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USE OF AVOCADO OIL FRUITS AS FAT REPLACER IN SOME FOOD PRODUCTS

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ABCTRACT

The aim of this work was to produce avocado mayonnaise without egg as special foods.

This study evaluated avocado (Perseaamericana, Millcvs. Hass and Fuerte) (season 2015). Dry matter, oil content and fatty acid composition were examined and compare it with Maraqiolive oil. Dry matter and oil content of both avocado cultivars were 29.77, 22.00 and 27.85, 20.30%, for Hass and Fuerte, respectively.

The results showed that avocado oils were very close to olive oil. Avocado is nutritionally rich in many health related components and a valuable energy source due to their high quality fat content.

***In conclusion**, avocado oil showed higher PUFA/SFA ratio than olive oil. According to total phenol contents and the lipid profile, the stability of avocado oils was similar to that of olive oil. The composition of Hass and Fuerte avocado oils were closed with this of Maraqi olive oil.*

Keywords: Avocado (*Perseaamericana*); Fatty acid composition; olive oil; avocado mayonnaise**.**

INTRODUCTION

Avocado (*Perseaamericana*) is an important tropical fruit and a good source of lipophilic phytochemicals such as monounsaturated fatty acids, carotenoids, vitamin E and sterols that have been inversely related to cardiovascular diseases. However, their antioxidant capacities have received far less attention compared with hydrophilic phytochemicals in this fruit (Frega *et al*., 1990).

Furete avocado fruits contain between 94 and 98% triglycerides and between 2 and 6% complex lipids. Crude avocado oil is a viscous liquid with storage brown-green pigmentation. After refining the oil color turns light yellow with a greenish tint, the green pigmentation is due to the chlorophylls a and b exiting in the skin and pulp at high concentrations(Jacobs-berg, 1988).

Among the nutritional composition of avocado pulp, the lipids are the second in concentration with values of 21% and are a potential source of oil (Ortiz-Moreno *et al.,* 2003). Avocado oil contains fatty acids similar to the virgin olive oil (Ratovohery*et al.,* 1988). The main monounsaturated and polyunsaturated fatty acids, are oleic acid ($C_{18:1}$ or ω-9) and linoleic acid ($C_{18:2}$ or ω-6), found in a relative concentrations of 60.28 and 13.66% in avocado oil and in virgin olive oil a value of 73 and 7% respectively (Andrikopoulos *et al.,* 2002). An important characteristic of this fruit is the high content of unsaponifiable matter (1 to 4%) when compared with that of common edible oils (Turatti and Canto, 1985).

The avocado (*Perseaamericana*) is known for its pleasing taste and predominance of monounsaturated fatty acids. It is also recognized as a functional food that contains health-promoting phytochemicals such as glutathione and beta-sitosterol. It has been used as a fruit, mashed as a sandwich spread, and cubed as a topping for baked potatoes and soups (Wekwete and Navder, 2008).

Mayonnaise is an oil-in-water emulsion and is a widely consumed product. Mayonnaise must contain at least 78.5% total fat that contribute to the appearance, flavor, texture and stability of food emulsions, but the fat has an important ,, negative role'' in development of cardiovascular diseases, hypertension and obesity. Therefore, the light mayonnaise production is a beneficial solution for human health (Marinescu, *et al*., 2011).

Avocado mayonnaise: Avocado pulp finely ground through the nut butter attachment of a food chopper and whipped into ordinary mayonnaise gives a mayonnaise deluxe. We find that if the avocado mayonnaise is added vinegar in a proportion to give l½ percent additional acid the product keeps well at room temperature. The proportion of pulp to ordinary mayonnaise is about 2 of avocado to 1 of mayonnaise and of vinegar (10 percent best distilled vinegar or 100 grain strength), about 3½ fluid ounces to each pound of the mixed mayonnaise. The proper method of preparing this mayonnaise would, of course, be in mayonnaise factories where about 2 thirds by weight of avocado pulp could be added to the regular mayonnaise mix of oil, egg, vinegar, salt, etc., and beaten in with the mayonnaise in the regular manner. Somewhat more vinegar than is customary with ordinary mayonnaise should be added; the exact amount could be readily determined by experiment. The avocado mayonnaise can be used in the same manner as any mayonnaise on salads, in sandwich spreads, *etc*. (Cruess and Harrold, 1927).

Food allergy is common and its prevalence in childhood is estimated at between 3–7%. Egg and milk allergies are the commonest food allergies of infancy. Egg allergy may be defined as an adverse reaction of an immunological nature induced by egg protein. This guideline focuses predominantly on type-1 Ig E mediated allergy to egg. Egg allergy presents most commonly in infancy. The presence of eczema is a significant risk factor for egg allergy. Sometimes, egg allergy occurs in association with allergies to other foods, such as cow's milk or peanuts**.** Eggs served in a recognizable form are easy to avoid, but they are also used in many different types of manufactured foods. An egg-free diet can therefore be difficult to maintain, unless most of the food consumed is cooked from fresh ingredients. From November 2005, prepackaged foods sold within the European Union (EU) have been required by law to list egg in the ingredients panel where it is a deliberately added component of the product, however tiny the amount (Clark *et al*., 2010).

Therefore, this study was planned to compare oil avocado (*Perseaamericana*, cv. Fuerte and Hass) with Maraqi olive oil. In addition, the possibility of production avocado mayonnaise from pulp and different substituted with avocado pulp without egg ingredients.

MATERIALS AND METHODS

Avocado (*Persea americana* cvs. Hass and Fuerte) fruits were obtained from April to October 2015 from HRI, ARC, Egypt. For the work, a sample of 3 undamaged fruits defects free were selected. The selected fruits were washed and removed manually epicarp and seed. Avocado pulp was prepared for analysis of moisture, protein, lipids, crude fibers, ash and carbohydrates according to **A**.O.A.C. (2007). Each analysis was performed in triplicate. Maraqi olive oil (season 2014) was obtained from HRI, ARC, Egypt.

All ingredients used to prepare the mayonnaise, such as sunflower oil, egg, vinegar, sugar and salt were purchased from a local grocery store.

Dry matter content was determined according to the method of Ozdemir and Topuz (2004). Lipid content was determined by Soxhlet extraction, using n-hexane as described by A.O.A.C. (2007). The results were expressed as percentage of dry matter and oil content.

Fruit quality assessment

Freshly prepared juice of avocado fruits samples were used for total soluble solids (TSS), titiratable acidity (TA) and oil content determinations as described by A.O.A.C. (2007).

Total phenols content of Hass and Fuerte avocados were determined spectrophotometer using Folin-Ciocalteu colorimetric method Asami *et al*. (2003).

Total lipid content was extracted from the samples using the modification of the Bligh and Dyer method (1959) for total lipid extraction. Lipids were extracted with a mixture of chloroform, methanol and water = 1:1:0.9 v/v/v. Following thorough mixing and brief centrifugation, two clear layers were resolved. The lower layer was predominantly chloroform and contained the lipids from the original tissue while the upper layer was composed of methanol and water and contains water soluble material from the original extract. Thus, when the chloroform layer was isolated, a purified lipid extract was obtained.

The extracted oil was analyzed for free fatty acid as oleic acid%, peroxide value as meq O_2/kg oil, refractive index and Specific extinction coefficient at 270 nm (k270) were determined as described by A.O.A.C.(2007).

The fatty acids methyl esters were prepared using trans-esterification with cold methanol solution of potassium hydroxide. The fatty acid methyl esters were identified by GC-capillary column according to the methods of I.O.O.C. (2001).

Avocado and olive oils comparison

Free fatty acid, peroxide value, refractive index, specific extinction coefficient at 270 nm (k_{270}) and fatty acid composition of avocado and olive oils were measured by the same methods for comparison as mentioned before. Unsaponifiable matter of oil samples were determined as various standards AOCS methods (AOCS, 1998). Iodine values were calculated utilizing the following equation:

IV = (0.95 × C16:1) + (0.86 × C18:1n-9) + (1.732 × C18:2n-6) + (2.616 × C18:3n-3) + (0.785 × C20:1).(AOCS, 1998).

Mayonnaise Preparation:

The mayonnaise recipes and preparation methods were modified from those of Worrasinchai *et al.*(2006). The control and avocado mayonnaise recipes are shown in Table 1.

Table 1: Percentage recipes of mayonnaise (wt %)

Ingredients	Control mayonnaise	25% Avocado mayonnaise (AM)	50% Avocado mayonnaise (AM)	100% Avocado mayonnaise (AM)
Sunflower oil	75.00	60.75	40.50	0.00
Egg yolk	6.00	0.00	0.00	0.00
Vinegar 5% (w/v)	10.00	10.00	10.00	10.00
Salt	1.10	1.10	1.10	1.10
Sugar	2.50	2.50	2.50	2.50
Water	5.40	5.40	5.40	5.40
Avocado pulp	0.00	20.25	40.50	81.00

We prepared 500 g of each mayonnaise sample for this study. The 25, 50 and 100% avocado mayonnaise samples were prepared by replacing 25, 50 and 100% of oil by avocado pulp, named 25%AM, 50%AM and 100%AM. The mayonnaise samples were prepared using a standard mixer. Briefly, sunflower oil, vinegar, salt and sugar were mixed together with some water. Not use of egg yolk was as special food for people who has egg allergy. The mayonnaise samples were transferred to 3 glass bottles (100 ml) with polypropylene screw caps and compare with control sample for sensory evaluation.

Sensory evaluation of avocado mayonnaise were conducted in terms of colour, flavour, consistency and overall acceptability using 8 panelists, According to Moskowitz (1985), using a five point measuring scale (from 1 to 5), where 1 is the least positive and 5 is the most positive response.

Statistical analysis

Statistical analyses was conducted using SPSS (Statistical Programme for Social Sciences, SPSS Corporation, Chicago, IL, USA) version 16.0 for Windows. All analyses were performed in triplicate and data reported as means ± standard deviation (SD).

Data were subjected to analysis of variance (ANOVA). The confidence limits used in this study were based on 95% ($P < 0.05$).

RESULTS AND DISCSSION

Table (2) show the proximate composition, dry matter, pH, TA and TSS of Hass and Fuerte avocado varieties. The moisture content of Hass fruits was less than those in Fuerte variety. Moisture content of Hass and Fuerte avocado were 70.23±0.20 and 72.15±0.15 % per 100g of the pulp which is the total percentage present inform of water, it is close to 72.30% reported by USDA (2011). The oil content of Hass fruits (22.0±0.30%) was greater than those in Fuerte variety (20.3±0.30%), this is higher than the value of 15.4g reported by USDA (2011) for Hass avocado. The oil content of Hass avocado was higher than that observed by Elez-Martınez *et al*., (2007). These results agreed with those of Gutfinger and Letan, (1974) who found that Hass had more oil content than Fuerte. At the contrary the data were not agree with Ozdemir and Topuz (2004) who found that Fuerte had more lipid than Hass avocado. Protein content of Hass and Fuerte avocados were 0.74 and 1.01%, respectively; these values are low as compared to the values of 1.96 g and 1.72g obtained by USDA (2011) and FAO (1989), respectively. Whereas, these agreed with Bora *et al*. (2001).

Results in Table (2) reveal that Hass and Fuerte avocado fruits had close results in fiber content. The ash content of Hass and Fuerte avocado were 0.62, 0.71%, respectively, this is the residue remaining after all the moisture and organic materials have been removed. This value falls within the range (0.4-1.68%) reported by FAO (1989) for fuerte avocado. These results agreed with Bora *et al*. (2001), Carbohydrate contents in Hass and Fuerte avocado fruits were 3.31 and 2.53%, respectively.

Data in Table (2) reveal that the pH values of Hass and Fuerte avocado oils were 6.05 and 6.12, respectively, this shows the slightly acidic nature of the oil, it compares favourably with the value of 5.5 reported by Bizimana*et al*, (1993).

As a result in Table (2), the total phenols content of Hass avocado fruit was higher than those of Fuerte avocado fruit. The total phenols content of Hass and Fuerte cultivars as 1.8 and 1.1 mg/g, respectively. Soong and Barlow (2004) obtained 1.3 mg/g based on fresh weight (gallic acid equivalent). These values were similar to our results. Slightly differences might be due to differences in harvesting time (maturity degree), agricultural practices, and climatic factors. These results were in agreement with those of Shehata and Soltan (2013) who reported that avocado fruits had 259.15 (mg/100g) at

Table 2. Proximate composition and some physico-chemical properties of Hass and Fuerte avocado fruits

Parameter	Hass cv.	Fuerte cv.
Moisture	70.23±0.20	72.15±0.15
Dry matter	29.77±0.20	27.85±0.15
Lipids	22.00±0.30	20.30±0.30
Proteins	0.74±0.03	1.01±0.02
Fibers	3.10±0.10	3.30±0.15
Ashes	0.62±0.03	0.71±0.05
Carbohydrates	3.31±0.66	2.53±0.67
pH	6.05±0.03	6.12±0.02
TA	0.021±0.001	0.026±0.001
TSS (◦Brix)	8.36±0.10	8.9±0.20
Total phenols (mg/g)	1.7±0.10	1.2±0.05

contrast, these results did not agree with those obtained by Golukcu and Ozdemir, (2010) who found that total phenols content of Fuerte avocado was slightly higher than those in Hass fruits.

Data in Table (3) show that the refractive indices were determined to be 1.46; this falls within the range of values reported for some seed oils, 1.47 for soybean and 1.47 for corn (Sodeke, 2005). The Free fatty acid (FFA) were 0.66 and 0.83% for Hass and Fuerte avocado oil, this is an important variable in considering the quality of oil because the lower the FFA, the better quality of the oil. Ikhuoria and Maliki (2007) reported a value of 0.37% for avocado oil and added that the lower the FFA, the more its edibility.

Formation of hydroperoxides precedes the oxidative reactions that cause oil rancidity. Peroxide value of Hass and Fuerte avocado oil were 3.52 and 3.92 meqO_2/kg oil, respectively (Table 3). Werman and Neeman (1986) reported an initial peroxide content of 5.85 meq O_2/kg measured in crude oil.

Specific extinction coefficient at 270 nm (k270) is a good indicator for the secondary phase of oxidation because it is related to the presence of final products such as trienes or unsaturated carbonyl compounds, that account for the characteristic flavor of an oxidized oil (Gertz and Klostermann, 2000).

The Iodine values (IV) were 87.99 and 81.78 g/100g; these values are higher than 79.53 g/100g determined for Maraqi olive oil. According to

Table 3. Comparison of Physicochemical parameters and stability of Hass and Fuerte avocado oils compared with Maraqi olive oil .

Oil / Parameters	Hass avocado oil	Fuerte avocado oil	Maraqiolive oil
RI	1.4651±0.0001[a]	1.4645±0.0002[b]	1.4690±0.0001[c]
FFA %(as Oleic acid)	0.66±0.03 [a]	0.83±0.01 [b]	0.35±0.02 [c]
Peroxide value (meq O_2 / kg oil)	3.52±0.02 [a]	3.92±0.12 [b]	3.21±0.10 [c]
K_{270}	0.113±0.001 [a]	0.128±0.002 [b]	0.106±0.001 [c]
IV	87.99±0.06 [a]	81.78±0.34[b]	79.53±0.19 [c]
Unsap	1.65±0.05 [a]	1.42±0.02 [b]	1.73±0.03 [c]
Oxidative stability (h)	38.68±0.20 [a]	37.00±0.50 [b]	40.09±0.09 [c]

Ikhuoria and Maliki (2007), iodine value gives an indication of the degree of unsaturation of oils, higher iodine values can be attributed to high unsaturation. Hass avocado oil contained more unsaponifiables than Fuerte oil (1.65 *vs* 1.42%).

The fatty acid composition of avocados (Hass and Furetecvs.) and olive (Maraqi) are given in Table 4. Palmitic, stearic, oleic, linoleic and linolenic acids were found to be major fatty acids in the three oils. The levels of oleic acid (65-69%) and palmitoleic acid (1.5-2.63%) in avocado oils compare favorably to those of Maraqi olive oil (78.87% oleic acid and 0.45% palmitoleic acid). Oleic (18:1) acid was the main fatty acid in ‘Hass and Fuerte’ avocados and was higher in Fuerteavocad oil than Hass oil. These results agreed with results observed by Azizi and Najafzadeh, (2008), Gutfinger and Letan, (1974) and Ozdemir and Topuz, (2004). Relative contents of palmitic (16:0), linoleic (18:2), palmitoleic (16:1), and alpha-linolenic (18:3) acids were 15.01, 10.47, 2.63 and 3.99% of total fatty acids, respectively in Hass oil and were 14.17, 10.71, 1.5 and 0.81% of total fatty acids, respectively in Fuerte oil. A high dietary intake of oleic and palmitoleic acid is related to a decreased risk of cardiovascular disease

Table 4. Comparison of the fatty acid compositions of Hass and Fuerte avocado oils compared with Maraqi olive oil.

Oil / Fatty acid	Hass avocado oil	Fuerte avocado oil	Maraqi olive oil
$C_{16:0}$	15.01 ± 0.10^a	14.17 ± 0.04^b	10.77 ± 0.11^c
$C_{16:1}$	2.63 ± 0.03^a	1.50 ± 0.10^b	0.45 ± 0.02^c
$C_{17:0}$	0.00 ± 0.00^a	0.04 ± 0.01^b	0.08 ± 0.01^c
$C_{17:1}$	0.00 ± 0.00^a	0.08 ± 0.01^b	0.07 ± 0.01^b
$C_{18:0}$	1.07 ± 0.02^a	2.38 ± 0.03^b	2.79 ± 0.04^c
$C_{18:1}$	65.83 ± 0.27^a	69.08 ± 0.02^b	78.87 ± 0.07^c
$C_{18:2}$	10.47 ± 0.05^a	10.71 ± 0.10^b	5.39 ± 0.04^c
$C_{18:3}$	3.99 ± 0.02^a	0.81 ± 0.02^b	0.63 ± 0.01^c
$C_{20:0}$	0.45 ± 0.02^a	0.71 ± 0.02^a	0.47 ± 0.01^b
$C_{20:1}$	0.39 ± 0.01^a	0.36 ± 0.01^b	0.38 ± 0.01^b
$C_{22:0}$	0.16 ± 0.02^a	0.16 ± 0.01^b	0.10 ± 0.00^b
Σ SFA*	16.69 ± 0.16^a	17.46 ± 0.11	14.21 ± 0.17^c
Σ USFA**	83.31 ± 0.16^a	82.54 ± 0.26^b	85.79 ± 0.16^c
MUSFA	68.85 ± 0.23^a	71.02 ± 0.14^b	79.77 ± 0.11^c
PUSFA	14.46 ± 0.07^a	11.52 ± 0.12^b	6.02 ± 0.05^c
C18:1/ C18:2	6.29 ± 0.05^a	6.45 ± 0.06^b	14.63 ± 0.09^c
USFA/SFA	4.99 ± 0.06^a	4.73 ± 0.01^b	6.04 ± 0.06^c
Monounsaturated to saturated (MUSFA/SFA)	4.12 ± 0.05^a	4.07 ± 0.01^a	5.61 ± 0.06^b
Polyunsaturated to saturated (PUSFA/SFA)	0.87 ± 0.00^a	0.66 ± 0.00^b	0.42 ± 0.00^c
Monounsaturated to polyunsaturated (MUSFA/PUSFA)	4.67 ± 0.04^a	6.16 ± 0.05^b	13.25 ± 0.09^c

* **SFA : ** Saturated Fatty Acids.   ** **USFA :** Unsaturated Fatty Acids

because these fatty acids preserve levels of high-density lipoproteins and act as antioxidants (Lopez *et al*., 1996; Richard *et al*., 2008). Stearic ($C_{18:0}$), ($C_{20:1}$) and ($C_{22:0}$) acids were present in trace amounts. Saturated, monounsaturated and polyunsaturated fatty acids represented about 16.69, 68.85, and 14.46%, respectively of the total fatty acids in Hass oil and 17.46, 71.02 .and11.52%, respectively of the total fatty acids inFurete oil. These results are in agreement with those reported by several authors for 'Hass' avocado (Landahl*et al*., 2009; Ozdemir and Topuz, 2004 and Plaza *et al*., 2009). Data reveal also that Hass and Fuerte avocado oils were closed with Maraqi olive oil.

Compared to Maraqi olive oil, the MUSFA content was significantly higher, especially due to the higher amount of oleic acid shown by olive oil, which, at the same time, showed lower amounts for palmitoleic and vaccenic acids. The lower MUSFA content showed by avocado oils were partially compensated by their higher PUFA content, containing interesting amounts of both omega-6 and omega-3 fatty acids. Hass avocado oil contained more than 2-folds the amount of linoleic acid present in Maraqi olive oil, being this acid quantitatively the third fatty acid in both types of oils. Also, linolenic was slightly, but significantly higher in avocado oils compared to Maraqi olive oil.

Additionally, the ratios of monounsaturated to saturated (MUSFA/SFA), polyunsaturated to saturated (PUSFA/SFA) were calculated since they are considered to be indicators of avocado nutritional value (Table 4).PUSFA/SFA ratios were 0.87 and 0.66 for Hass and Fuerte olive oil, respectively and 0.42 for Maraqi olive oil. Slater *et al*. (1975) reported for 'Hass' avocados an average PUSFA/SFA ratio of 0.75. Olive oil PUSFA:SFAratio is in the range of 0.14-1.19 depending on the growing region (IOOC, 1984 andKiritsakis, 1990). However, recent developments in nutrition reported better health benefits from a high dietary ratio monounsaturated (especially oleic acid) to saturated fatty acids (MUSFA:SFA) than from a diet with a high PUSFA:SFA ratio. For instance for Maraqi olive oil MUSFA:SFA ratio was 5.61 and for Hass and Fuerte avocado oils were 4.12 and 4.07, respectively.

The highest oxidative stability was 40 hrs. for Maraqi olive oil followed by 38 and 37 hrs. for Hass and Fuerte avocado oils, respectively (Table 4). Furthermore, the polyphenol content and oleic/linoleic fatty acid ratio as well as the monounsaturated/polyunsaturated fatty acid ratio (Tables 4 and 5) probably influenced the oil oxidative stability. High positive correlations between oil oxidative stability and polyphenol content had been observed by other authors and also found a positive correlation between oil oxidative stability and the oleic/linoleic fatty acid ratio (Morales-Sillero*et al.*, 2007). Some studies have demonstrated the capability of some fatty acids to act as antioxidants beyond being a source of free radicals. It seems that this capacity directly depends on fatty acids degree of un-saturation (Richard *et al*., 2008).

Table 5: Sensory evaluation of mayonnaise samples.

Properties	Mayonnaise (Control)	Mayonnaise substituted with 25% avocado fruit (25% AM)	Mayonnaise substituted with 50% avocado fruit (50% AM)	Avocado 100% mayonnaise (100% AM)
Appearance	4.92±0.2a	3.33±0.60b	3.33±0.75b	2.58±0.58c
Colour	5.00±0.00a	3.42±1.02b	3.00±0.71bc	2.42±0.66c
Odour	4.92±0.20a	3.67±0.52b	3.25±0.69bc	2.67±0.52c
Texture	5.00±0.00a	3.67±0.60b	3.00±0.63bc	2.67±0.68c
Taste	4.83±0.26a	3.5±0.55b	3.00±0.84bc	2.42±0.80c
Overall acceptability	**4.58±0.20a**	**3.33±0.52b**	**2.92±0.73bc**	**2.58±0.58c**

Sensory evaluation scores of avocado mayonnaises are shown in Table 5. The control mayonnaise was have scores significantly ($P \leq 0.05$) increased than others avocado mayonnaises in sensory properties. The appearance scores of avocado mayonnaise samples decreased significantly ($P \leq 0.05$) with increasing the substitution levels of avocado. The color of 25% AM sample was better than the others avocado mayonnaise samples. The overall acceptability scores were significantly higher with 25% AM than other substitution levels of avocado pulp. This is mainly contributed by the performance of appearance, colour, odour, texture and taste attributes.

In conclusion, avocado oil showed higher PUFA/SFA ratio than olive oil. According to total phenol contents and the lipid profile, the stability of avocado oils was similar to that of olive oil. The composition of Hass and Fuerte avocado oils were closed with this of Maraqi olive oil.

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استخدام زيت الأفوكادو كبديل فى بعض المنتجات الغذائية.

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تم تقييم ثمار الأفوكادو صنفى فيورت وهاس من حيث المادة الجافة والمحتوى الكلى وتركيب الزيت بالمقارنة مع زيت الزيتون صنف مراقى . ووجد ان المادة الجافة فى الموسمين لكى الصنفين تحت الدراسة ٢٢. ، ٢٩,٧ ، ٢٠,٣٠ ، ٢٧,٨٥ على الترتيب فى كلا الموسمين.

واظهرت الدراسة ايضا ان زيت ثمار الأفوكادو يقارب فى تركيبه زيت الزيتون . فضلاً عن امكانية استخدام زيت الافوكادو فى تصنيع المايونيز دون استخدام بيض المائدة.

التوصية: اظهر زيت الأفوكادو أعلى نسبة من PUFA/SFA عن زيت الزيتون، طبقا لمحتواه من الفينولات الكلية والدهون، بالاضافة الى ثبات مماثل لزيت الزيتون .مكونات زيت صنفى الأفوكادو هاس وفويرت مماثل لزيت الزيتون صنف المراقى.