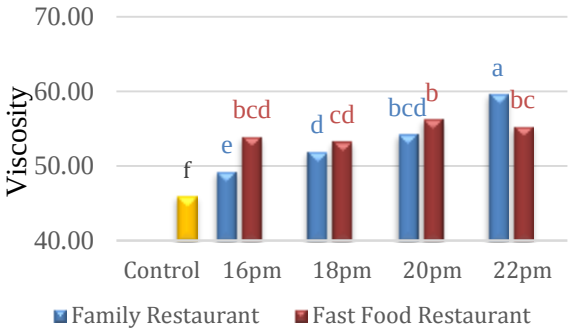

Figure 1. Change in viscosity in sunflower oil samples during four-time frying 185±5°C from Family and fast food restaurants.

* Means with the same letter for each line are not significantly different at P≤0.05.

This can be because fried potato fingers quantity in fast food restaurants more than family restaurants; subsequently the rise in absorbed oil and the adding of fresh oil to supersede the oil soak up via the potato fingers. Although, removal of the moisture inevitably leads to a substantial oil uptake which quantities to about 35% of the chip mass (1).

Data also showed that the refractive index of the oils increased with that of sunflower oil going from the initial 1.4881 to 1.4889 and 1.4891 on frying of the final potato chips from family and fast food restaurants respectively (Figure 2). There is a significant difference (P≤0.05) in the mean values of RI of sunflower oil throughout frying process; therefore, continuous rise in the Refractive index (RI) of the oil due to repeated frying batches indicates that deep-frying rises

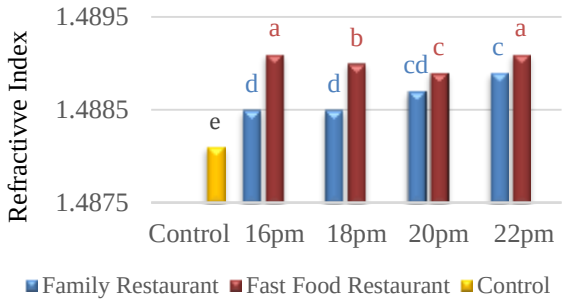

Figure 2. Change in Refractive Index in sunflower oil samples during four-time frying 185±5°C from Family and fast food restaurants.

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rancidity of the oil. Greater the refractive index higher is the chances of spoilage because of oxidation. RI is a fundamental value that associates with the molecular weight, fatty acid, chain length of fatty acids, unsaturation degree and, conjugation degree, which increase in the refractive Index of the oil due to repeated frying batches, indicates that deep frying increases rancidity of the oil. (8 and 23).
* Means with the same letter for each line are not significantly different at P≤0.05.

Photo color index (PCI) act as an indicator to measure the oil degradation by assessment of the color indicator of the oil (Fig. 3). Maximum values of PCI were noticed in sunflower oil deep-frying with values of 3.8 and 3.7 from family and fast food restaurant respectively after 8 hours of frying. This is ascribed to differential oxidation of oils throughout frying process and accumulation of non-volatile disintegrated compounds for example oxidized triacylglycerol's and FFA (38). The deep-frying investigations majority presented color darkening of oil was positively correlated with time of frying and frying temperatures, but they did not indicate how the oxidation products influence on color alterations throughout deep-frying operation (2). However, an increase from 0.3 to 3.3 at 16 pm in the color value of the oil used in the fast food restaurant was seen in the first two hours, (figure 3). It may be due to the increase in frying potato fingers quantitatively and thus the rise in deterioration as well as the absorption of oil and the amount of frying oil reduces as it is replaced by un-heated oil after this period in order to continue frying. the fresh oil replenishment process is diluting chemical compounds in the frying oil and most adsorbents have a bleaching effect, and improved the color of the oil, especially at high levels of fresh oil replenishment(28).

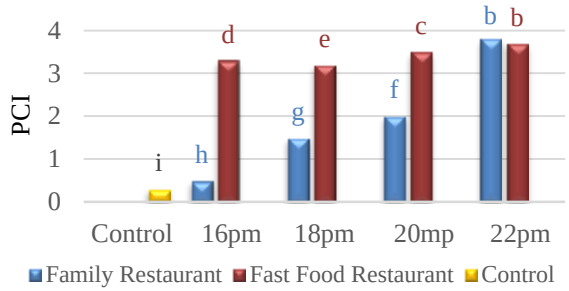

Figure 3. PCI measurements of oil samples collected during four-time frying185±5°C. from fast food and family restaurants
* Means with the same letter for each line are not significantly different at P≤0.05 collapse disintegrate.

Smoke point is defined as the temperature at which oil starts to smoke constantly and can be seen like bluish smoke (7). It is a sign of the fat chemical decomposition to glycerol and free fatty acids (2). A decrease in the smoke point values was seen after both frying in both restaurants. This decrease is constant with the rise in fatty acid value (Figure. 4).

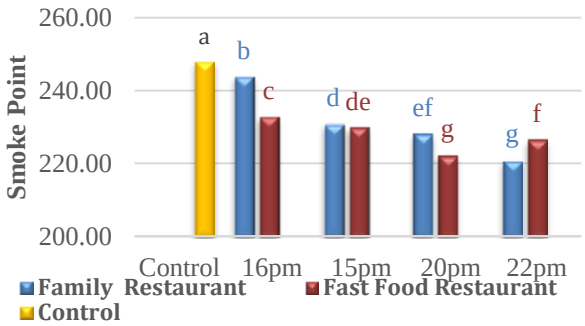

Figure 4. Smoke Point measurements of oil samples collected during four-time frying 185±5°C from fast food and family restaurants
* Means with the same letter for each line are not significantly different at P≤0.05.

The alteration in their smoke point was significant reduce (P ≤ 0.05) throughout frying operating, starting from 248 °C to lowest 221 °C at 22 pm. However, an increase in smoke point was seen in fast food restaurant from 222.33 °C at 20 pm and then raised 226.67 °C. This increase may be due to the replenish fried oil with

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un-heated oil. This is also consistent with alterations in FFA percentage for each oil.
The results also showed highest acid value (AV) (0.95 mg KOH/g) for the fried oil in fast food restaurant at 22 pm (Fig. 5). Higher of acid value is recorded in fried oil samples with higher level of FFA, which indicates reduced oil quality (9). When the greatest increase occurred in certain periods first two hours from fast food restaurants fried oil. This is a sign of the exposure of oil's to deterioration factors, though free fatty acids are yielded throughout triacylglycerol hydrolysis and as decay resultants from oxidized triacylglycerol's. The principal chemical reactions occurred throughout process of deep fat frying are hydrolysis (16 and 46), further hydroperoxides disintegration is one of the most essential signs of frying oil decay.
As shown in Figure 5, the oil's AV before frying process was 0.2 mg/g, there was significant difference in the amount of AV between the two oil samples at the end time, suggesting degree of hydrolysis as well as amount of finger potato fried.

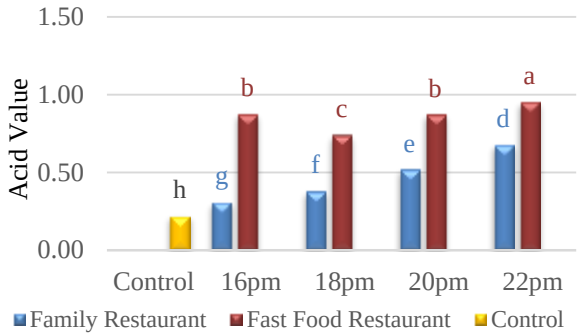

Figure 5. Acid value measurements of oil samples collected during four-time of frying185±5°C from fast food and family restaurants.
* Means with the same letter for each line are not significantly different at P≤0.05.

The alteration in peroxide value (PV) (mEq /kg of sample) of the oil is presented in Figure 6. The PV of the fried oils fast food and family restaurants respectively (10 and 12.2 mEq/kg) were significantly greater (P ≤ 0.05) than un-heated (2 mEq/kg). However, significantly increase (P≤0.05) in the PV at the beginning of the frying process was fast from both restaurants, and then rise in PV is non-significant (P≤0.05) particularly from fast food frying oil.
Additionally, to adding oil as an alternative of absorbed oil by the of potato fingers during frying resulted in the decrease in PV throughout frying. Also addition of the un-used oil lead to increase moisture content of fried oil that can have a positive impact on the production of a steam-blanket over the oil surface, thereby decreasing connection with air as well as aiding to volatilize and eliminate peroxides, flavors, and odors which would otherwise collect in the frying oil (44). Considering all the repoints, food investigators (45) have concluded that the PV is not a good indicator for the oxidation determine because hydroperoxides are unsteady under frying circumstances. The peroxide detection provides the initial evidence indication of rancidity in unsaturated fatty acids in both fats and oils. Other procedures are existing, but the most broadly utilized is PV. It determines the extent to which an oil sample has undergone initial oxidation, the secondary oxidation extent may be measured from the p-Anisidine value examine (14 and 48).

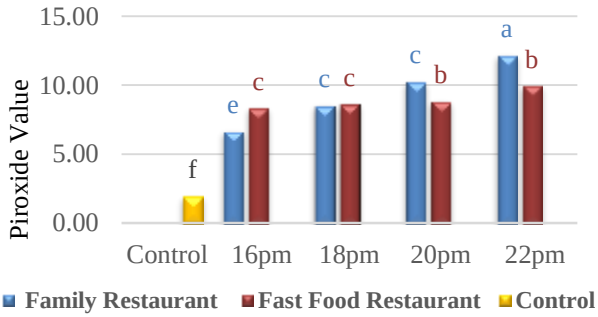

Figure 6. Peroxide value measurements of oil samples collected during four-time frying185±5°C from fast food and family restaurants.
* Means with the same letter for each line are not significantly different at P≤0.05.

The p-Anisidine value (p-AV) in oil of sunflower utilized at 16 pm to 22 pm frying process raised from 1.7 to 20 and 27 in fresh oils to in oils of fast food and family finger

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potato fries respectively. According to the literature, the p-AV must be less than 10 for good quality of oil (32).

Figure 7. P-Anisidine Value measurements of oil samples collected during four-time frying185±5°C from fast food and family restaurants.

* Means with the same letter for each line are not significantly different at P≤0.05.

A rapid increase of p-AV in family restaurants oil was seen, but its severity was decreased in the final of frying period (Fig. 7). Though, the p-AV assesses the oxidation secondary products, involving non-volatile this parameter, indicative of that oil sensitivity to thermo oxidation inside deep-fat frying process (18). carbonyl compounds produced from hydroperoxides, so as (2), stated that the carbonyl compounds degradation and the absorption of these composites by fried product reasons decrease the severity of p-anisidine value growth of oil throughout deep-fat frying process.

Table 1. illustrates the main fatty acid isomeric constitution of the sunflower oil. The oil samples fatty acid constitution had a significant difference ($P \leq 0.05$) before and after deep-fat frying operation. At the final stages of frying process, the decrease in the relative percentage of oleic acid C18:1 was 32.33%, 32.87% and 33.33% for control sample, family and fast food restaurants, respectively. Throughout the identical frying course, nonetheless the proportion of linoleic acid was 56.14% in fresh sunflower oil decreased to 52.55 and 53.33%, in family and fast food restaurant oils, respectively. However, there was significant difference for

Table (1) Changes in fatty acids' composition (%) of sunflower oils after frying185±5°C of French fries chips.

Fatty Acids	Control	Family Restaurant oil				Fast Food oil			
		16pm	18pm	20pm	2pm	16pm	18pm	20pm	22pm
Caprylic C-8:0	0.02d	0.04 c	0.04 c	0.06 b	0.08a	0.04c	0.06b	0.05bc	0.03c
Myristic C-14:0	0.06bc	0.08ab	0.08ab	0.09 a	0.09a	0.07b	0.04c	0.07 b	0.07b
Palmitic C-16:0	5.83 a	5.73 b	5.68 b	5.59 b	5.63b	5.73b	5.96a	5.91a	5.93a
Palmitoleic C-16:1	0.15 a	0.12 a	0.12 a	0.10 a	0.10b	0.19a	0.27a	0.11a	0.16a
Stearic C-18:0	4.08 d	4.49 c	4.66 c	4.79 a	4.89b	4.88b	5.01b	4.21b	5.03b
Oleic C-18:1	32.33e	32.6d	32.71d	32.85c	32.87c	33.00b	33.03b	32.41e	33.33a
Linoleic C-18:2	56.14a	54.9b	54.02c	53.88c	52.55e	53.83c	53.17d	54.12cd	53.33d
Linolenic C-18:3	0.05 a	0.03 b	0.01 b	0.01b	0.03b	0.01b	0.00b	0.03b	0.01b
Arachidic C-20:0	0.21 c	0.19 c	0.20bc	0.20bc	0.22b	0.33a	0.26b	0.26b	0.30a
Behenic C-22:0	0.81 a	0.79 a	0.77 a	0.73b	0.72b	0.62b	0.58b	0.62b	0.63b
Lignoceric C-24:0	0.31 b	0.32 b	0.32 b	0.34b	0.33b	0.32b	0.23d	0.37a	0.39a

* Means with the same letter for each line are not significantly different at P≤0. 05

After frying oil, fatty acid of linoleic reduced, whereas oleic acid increased (40). The level of stearic and reduced throughout frying process in both fast food and family restaurants. Other fatty acids likewise displayed a significant linear tendency to rise (Lignoceric) or to reduce (Behenic).

In view of this, a rat experiment with careful diet handling and special feeding methods was conducted to study their

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influences on feed competence and fat consumption. They were collected from both fast food and family kind restaurants through a controlled commercial- kind deep-frying operation typical of the industry. The influence of fried oil on liver function enzymes was assessed. Significant difference ($P \leq 0.05$) among fresh, family and fast food groups was seen on liver function.

Table 2. Both fresh and fried oils comparable in their influence upon serum cholesterol and peroxidation of lipid. It seems that long term feeding with both fresh and fried did have an influence upon serum lipid profile. However, it that extended heating rises LDL-c level. Highest increase LDL-c levels 61.47 mg/100ml, lower HDL-c levels 17.92 mg/100ml In the serum of rats fed on a diet containing family restaurant oil, While research has largely indicated that increase LDL-c level has a negative effect on the body, which increases a person's risk for coronary heart disease, peripheral vascular and cerebrovascular disease (3). In our study found rats serum MAD was significantly increased in groups fed with heated sunflower oil used from family restaurant and fast food restaurant group 4.33 µmol/L and 3.77 µmol/L than group fed with unheated oil (Control) 3.00 µmol/L, as well as MDA is one of the end products of lipid peroxidation that is indicate for cell damage (10).

Table (2) Serum lipid profile, Malondialdyhyd and Liver enzymes of rats in the experimental groups after six weeks, feeding with fried oil sunflower.

Biochemical parameters	Control Group	Family Restaurant Group	Fast Food Restaurant Group
Triglycerides	71.21 a	59.72 c	63.10 b
Total Cholesterol	85.79 c	89.72 b	96.16 a
HDL-Cholesterol	31.41 a	17.92 c	20.22 b
LDL-Cholesterol	44.02 c	61.47 a	58.92 b
Malondialdyhyd	3.00 c	4.33 a	3.77 b
AST	75.60 c	121.17 a	98.90 b
ALT	22.92 c	51.00 a	44.15 b
ALP	62.00 c	111.00 a	96.00 b

* Means with the same letter for each line are not significantly different at $P \leq 0.05$.

Abbreviations: HDL-c, high-density lipoprotein cholesterol; LDL-c; low-density lipoprotein cholesterol; TC, total cholesterol; TG, triglycerides;. ALT= alanine aminotransferase, AST = aspartate aminotransferase, ALP = alkaline phosphatase.

Liver enzymes such as, ALP and AST were significantly increased ($p \leq 0.05$) in fried oils fed rats compared to control (Table 2). Group Feeding heated Family restaurant oil led to significant($p \leq 0.05$) higher levels of AST, ALT and ALP was 121.17 IU /L, 51.00 IU /L , 111.00 IU /L respectively in comparison to un-heated oil fed group was 75.60 IU /L , 22.92 IU /L, 62.00 IU /L respectively . as well as level of this liver Enzymes in serum group feeding heated fast food restaurant oil lower than group feeding heated family restaurant oil, the reason may also be due to the increase in the amount of fried potatoes in fast food restaurants, in return, increase absorbing the heated and degraded oil, Subsequently reducing the accumulation of oxidants compounds in the oil during the deep frying process and replacing it with fresh oil. Improved plasma ALT and AST levels are indicative of liver injury (37). Plasma ALP is an allergic

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detector for intrahepatic and extra hepatic bile barrier (19). It is known that nutritional fat sources strongly affect some biochemical changeable both in biological membranes and in plasma (39 and 33), utilization fried oils diets reasons a major rise of biochemical pointers of liver injury

CONCLUSION

In conclusion, fried oil physiochemical properties and biological impact in both fast food and family style restaurant in deteriorating with frying time. In this investigation, we assessed some physicochemical and nutritional properties such as viscosity, PCI, RI, smoke point, AV, PV, p-AV, fatty acids composition, TG, HDL and TC/HDL, throughout frying of finger chips in both family and fast food restaurants in Erbil city. The results showed that higher physicochemical changes occur in fast food restaurant in comparison to family restaurant in the first hours of deep-frying of oil. However, in the last hours, the results deterioration of the oil used in frying was more obvious in the family restaurant frying oil. Which feeding fried-oil with un-used oil during frying can compromise the deteriorated physiochemical and biological properties of the fried oil; extended heating of sunflower oil raises level of LDL-c and MDA. Fried oils diets consumption reasons a major rise of biochemical pointers of liver injury, that whether Feeding led to substantial greater AST, ALP and LDH proportions in compared to un-heated oils.

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