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Acid, Peroxide, Ester and Saponification Values for Some Vegetable Oils Before and After Frying

Adel Imhemed Alajtal*, Fatima Emhemed Sherami, Mohamed Atiga Elbagermi

Chemistry Department, Faculty of Science, University of Misurata, Misurata, Libya

Email address

alajtal6@yahoo.co.uk (A. I. Alajtal)
*Corresponding author

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Abstract: Vegetable oils are triglycerides extracted from plants. Edible vegetable oils are used in food, both in cooking and as supplements. There are three types of vegetable oils (before and after frying were analysed Using standard procedures of the Association of Official Analytical Chemists (AOAC) and - American Oil Chemists' Society (AOCS), the physicochemical properties (Acid value, peroxide value, saponification and ester value) were investigated. Acid value which must be not more than 17 mg KOH/g oil in olive oil and 0.6 mg KOH/g oil in other edible oils were found 0. 28, 0.65 and 4.49 mg KOH/g oil in fresh sunflower, corn and olive oils samples respectively, and 0.84, 0.75 and 5.05 mg KOH/g oil in the frying oils of sunflower, corn and olive oils samples respectively. Easter and Saponification values were ranged between 14.92-20.89 and 19.41-21.54 mg KOH/g oil in fresh oils respectively and between 16.11-21.60 and 21.15-22.44 mg KOH/g oil in frying oils respectively furthermore, Peroxide values ranged from 12.5 to 55 Meq/Kg in fresh oils and from 37.5 to 150 in frying oils were to exceed the permitted value of 20 meq/Kg for olive oil and 10 meq/Kg for other edible oils in nearly half the analysed samples.In general feeding on these kinds of edible oils which have high values of acidity and peroxides is very dangerous because of the destructive effects of peroxide compounds and acidity on the components of the membranes of the living cell.

Keywords: Acid, Peroxide, Ester, Saponification Values, Vegetable Oil

1. Introduction

Fats and oils are parts of normal daily consumptions. As a major source of energy, fats and oils are considered as important nutrients in human diets. The edible oils are used in cooking as well as in traditional medicine for the treatment of colds, coughs, bronchitis, edema and burns, also play an important role in the body as carriers of essential fatty acids which are not synthesised in the body but are needed through the diet to maintain the integrity of cell membranes. They are also needed for the synthesis of prostaglandins which have many vital functions to perform in the body [1, 4].

The human body uses oils and fats in the diet for three purposes, as an energy source, as a structural component and to make powerful biological regulators. Oils and fats also play an important role in metabolic reactions in the human body. Oils and fats contain fatty acids, which are susceptible to attack by a number of agents e.g. light, oxygen, metals, etc [4-6]. Edible oils are derived from a wide variety of plants and plant seeds and are used in many aspects of domestic and world-wide food production. Once the oil has been extracted from a plant seed, it is refined as needed for use in foods such as salad dressings, margarine, shortenings, snack foods and frying oil. Edible oils are extracted and processed world-wide and hence are important domestic and international commodities. Edible oils are very important food for word. The human body uses oils and fats in the diet for three purposes, as an energy source, as a structural component and to make powerful biological regulators. Oils and fats also play an important role in metabolic reactions in the human body [6]. Vegetable oils are beneficial and popular due to their cholesterol-lowering effect. In contrast to animal fats, which are predominantly saturated and hence do not react readily with other chemicals, especially oxygen, unsaturated vegetable oils are more reactive [6-11]. Vegetable oils are essential in global nutrition depending on the regional conditions, a variety of oils are produced in different qualities [12].

Many vegetable oils are consumed directly or used as ingredients in food. Reports show that approximately 75% of the World's production of oils and fats come from plant sources. Although many plant parts yield oil, in actual commercial practices, oil is extracted primarily from seeds of oilseed plants [13]. Vegetable oils are mostly composed of lipids. Other minor components of vegetable oils include antioxidants, colorants, flavors, and emulsifiers [14-17]. Some of these compounds occur naturally and some are added during the manufacturing process. Also, the presence of hydrocarbons such as n alkanes in vegetable oils has been reported [17]. n-Alkanes ranging from C8 to C35 have been found at very low concentration, usually less than 1 mg/kg per alkane. Vegetable oils had very high probates (iodine value fatey acid) become more vulnerable to oxidation, making these oils not suitable for deep- fat frying purposes [18].

2. Materials and Methods

Edible oil samples before and after frying were collected from some food supply markets in Libya and home kitchen uses. The acid value, peroxide value, ester value and saponification value of edible oil before and after frying were measured according to the AOCS and AOAC [19-21].

3. Results and Discussion

Some chemical characteristics of sunflower oil, corn oil and olive oil before frying and after frying have been extensively investigated. The data of saponification values, acid value, peroxide value, and ester value of sunflower oil, corn oil and olive oil are illustrated in Tables 1-3 and figures 1-4.

It can be seen from the last tables and figure 1 that, saponification value of sunflower oil, corn oil and olive oil before and after frying were almost the same in all the oils which are 21.09 and 22.44 for sun flower, 21.54 and 22.27 for corn oil and 1941 and 21.15 mgKOH/g.

On the other hand, the acid value of sunflower oil, corn oil and olive oil after frying 0.84, 0.75 and 5.05 respectively, had slightly higher value compared with that before frying, also It can be noticed that the acid value of olive oil before and after frying had higher values 4.49 and 5.05 mg KOH/g oil compared with sunflower oil and corn oil both before and after frying 0.28, 0.84 for sunflower and 0.65, 0.75 mg KOH/g oil for corn oil. Generally, the slight increase of the acid value of the investigated samples may attribute to the complete inhibition of enzymes activity (Tables 1, 2 and 3 and Figure 2).

The obtained data indicated that the ester values of sunflower oil, corn oil and olive oil after frying had slightly higher value compared with that before frying as seen in tables 1, 2 and 3 and Figure 4.

Also, it is clear from the obtained results (Tables 1, 2 and 3 and Figure 3) that, peroxide values of sunflower oil, corn oil and olive oil increased after frying (37.5, 44.80 and 150 Meq/Kg for sunflower oil, corn oil and olive oil) respectively, compared with that before frying (12.5, 17.5 and 55 Meq/Kg for sunflower oil, corn oil and olive oil) respectively, causing undesirable odor of oil sample after frying. These results might be due to the effect of high frying temperature causing destruction of some glycerides [21].

Table 1. *Chemical characteristics of sun flower before after frying.*

Characteristics	Sun flower	
	Before frying	After frying
Saponification value, mg KOH / g oil	21.09	22.44
Acid value, mg KOH / g oil	0.28	0.84
Peroxide value Meq/Kg	12.5	37.5
Ester value, (S.V - A.V) mg KOH) /g oil	20.81	21.60

Table 2. *Chemical characteristics of corn oil before after frying.*

Characteristics	Olive oil	
	Before frying	After frying
Saponification value, mg KOH / g oil	19.41	21.15
Acid value, mg KOH / g oil	4.49	5.05
Peroxide value Meq/Kg	55.00	150.00
Ester value, (S.V - A.V) mg KOH) /g oil	14.92	16.11

Table 3. *Chemical characteristics of olive oil before after frying.*

Characteristics	Corn oil	
	Before frying	After frying
Saponification value, mg KOH / g oil	21.54	22.27
Acid value, mg KOH / g oil	0.65	0.75
Peroxide value Meq/Kg	17.5	44.80
Ester value, (S.V - A.V) mg KOH) /g oil	20.89	21.58

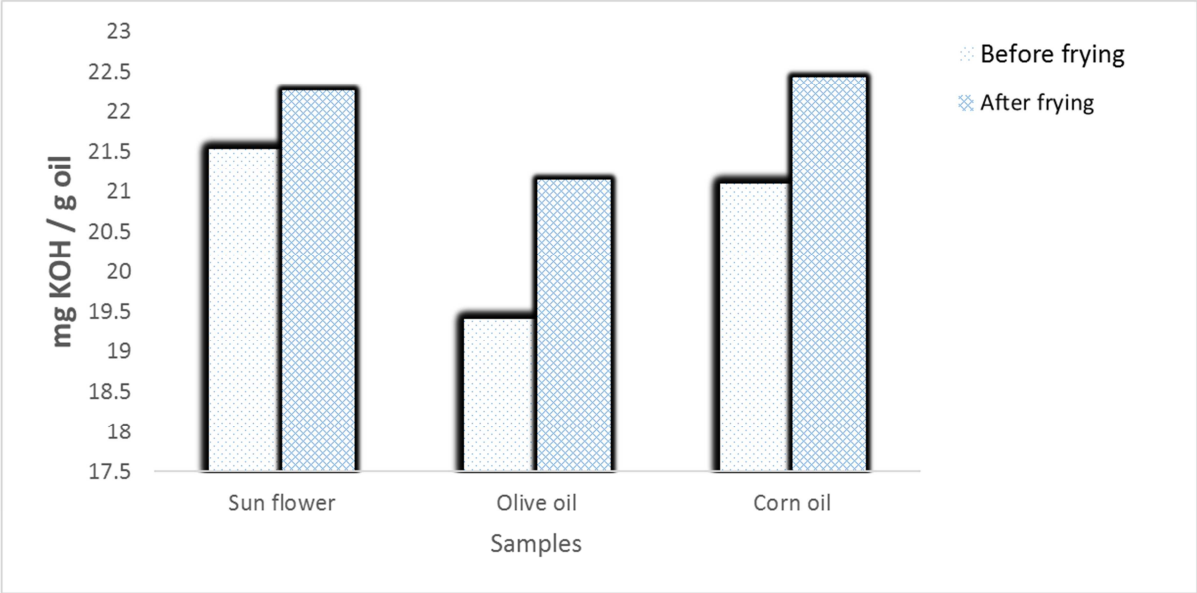

Figure 1. *Saponification value in samples.*

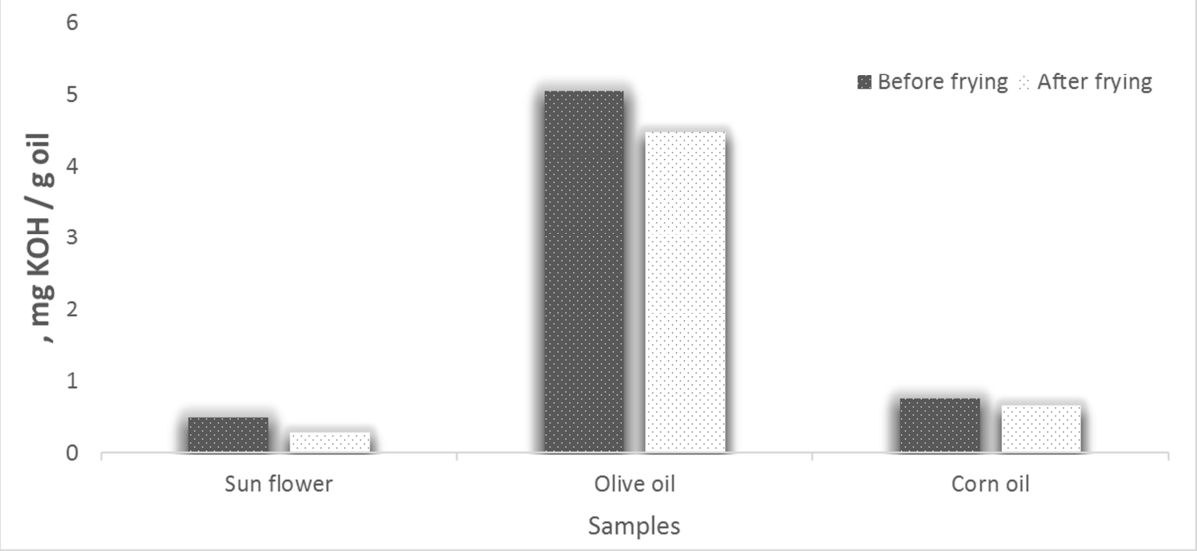

Figure 2. *Acid value in samples.*

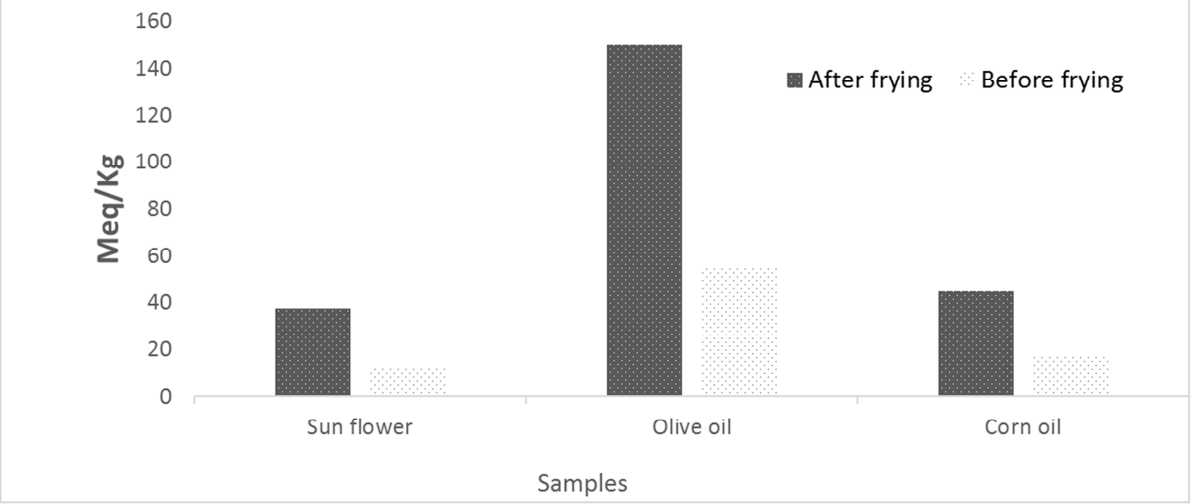

Figure 3. *Peroxide value in samples.*

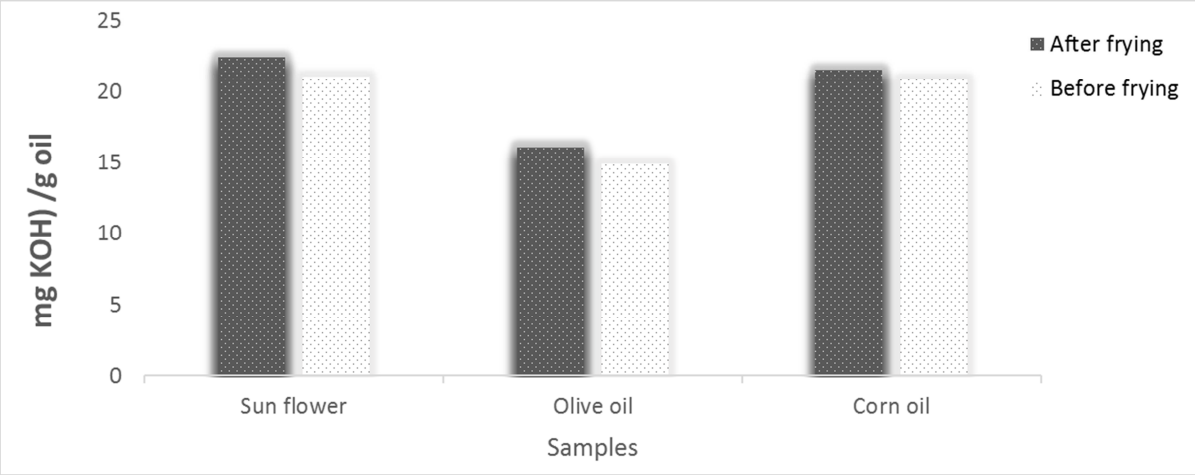

Figure 4. *Ester value in samples.*

4. Conclusion

The Edible oil before and after frying (sunflower, corn and olive oils) collected from some markets in Misurata city of Libya and home kitchen use as samples in this study.

The saponification values, acid value, peroxide value, and ester value of sunflower oil, corn oil and olive oil befoul and after are investigated.

It is clear from the obtained results that, the acid and peroxide values of edible oil increased after frying compared with that before frying (might be due to the effect of high frying temperature causing destruction of some glycerides).

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