Journal of Food and Dairy Sciences

Journal homepage: www.jfds.mans.edu.eg
Available online at: www.jfds.journals.ekb.eg

Studies on Fatty Acids Composition, Antioxidants and Antibacterial Activity of some Egyptian vegetable Oils

Hamad, M. N. F.[1]*; Dina H. El-Bushuty[2] and Amaal M. H. Abdallah[1]

[1] Dairy Department, Faculty of Agriculture, Damietta University.
[2] Home economics department, Faculty of Specific Education, Damietta University.

Cross Mark

ABSTRACT

This study was designed to determine fatty acids composition in some Egyptian vegetable oils namely virgin olive, sunflower, corn, and sesame seed oils. Obtained results using gas chromatography (GC) showed that these oils are a good source of monounsaturated fatty acids (MUFAs) because the highest of Monounsaturated Fatty Acids (MUFAs) that reported being 63.62% in virgin olive oil, sunflower oil 28.04, corn oil 28.21 and sesame oil 43.3%, respectively. Also, n-3 PUFA represented by α-linolenic acid (ALA, C18:3, n-3) were virgin olive oil, sunflower oil, corn oil and sesame oil at the ratio of 0, 27%, 0.53%, 0.54% and 0.4%, while n-6 PUFA virgin olive, sunflower, corn, and sesame oils were represented by linoleic (LA, C18:2, n-6) at the ratio of 24.65%, 57.36%, 57.00% and 41.33%. Virgin olive oil and Sunflower oil had high amount of free radical scavenging capacity (IC_{50}:516.32 mg and 2278.643, respectively). While Sesame oil and corn oil had relatively low capacity (IC50:2459.42 mg and 132179.8 mg, respectively) in compared with ascorbic acid (IC_{50}:10 µ/ml). The highest amount of phenolic compounds was 1.3095g GAE/100g in virgin olive oil, while the lowest oil one in phenolic compounds was sunflower oil reported by 0.1641g GAE/100g. Antibacterial activity has not been detected in the all analyzed vegetable oils.

Keywords: Vegetable oils, Fatty acids, Antioxidants, Antibacterial.

INTRODUCTION

25% of the calories required for a person are consumed from vegetable oils, which are one of the most important components of the human diet. In food products, vegetable oils act as carriers of fat-soluble vitamins (A, D, E, and K), and they have an important functional and sensory role as they contain essential linoleic and linolenic acids that are responsible for growth (Fasina *et al.*, 2006 and Dzisiak, 2004). Free fatty acids are classified into categories such as saturated, monounsaturated (MUFA) and polyunsaturated fatty acids (PUFA). Unsaturated acids are classified into a chain known as omega, being ω-9 considered unnecessary for humans, and ω-3 and ω-6 as essential fatty acids that mammals cannot synthesize, so they must be obtained in the diet (Ristic and Ristic, 2003 and Assiesa, *et al.*, 2004). The proportion of unsaturated fatty acids is of great importance in human nutrition, and we find that high levels of saturated fatty acids are very important in the composition of food oils and fats because of its importance in increasing the stability of the oil, but we find that it is not desirable from a nutritional point of view for humans as the high levels of fatty acids Saturated with a significant role in increasing the concentration of low-density lipoprotein (LDL) to high-density lipoprotein (HDL), and promotes the vascular smooth and clothing muscle proliferation Diet with increasing intake of linolenic and linoleic acids increase HDL-cholesterol and decreases LDL-cholesterol, Although higher oleic acid intake reduces LDL-cholesterol, it does not affect levels of HDL cholesterol (Lawton, *et al.*, 2000).

In the countries of the Mediterranean Sea, we find that olive oil is one of the main ingredients in the diets of those who live in these countries, and olive oil is the main source of fats in their kitchen (Gunstone, 2011). Also, there are two major fatty acids: PUFA (high sunflower, corn, maize and soybean oils concentrations). A person needs a high level of essential fatty acids (PUFA) as a diet. The total percentage of PUFA constituted by linoleic acid (18:2) alone is about 60 percent in corn oil, while, the monounsaturated fatty acid (MUFA) (high canola, peanut, and olive oil concentrations), about 24 percent is MUFA (oleic acid; 18:1), Palmitic acid (16:0) is almost 13 percent among saturated fatty acids, and stearic acid (18:0) is 1 percent (Milin *et al.*, 2001).

Sesame oil is distinguished from other vegetable oils as it is rich in unsaturated fatty acids due to the oil's ability to reduce cholesterol levels in the blood, where the oil contains a type of phospholipids with a very high percentage, which is lecithin, which acts as a strong emulsifier that dissolves fats in aqueous media (Lichtenstein and Deckelbaum, 2001). It has a high volume of polyunsaturated fat, abundant compounds of lignans and alpha tocopherol. The composition of fatty acids contains 43% oleic and linoleic acids, 9% palmitic fatty acids and 4% stearic acid (Sowmya, *et al.*, 2009). Traditional medical practitioners use sesame oil as a topical antibacterial, antifungal, and antivirus (Chandra and Kuvibidila, 2012).

* **Corresponding author.**
E-mail address: dr_mnour@du.edu.eg
DOI: 10.21608/jfds.2021.59377.1013

Natural antioxidants are significant phenolic compounds. In general, Caffeine Acid Equivalent (CAE) is the term used to express phenol content. It is customary to estimate the phenolic content of vegetable oils without considering the source or form, is in the range of 18–99 ppm CAE (Siger, *et al*., 2008). The objective of this study was to determine the composition of fatty acids, antioxidants, and antibacterial activity in some Egyptian vegetable oils which are spread in Egypt namely of virgin olive, sesame, corn, and sunflower oils to show their nutritional importance.

MATERIALS AND METHODS

Materials

Virgin Olive oil obtained from El-Dorra market in New Damietta that obtained from Suez Sinai. Sunflower oil and corn oil obtained from El-Sherbiny's company in Damietta, Egypt and it were produced by Arma Company in Obour City, Cairo, Egypt. Sesame oil obtained from EL-Masrayia Company for Natural Oils, Cairo, Egypt. Bacterial strains were two-gram positive bacteria namely, *Bacillus cereus* (B-211) and *staphylococcus aureus* (ATCC 6538) as well as two-gram negative Bacteria, *Pseudomonas aeruginsa* (B-212) and *Escherichia coli* (B211) were obtained from Assiut University Mycological Center (AUMC), EGYPT.

Methods

Fatty acids composition: Fatty acids composition of virgin olive, corn, sunflower, and sesame oils were determined using GLC namely "PayUnicam304 by flame ionisation detector and column ECTMWAX, 30m, ID0.25mm, and Film 0,25μm" in Institute Food & Feed Technology according to AOAC (2016).

Acid value: The acid value of oils was determined according to AOAC (2016).

Thiobarbaturic acid (TBA): The TBARS distillation method were determined using a spectrophotometer Method at 538nm with the double beam Perkin Elmer UV/Visible spectrophotometer (Lamda2S) according to the method showed by Vycnke (1970). The absorbance was determined at 538nm by a spectrophotometer at 538nm against a blank containing distilled water and TBA. The results were expressed as "mg malonaldehyde (MDA) on oil.

TBA mg (MDA)\kg = OD × 7.8

OD: The spectrophotometric absorbance of rose color for samples of oils at 538 nm.

Antioxidant Activity for different vegetable oils:

Radical scavenging activity of oils using DPPH: The antioxidant activity of virgin olive oil, sunflower oil, corn oil and sesame oil were performed by 2, 2–Diphenyl-1-picrylhydrazyle (DPPH) radical scavenging capacity according by Amarowicz *et al.* (2004).

Total phenols content: Total Phenol content of olive oil was determined according to Gutifinger (1981). The phenolic contents were extracted by (40:60) aqueous alcohol solution and the extraction process were repeated two times.

The antibacterial Susceptibility Determination by Agar Diffusion for vegetable oils: Agar diffusion test was determined with some modifications following of Fratianni *et al*. (2016).

RESULTS AND DISCUSSION

Fatty acids composition of different vegetable oils (virgin olive, sunflower, corn, and sesame oils):

Table (1) shows the fatty acid content of virgin olive oil, and from the results obtained, we found that virgin olive oil contains Palmitic Acid,, Stearic acid, Vaccenic acid, Oleic acid, Linoleic acid n6, Linolenic acid n3, Arachidic acid, Behenic acid and non-Identified fatty acids that reported 6.5%, 3.56%, 0.72%, 24.65%, 62.9%, 0.27%, 0.20%, 0.48% and 0.02%, respectively. The fatty acid content of sunflower oil contains Palimitic Acid,, Stearic acid, Vaccinic acid, Oleic acid, Linoleic acid n6, Linolenic acid n3 and Non-Identified fatty acids that reported 11.39%, 1.84%, 0.56%, 27.48%, 57.36%, 0.53% and 0.18%, respectively. The corn oil contains Palimitic Acid, Palmitoleic acid, Stearic acid, Vaccinic acid, Oleic acid, Linoleic acid n6, Linolenic acid n3 and Arachidic acid fatty acids that reported 11.56%, 0.10%, 1.73%, 0.61%, 27.5%, 57.0%, 0.54% and 0.20%, respectively. While, the sesame oil contains Palimitic Acid,, Stearic acid, Vaccinic acid, Oleic acid, Linoleic acid n6, Linolenic acid n3, Arachidic acid, and non-identified fatty acids that reported 9.14%, 5.10%, 0.96%, 42.0%, 41.33%, 0.4%, 0.54% and 0.22%, respectively. Also, from the results the predominant fatty acid in virgin olive oil of Linoleic acid 24.65% and Oleic acid 62.9%. Orsavova, *et al*. (2015) reported that sunflower oil C18:1cis (n-9) 28.0%, C18:2cis (n-6) 62.2%; sesame oil C18:1cis (n-9) 41.5% C18:1cis (n-6) 40.9%; olive oil C18:1cis (n-9) 66.4% C18:2cis (n-6) 16.4%.

Various effects of SFAs on human health have been studied through some studies, and it has been shown that both lauric acid (C12: 0) and myristic acid (C14: 0) raise total plasma cholesterol concentrations and this is due to an increase in low-density lipoprotein cholesterol, and high both LDL and HDL concentrations (Denke and Grundy, 1992) and Zock *et al*., 1994). The fatty acid composition of vegetable oils consists of a mixture of saturated fatty acids (SFAs) and unsaturated fatty acids (UNFAs) classified according to the number of unsaturated bonds as monounsaturated (MUFAs) or polyunsaturated fatty acids (PUFAs). However, each of the vegetable oils analyzed have a specific fatty acid distribution depending on their plant sources (Mensink, 2003 and Lawrence, 2013). Obtained results also, showed that, monounsaturated fatty acids (MUFAS) olive, sesame, corn, and sunflower oils are an excellent resource for (MUFAs) because the highest of Monounsaturated Fatty Acids (MUFAs) that reported in virgin olive oil 63.62%, sunflower oil 28.04, corn oil 28.21and sesame oil 43.3%. Nuts, seeds, and leafy vegetables are often the main sources of polyunsaturated fatty acids (PUFAs) (De Caterina and Basta, 2001). Their names were identified by differentiating them by the location of the first double bond in the carbon chain of fatty acids (n-3 and n-6 PUFAs) due to the large differences in their biological functions that can be derived from the course of their reactions in the body Mišurcová, *et al.* (2011), the ratio of n-6 / n-3 has been discussed through many studies and is considered the main factor for the balanced synthesis of eicosanoids. Also, the proportions recognized in the human diet have been relied upon.

Results in From Table (1). In the analyzed oils, n-3 PUFAs represented by α-linolenic acid (ALA, C18:3, n-3) were found in virgin olive oil at ratio 0, 27%, while the group of n-6 PUFAs was represented by linoleic (LA, C18:2, n-6) 24.65%. From Table (1) n-3 PUFAs represented by α-linolenic acid (ALA, C18:3, n-3) were found in sunflower oil at ratio 0.53%, while the group of n-6 PUFAs was represented by linoleic (LA, C18:2, n-6) at ratio 57.36%. In addition, from this Table, n-3 PUFAs represented by α-linolenic acid (ALA, C18:3, n-3) were found in corn oil at ratio 0. 54%, while the group of n-6 PUFAs was represented by linoleic (LA, C18:2, n-6) at ratio 57.00%. From the Table (1) n-3 PUFAs represented by α-linolenic acid (ALA, C18:3, n-3) were found in sesame oil at ratio 0.4%, while the group of n-6 PUFAs was represented by linoleic (LA, C18:2, n-6) at ratio 41.33%. These results agreement with Sirtori *et al*. (1992), Gharby *et al.* (2017) and Chowdhury (2007).

Table 1. Total fatty acids, total unsaturated, total saturated the amount of different ratio of essential fatty acids.

Fatty acids	Vegetable oil samples			
	Virgin olive	Corn	Sunflower	Sesame
Saturated fatty acid:				
1-Palimitic Acid C16:0	6.5%	11.56%	11.39%	9.14%
2-Stearic acid C18:0	3.56%	1.73%	1.84%	5.10%
3-Arachidic acid C20:0	0.20%	0.20%	--	0.54%
4-Behenic acid C22:0	0.48%	--	--	--
Total Saturated fatty acids:	10.74%	13.49%	13.23%	14.78%
B) Unsaturated fatty acid				
1-Palmitoleic acid C16:1 ω7	--	0.10%	--	0.14%
2-Oleic acid C18:1 ω 9	62.9%	27.5%	27.48%	42.0%
3-Vaccinic acid C18:1 ω7	0.72%	0.61%	0.56%	0.96%
4-Linoleic acid C18:2 n6	24.65%	57.0%	57.36%	41.33%
5-Linoleic acid C18:2 ω 4	0.74%	0.80%	0.66%	--
6-Linolenic acid C18:3 n3	0.27%	0.54%	0.53%	0.4%
7-Gadolic acid C20:1 ω9	--	--	--	0.20%
Total unsaturated fatty acids	89.28%	86.55%	86.59%	85.03%
C) Non-Identified fatty acids	0.02%	--	0.18%	0.22%

Acid value and TBA of virgin olive, corn, sunflower and sesame oils:

From data in Table (2) acid value in vegetable oils: namely Virgin olive, corn, sunflower and sesame oils reported 0.989, 0.136, 0.198 and 0.921 mg/g, respectively, these results agreed with (Squires, 1991 and Al-Sherbini *et al*., 2018) who reported the acid value of corn oil ranged from 0.1-1.1 mg/g (Rey, *et al.*, 2001; Cao, *et al.*, 2015 and Grossi, *et al.*, 2014) who reported the acid value ranged from 0.8-2%. It was decided that the acidity of olive oil should be according to decide by the International Olive Council (IOC) in 2015 that the acidity be as follows: extra-virgin olive oil (0.8%), virgin olive oil (2%), and ordinary olive oil (3.3%). Data showed that virgin olive oil recorded the highest acid value followed by sesame oil, while the lowest is corn oil.

From data in Table (2), TBA in different vegetables oils: Virgin olive, sunflower, corn and sesame oils reported 1.0062, 0.405, 0.2 and 0.421, respectively. This results agreement with Rey, *et al*. (2001), Cao, *et al*. (2015), Nouros, *et al*. (2000), Squires, (1991) and El-Kalyoubi (2015) reported TBA of olive oil ranged 0.01-1.86. data showed that virgin olive oil scored the highest TBA value followed by sesame oil, while the lowest oil in TBA value is corn oil followed by sunflower oil.

Table 2. Acid value and thiobarbituric acid values TBA of virgin olive, corn, sunflower and sesame oils:

Vegetable oil samples	Acid value (mg/g)	TBA µg malonaldehyde /kg oil
Virgin olive oil	0.989	1.0062
Sunflower oil	0.198	0.405
Corn oil	0.136	0.200
Sesame oil	0.921	0.421

Total phenolic contents of vegetable oils (Virgin olive, Sunflower, Corn, and Sesame oils):

Phenolic compounds have many benefits for human beings such as antioxidant and antimicrobial activities. Results obtained in Table (3) showed that highest phenolic compounds exhibited in virgin olive oil by 1.3095g GAE/100g, while the lowest one was sunflower oil as 0.1641g GAE/100g. While corn oil and sesame oil reported 0.1796, 0.5022, respectively. Obtained results agreement with those by Aşık and Özkan (2011) who studied physco-chemical and antioxidant properties of olive oil extracted from Memecik cultivar, total phenolic content and antioxidant activity of oils was 169.25mg gallic acid equivalent/kg. These results agreement, with Tuberoso *et al*. (2016) who studied Extra virgin olive oils from fruits of Italian autochthonous varieties *Tonda di Villacidro*, *Tonda di Cagliari*, *Semidana*, and *Bosana* were investigated to promote their quality aspects and reported that total poly phenols ranged 133-421mg GAE/kg extract these results similar the results obtained from Table (3).

Cultivation procedures, environmental factors, the stage of harvest, storage conditions, fruit processing and stages of olive harvesting are all factors that lead to differences in the total phenolate content of the oil, and this is what was decided by (Mousa *et al*., 1996) who studied after the oils extracted from the main Jordanian varieties such as Rumi and Nabali. Güzel *et al*. (2009) who studied Antioxidant and total Phenol Contents of Turkish Oils: Sunflower 0.412 mM gallic acid equivalents/L, corn oil 0.448 mM gallic acid equivalents/L. Several factors can influence phenolics content of sesame oil. Studies showed that extrinsic factors (as climatic and geographical factors), genetic factors, but also the maturation degree of plant and the length of storage influence on the content of antioxidant compounds (Williamson *et al.*, 2008). Zeb *et al*. (2017) reported the poly phenols in sesame oil 0.7g GAE/100g extract these results differ from results obtained in Table (3).

Table 3. Total phenolic contents of vegetable oils (virgin olive, sunflower, corn, and sunflower oils):

Vegetable oil samples	Phenolic Compounds (GAE g/100g EX) *
Virgin olive	1.3095
Sunflower	0.1641
Corn	0.1796
Sesame	0.5022

***(gGAE/100g extract): gram of gallic acid equivalent per 100 grams of extract.**

Radical scavenging activity of vegetable oils extract using DPPH:

Determination of 2, 2-diphenyl-1-picryl-hydrazyl measures the ability to donate hydrogen ion to free radicals.

DPPH obtain the maximum absorbance at 517nm and are purple color. The color changes from purple to yellow because DPPH free radicals are reduced by an antioxidant. The result of de-colorization could be observed spectrophotometry like as a measurement of antioxidant activity a further reduction of in solution absorbance indicates a higher antioxidant activity.

The antioxidant capacity of vegetables oils extracts (scavenge DPPH free radicals from the results obtained in Table (4) showed that virgin olive oil and Sunflower oil have high free radical scavenging capacity (IC_{50}:516.32 mg and 2278.643 mg, respectively). While Sesame oil and corn oil had relatively low capacity (IC50:2459.42 mg and 132179.8 mg, respectively) in compared with ascorbic acid (IC_{50}:10 μ/ml), considering that there is a reverse relationship between the IC_{50} value and the antioxidant activity. These results might be due to the total phenolic content of virgin olive, sunflower, corn, and sesame oils that showed in Table (4).

Table 4. Radical scavenging activity (DPPH%) of Virgin olive, sunflower, corn, and sesame oils:

Inhibition %	Vit C (µg)	(mg) Virgin olive oil	Sunflower oil	Corn oil	Sesame oil
10	2	118.285	512.563	33812.37	626.02
20	4	217.794	954.083	58404.22	1084.37
30	6	317.303	1395.603	82996.08	1542.72
40	8	416.812	1837.123	107587.9	2001.07
50	10	516.321	2278.643	132179.8	2459.42

Antibacterial Activity of vegetable oils under study:

The antibacterial capability of oils virgin olive, sunflower, corn and sesame oils were assayed against Two-gram positive bacteria namely, *Bacillus cereus* (B-211) and *staphylococcus aureus* (ATCC 6538) as well as two-gram negative Bacteria, *Pseudomonas aeruginsa* (B-212) and *Escherichia coli* (B-211), through the inhibition zone test. Results are shown in Table (5) these results agreement with Gonzalez, *et al.* (1990) who reported antibacterial activity has not been detected in olive oil Pietrocola, *et al.* (2018). Also, these results agreement with Nazzaro, *et al*. (2019) who studied antibacterial activity on oils extracted from three varieties of olive, *Ruvea antica*, Ogliarola, and Ravece of *O. europea*, and reported that Anti-microbial effect varies depending on the bacterial strains used and depending on the type extracted oils because Ravece of *O. europea*, not detected any effect with *S. aureus* unlike other types.In addition, Sesame oil and virgin olive oil not detected against *S. aureas* this may be due to the low of concentration was used Heidari-Soureshjani, *et al*. (2016).

Table 5. Clear zones diameters (mm) of oils extract against some pathogenic bacteria strains:

pathogenic bacteria strains	Clear zone for different vegetable oils: Virgin Olive 50	Virgin Olive 70	Sunflower 50	Sunflower 70	Corn 50	Corn 70	Sesame 50	Sesame 70
	Concentrations of extracts (µg)							
Bacillus cereus	--	--	--	--	--	--	--	--
Escherichia coli	--	--	--	--	--	--	--	--
P. aeruginsa	--	--	--	--	--	--	--	--
S. aureus	--	--	--	--	--	--	--	--

CONCLUSION

Virgin olive, corn, sunflower, and sesame oils are a good source of essential fatty acids, covering both SFAs, MUFAs and MUFA groups. The type of fatty acids varies from one source to another depending on the source from which they were extracted and the technological processes that were followed during the production process. Analyzed oils samples not detected antibacterial activity. Phenolic compounds were reported in analyzed oils samples. However virgin olive oil reported the highest content of phenolic compounds. Virgin olive oil had the highest free radical scavenging capacity (IC_{50}:516.32 mg/ml. The results of this research include data on these oils have a nutritional and health impact in order to function as dietary sources of antioxidants of natural origin.

REFERENCES

Al-Sherbini, A.S., Khalil, M.M., El-Sayed, H.H. and Soliman, A.F. (2018). Prolonged preservation of corn oil via gold nanoparticles. Journal of Food Processing and Preservation 42(1): e13358.

Amarowicz, R., Pegg, R.B., Rahimi-Moghaddam, P., Barl, B., and Weil, J.A. (2004). Free-radical scavenging capacity and antioxidant activity of selected plant species from the Canadian prairies. Food chemistry 84(4): 551-562.

AOAC Official Method of analysis (2016) 20th ed.no.969.33-chapter 41 p. online

Aşık, H.U., and Özkan, G. (2011). Physical, Chemical and Antioxidant Properties of Olive Oil Extracted from Memecik Cultivar. Academic Food Journal/Akademik GIDA.

Assiesa J., Loka A., Bocktinga C.L., Weverlingb G.J., Lieversec R., Visserd I., Abelinge N.G.G.M., Durane M., and Schenea A.H. (2004) Fatty acids and homocysteine levels in patients with recurrent depression: an explorative pilot study. Prostaglandins, Leukotrienes and Essential Fatty Acids 70: 349-356.

Cao, J., Li, H., Xia, X., Zou, X.G., Li, J., Zhu, X.M., and Deng, Z.Y. (2015). Effect of fatty acid and tocopherol on oxidative stability of vegetable oils with limited air. International Journal of Food Properties 18(4): 808-820.

Chandra, L.C. and Kuvibidila, S. (2012). Health benefits of sesame oil on hypertension and atherosclerosis.AJBBLhttp://www.ajbbl.com 1(01): 36-42.

Chowdhury, K., Banu, L.A., Khan, S., and Latif, A. (2007). Studies on the fatty acid composition of edible oil. Bangladesh Journal of Scientific and Industrial Research, 42(3): 311-316.

De Caterina, R. and Basta, G. (2001). n-3 Fatty acids and the inflammatory response—Biological background. Eur. Heart J. Suppl. 3, D42–D49.

Denke, M.A. and Grundy, S.M. (1992). Comparison of effects of lauric acid and palmitic acid on plasma lipids and lipoproteins. Am. J. Clin. Nutr.,56, 895–898.

Dzisiak D. (2004). New oils reduced saturated and Trans fats in processed foods. Cereal Foods World, 49(6):331-333

El-Kalyoubi, M.H., El-Razik, A., Abou-Zaid, F.O., and El-Sayed, W.M. (2015). Implementation of hazard analysis critical control points system (HACCPs) during extraction olive oil using hydraulic press method. Journal of Agricultural and Veterinary Sciences 267(3723): 1-18.

Fasina O. O., Hallman C.H.M., and Clementsa C. (2006). Predicting Temperature-Dependence Viscosity of Vegetable Oils from Fatty Acid Composition. JAOCS 83(10): 899-903.

Fratianni, F., Ombra, M.N., Cozzolino, A., Riccardi, R., Spigno, P., Tremonte, P., Coppola, R. and Nazzaro, F. (2016). Phenolic constituents, antioxidant, antimicrobial and anti-proliferative activities of different endemic Italian varieties of garlic (Allium sativum L.). J. Funct. Foods 21: 240–248.

Gharby, S., Harhar, H., Bouzoubaa, Z., Asdadi, A., El Yadini, A., and Charrouf, Z. (2017). Chemical characterization and oxidative stability of seeds and oil of sesame grown in Morocco. Journal of the Saudi Society of Agricultural Sciences 16(2): 105-111.

Gonzalez, M.D., Moreno, E., Quevedo-Sarmiento, J., and Ramos-Cormenzana, A. (1990). Studies on antibacterial activity of waste waters from olive oil mills (alpechin): inhibitory activity of phenolic and fatty acids. Chemosphere 20(3-4): 423-432.

Grossi, M., Di Lecce, G., Toschi, T.G., and Riccò, B. (2014). Fast and accurate determination of olive oil acidity by electrochemical impedance spectroscopy. IEEE Sensors Journal 14(9): 2947-2954.

Gunstone, F. (Ed) (2011). Vegetable oils in food technology: composition, properties and uses. John Wiley & Sons. Citation book frank.

Gutifinger J. (1981). Polyphenols in olive oils. J. Am. Oil Chem. Soc. 58: 966.

Güzel, S., Herken, E.N., and Ozcan, E.R.E.L. (2009). Total antioxidant capacity and total phenol contents of Turkish edible oils. Akademik Gıda 7(6): 13-17.

Heidari-Soureshjani, R., Obeidavi, Z., Reisi-Vanani, V., Ebrahimi Dehkordi, S., Fattahian, N., and Gholipour, A. (2016). Evaluation of antibacterial effect of sesame oil, olive oil and their synergism on Staphylococcus aureus in vitro. Advanced Herbal Medicine 2(3).

International Olive Council (IOC) (2015). Trade standard applying to olive oils and olive pomace oil. COI/T.15/NC No 3/Rev.9 June 2015. (p. 17)

Lawrence, G. D. (2013). Dietary fats and health: Dietary recommendations in the context of scientific evidence. Adv. Nutr. 4: 294–302.

Lawton C.L., Delargry H.J., Brockman J., Simith R.C., and Blundell J.E. (2000). The degree of saturation of fatty acids of fatty acids influences in post ingestive satiety. British Journal of Nutrition 83(5): 473-482.

Lichtenstein, A.H. and Deckelbaum, R.J. (2001). Stanol/sterol ester-containing foods and blood cholesterol levels. A statement for healthcare professionals from the Nutrition Committee of the Council on Nutrition, Physical Activity, and Metabolism of the American Heart Association, Circulation 103, n. 8: 1177

Mensink, R.P., Zock, P.L., Kester, A.D.M. and Katan, M.B. (2003). Effects of dietary fatty acids and carbohydrates on the ratio of serum total to HDL cholesterol and on serum lipids and apolipoproteins: A meta-analysis of 60 controlled trials1−3. Am. J. Clin. Nutr. 77: 1146–1155.

Milin, Č., Domitrović, R., Tota, M., Giacometti, J., Ćuk, M., Radošević-Stašić, B., and Ciganj, Z. (2001). Effect of olive oil-and corn oil-enriched diets on the tissue mineral content in mice. Biological trace element research, 82(1-3): 201-210.

Mišurcová, L., Vávra Ambrožová, J. and Samek, D. (2011). Seaweed lipids as nutraceuticals. Adv. Food Nutr. Res. 64: 339–355.

Mousa Y.M., Gerosopoulos D., Metzidakis, I. and Kiritsakis A. (1996). Effect of altitude on fruit and oil quality characteristics of Mastoides olives. J. Sci. Food Agric., 71:345.

Nazzaro, F., Fratianni, F., Cozzolino, R., Martignetti, A., Malorni, L., De Feo, V., and d'Acierno, A. (2019). Antibacterial activity of three extra virgin olive oils of the campania region, southern italy, related to their polyphenol content and composition .Microorganisms 7(9): 321.

Nouros, P.G., Georgiou, C.A., and Polissiou, M.G. (2000). Determination of olive oil 2-thiobarbituric acid reactive substances by parallel flow injection. Analytica chimica acta 417(1): 119-124.

Orsavova, J., Misurcova, L., Ambrozova, J.V., Vicha, R., and Mlcek, J. (2015). Fatty acids composition of vegetable oils and its contribution to dietary energy intake and dependence of cardiovascular mortality on dietary intake of fatty acids. International journal of molecular sciences 16(6): 12871-12890.

Pietrocola, G., Ceci, M., Preda, F., Poggio, C., and Colombo, M. (2018). Evaluation of the antibacterial activity of a new ozonized olive oil against oral and periodontal pathogens. Journal of clinical and experimental dentistry 10(11): e1103.

Rey, A.I., Kerry, J.P., Lynch, P.B., Lopez-Bote, C.J., Buckley, D.J., and Morrissey, P.A. (2001). Effect of dietary oils and α-tocopheryl acetate supplementation on lipid (TBARS) and cholesterol oxidation in cooked pork. Journal of animal science 79(5): 1201-1208.

Ristic V., and Ristic G. (2003). Role and importance of dietary Poly unsaturated fatty acids in the prevention and therapy of atherosclerosis. Med. Pregled.56(1-2):50 53.

Siger, A., Nogala- Kalucka, M. and Lampart- Szczapa, E. (2008). The content and antioxidant activity of phenolic compounds in cold- pressed plant oils, Journal of Food Lipids, 15: 137–149.

Sirtori, C.R., Gatti, E., Tremoli, E., Galli, C., Gianfranceschi, G., Franceschini, G., and Perego, P. (1992). Olive oil, corn oil, and n− 3 fatty acids differently affect lipids, lipoproteins, platelets, and superoxide formation in type II hypercholesterolemia. The American journal of clinical nutrition 56(1): 113-122.

Sowmya, M., Jeyarani, T., Jyotsna, R., and Indrani, D. (2009). Effect of replacement of fat with sesame oil and additives on rheological, microstructural, quality characteristics and fatty acid profile of cakes. Food Hydrocolloids 23(7): 1827-1836. Http://dx.doi.org/ 10.1016 /j. foodhyd.2009.02.008.

Squires, E.J., Valdes, E.V., Wu, J., and Leeson, S. (1991). Research note utility of the thiobarbituric acid test in the determination of the quality of fats and oils in feeds. Poultry science 70(1): 180-183.

Tuberoso C.I.G, Jerković I., Maldini M., and Serreli G. (2016). "Phenolic compounds, antioxidant activity, and other characteristics of extra virgin olive oils from Italian autochthonous varieties Tonda di Villacidro, Tonda di Cagliari, Semidana, and Bosana," Journal of Chemistry 7, https://doi.org/10.1155/2016/8462741

Vycnke, W. (1970). Direct determination of the Thiobarbaturic acid value in trichloracetic acid extracts of fish as a measure of oxidative Rancidity, European Journal of lipid Science and Technology 72: 1084-1087.

Williamson, K.S., Morris, J.B., Pye, Q.N., Icamat, C.D. and Hensley, K. (2008). A survey of sesamin and composition of tocopherol variability from seeds of eleven diverse sesame (Sesamum indicum L.) genotypes using HPLC-PAD-ECD. Phytochemical Analysis 19(4): 311-22.

Zeb, A., Muhammad, B., and Ullah, F. (2017). Characterization of sesame (Sesamum indicum L.) seed oil from Pakistan for phenolic composition, quality characteristics and potential beneficial properties. Journal of Food Measurement and Characterization 11(3): 1362-1369.

Zock, P.L., de Vries, J.H.M. and Katan, M.B. (1994). Impact of myristic acid versus palmitic acid on serum lipid and lipoprotein levels in healthy women and men. Arterioscler. Thromb. Vasc. 14: 567–575.

دراسات عن تركيب الأحماض الدهنية ومضادات الأكسدة والخصائص المضادة للبكتيريا للزيوت الغذائية المصرية

محمد نور الدين فريد حماد[1]، دينا حامد أمين البشوتي[2] و آمال معتمد حسن عبدالله[1]

[1] قسم الألبان - كلية الزراعة - جامعة دمياط - مصر

[2] قسم الإقتصاد المنزلي - كلية التربية النوعية - جامعة دمياط - مصر

صممت هذه الدراسة لتحديد لدراسة تركيب الأحماض الدهنية للزيوت الغذائية الزيتون البكر وزيت عباد الشمس وزيت الذرة وزيت السمسم باستخدام كروماتوجرافيا الغاز (GC) ، وتعتبر الزيوت التي تم تحليلها مصدرًا جيدًا للأحماض الدهنية الأحادية غير المشبعة (MUFAs) لارتفاع الأحماض الدهنية الأحادية غير المشبعة (MUFAs) الموجودة في زيت الزيتون البكر 63.62٪، زيت دوار الشمس 28.04 %، زيت الذرة 28.21%، زيت السمسم 43.3٪.وجد في الزيوت التي تم تحليلها الاحماض الدهنية عديدة عدم التشبع PUFAs ممثلة بحمض ألفا لينولينيك(ALA, C18: 3 n-3) في زيت الزيتون البكر وزيت عباد الشمس وزيت الذرة وزيت السمسم بنسبة 0، 27٪، 0. 53٪، 0. 54٪ و 0. 4٪، بينما وجدت مجموعة PUFA الممثلة في حمض اللينوليك (LA,C18: 2, n-6)في زيت الزيتون البكر ، زيت الشمس ، زيت الذرة وزيت السمسم بنسب 24.65 ٪، 57.36٪، 57.00٪، 41.33٪ علي التوالي. زيت الزيتون البكر وزيت دوار الشمس لهما قدرة عالية على التخلص من الجذور الحرة 516.32 مجم و 2278.643 مجم على التوالي, بينما كان لزيت السمسم وزيت الذرة سعة منخفضة نسبيًا 2459.42 مجم و 132179.8 مجم على التوالي (مقارنة بحمض الأسكوربيك (ميكروجرام/مل10 :IC50) وكان أعلى زيت في المركبات الفينولية هو زيت الزيتون البكر الذي سجل 1.3095 جم.جاليك /100جم مستخلص ، بينما كان أقل زيت في المركبات الفينولية هو زيت عباد الشمس حيث تم تسجيل 0.1641 جم جاليك/100جم مستخلص ولم يتم الكشف عن نشاط مضاد للبكتيريا في الزيوت التي تم تحليلها.