Determination of Tocopherols, Total Phenolic Compounds and Antioxidant Activity of Some Nonconventional Vegetable Oils

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ABSTRACT:

In the last years, a rising in demand of oil has been noted. therefore, Researchers start searching for new oil sources to cover their demand. Three types of seed oil were investigated, pumpkin seed oil, roselle seed oil and apricot seed oil, the ratio of oil in seed was 34.82%, 23.09% and 40.15%, respectively. The oil Samples were found to be unsaturated oil, whereas unsaturated fatty acid ratio reached 79.21, 82.24, 93.29, respectively. The oil Samples had an Extremely high content of phenolic acids. Total phenolic content (TPC) pumpkin was (209 µg gallic acid/ 1g oil), TPC of roselle was (115.50 ± 13.92 µg gallic acid/ 1g oil), TPC of apricot was (365.8 ± 47.3 µg gallic acid/ 1g oil). Also, high content of tocopherol was found in All Samples. The Total Tocopherol content of pumpkin, roselle, apricot, was (250,298 and 159 mg\kg oil), respectively, these results revealed that this vegetable oil are a source for nutritional components like antioxidant and vitamins. Also, they can be used as edible oil.

Keywords: edible oil, non-conventional sources, pumpkin, antioxidant, and total phenolic content.

INTRODUCTION

Due to their high concentration of bioactive lipid components, such as polyunsaturated fatty acids, fruit and vegetable oils are gaining increasing attention. The usage of fats and oils, as well as the many lipids they contain, is widespread in the food industry as well as in the cosmetics, pharmaceutical, oleochemical, and other industries. Straccia *et al*., (2012).

pumkin seed oils: Pumpkin (Cucurbita Maxima) contains ahigh percentage of protein (25-51%), indicating the nutritional importance of these seeds Bombardelli and Morazzoni (1997), also, having a significant amount of oil, ranged from 40.8% and 60.8% Fokou *et al*., (2009); Achu *et al*., (2006). However, PSO in general is considered as unsaturated oil, linoleic (35.6-60.8%), oleic (21.0-46.9%), stearic (3.1- 7.4%), and palmitic acid (9.5-14.5%) are the most common fatty acids in PSO. Fatty acid content depends on a number of factors, including diversity and climatic conditions. Lerma-García *et al*., (2015). Pumpkin seed oil has high content of micro-constituents like (tocopherols, phytosterols, carotenoids and phenolic compounds).

Apricot seed oil: Apricot *(Prunus Armenica L.)* seeds considered as a byproduct, whereas, Apricot food industrial process discarding a lot of fruit seeds. El-Adawy and Taha (2001); Schieber *et al*., (2001). Kernel can used to bread production as well as consumed as an appetizer. ASO considered as a significant source of oil (49.8–56.1%), dietary protein (22.4–29.3%), and fiber. The oil in the kernel contains unsaturated fatty acids, including oleic acid (31-80%), linoleic acid (6.3-51%), and tocopherol. Femenia *et al*., (1995). Consequently, Apricot seed oils are an edible oil and can be Comparable to other commercial seed oils including soybean (15–20%), cottonseed (30–36%), and sunflower (36–55%). Shariatifar *et al*., (2017). Triacylglycerols make up the majority of apricot oil (98%) followed by phospholipids (1.1%), Unsaponifiable compounds make up 0.7% of the oil weight, together with free fatty acids (0.2%) Zlatanov and Janakieva (1998).

Roselle seed oils: Only the roselle *(Hibiscus sabdariffa L.)* seeds are utterly ignored and always thrown away in Egypt. Given that the fixed oil in the seed ranges from 17 to 20 percent and has properties resembling those of cotton seed oil Ottai *et al*., (2006). Al-Ansary *et al*., (2016). Mohamed *et al*., (2007) showed that protein and antioxidants, such as vitamin E, gamma-tocopherol are abundant in Roselle seed oil's phytosterol and tocopherol content. Eltayeib and Elaziz (2014) showed that Roselle seeds contain a lot of oil (21.1%), with oleic and linoleic acids making up the majority of the unsaturated fatty acids.

MATERIALS AND METHODS

Seed collections:

Pumpkin seeds:

The fruit was brought from EL Obour Market in Cairo governorate, Egypt, The fruit was then crushed and the seeds were directly isolated, washed to remove impurities, and

sun dried, The seeds were peel removed and grinded using domestic grinder to make powder, After that, The powder was dried on drying oven at (60°C) for 48hours.

***Roselle seeds**:*

Roselle *(Hibiscus Sabdariffa L.)* seeds were purchased from local market in Kom Ombo – Aswan Governorate, Egypt. In (2021) after harvest season. The seeds were cleaned and grinded using domestic grinder to extraction size, the powder was dried by drying oven at (60°C) for 48hours.

Apricot seeds:

About 30kg from apricot *(prunus armeniaca L.)* fruit was obtained from EL Obour Market, washed and peel removing, the kernels were smashed, and the inner part was showed up, the seed was kept in refrigerator until the rest seeds were available. After that, the seeds were grinded using domestic grinder to extraction size, the powder was dried by drying oven at (60 °C) for 48hours.

Determination of chemical composition

Moisture, crude fat, crude protein, ash, and crude fiber of sample were determined according to AOAC (2012). The carbohydrates were calculated by the difference.

Extraction method

chloroform and methanol solvents were used to extract oil from the seed powder by immersing in an extractor in order to get rid of the existing oil. The solvent was removed by a rotary evaporator. Bligh; Dyer (1959)

Identification of fatty acid profile of oils by GLC

Fatty acid profile was analyzed (in Laboratory of Oils and Fats Dept., Food Technology Research Institute – FTRI) as described in procedure of ISO 12966-2 (2017).

Determination of total phenolic content

Determination of the total phenolic content was done at the National Research Centre within the Oils and Fats Research Laboratory. The determination of total phenolic content in oil was based on the procedure introduced by Gutfinger (1981) using the Folin–Ciocalteu reagent (Singleton and Rossi 1965). A sample (2 g) oil was dissolved in 5 ml hexane, and the phenolic compounds were extracted with 3 ml methanol/ water (60:40, vol/vol) for 2 min by means of a vortex system 4 times. The methanolic extracts were combined and an aliquot (0.25 ml) of the methanolic phase was diluted with water to a total volume of 2.5 ml, followed by the addition of 0.25 ml Folin–Ciocalteu reagent. After 3 min, 0.5 ml sodium carbonate solution (35%, wt/vol) was added to the reaction mixture, which was finally mixed and diluted with water to 5 ml. The absorbance of the solution was measured after 2 h against a blank sample by a Shimadzu, UV-spectrophotometer UV-240 at a wavelength of 725 nm. The results were calculated as μg equivalents gallic acid (EGA) per 1 g oil.

Measurement of antioxidant activity of oils

Determination of antioxidant activity was also done in The National Research Centre within the Oils and Fats Research Laboratory. $DPPH^{\cdot}$ assay was used to measure the antioxidant activity of treated oils. Toluene solution of $DPPH^{\cdot}$ was prepared freshly at concentration of 10-4 M. Different amounts of oil was weighted in test tubes (10, 20, 30, 40 mg) and completed to 4 ml by toluenic $DPPH^{\cdot}$ solution and vortexed for 20 seconds. The decrease in absorption was measured at 515 nm after 30 min using blank of toluene and $DPPH^{\cdot}$ solution as control. The radicals scavenging activity (R.S.A %) was calculated from the equation:

$$R.S.A\ \% = [(A\ control - A\ sample)/A\ sample] \times 100$$

The concentration was plotted against the R.S.A. % on excel program and the relation line was drowned. Then, the resulting equation was used to calculate the EC50 (concentration of sample that can scavenge 50 % of $DPPH^{\cdot}$ radical.

Determination of total Tocopherol content

According to the Association of Official Analytical Chemists (AOAC) standard procedure, the total tocopherol content has been assessed using Agilent HP 1100 series high-performance liquid chromatography (Konings *et al*., 1996).

Data analysis:

Statistical analysis was done using the excel program by calculating the average of the sample and then estimating the standard deviation of all data and estimating the lower and upper limits for each sample.

RESULTS AND DISCUSSIONS

Chemical composition of vegetables seeds: -

Chemical Composition of Pumpkin seed:

Table 1 shows the findings of the chemical analysis of air-dried apricot kernel powder,

roselle seed, and pumpkin seed. The moisture content of the air-dried pumpkin seed was 4.38%. These seeds can be kept in storage for a long time without going bad thanks to their low moisture content. 34.82% of the oil content was discovered. However, this proportion was lower than other European variations, i.e., 54.9%, Murkovic *et al.*, (1999), and Egyptian variants, i.e., 51.0% El-Adawy and Taha (2001). They did, however, report greater values (21.9–35.0%) when compared to species in African nations Younis *et al.*, (2000). As a result, pumpkin seeds can be used as a source of vegetable oil in a wide range of commercial and domestic applications. The protein content found in this study (45.23%) (Table 1) was much higher than that of C. pepo (26.5%) found in AlKhalifa's (1996) study. Protein content in fruits can vary. This variation is caused by the diversity of the habitat and the species, which is consistent with Achu *et al.*, (2005). In general, pumpkin seeds contain a lot of protein. According to some authorities, it can provide adults' 23.6 g/100 g daily protein requirements. Ajayi and others (2006). For C. maxima and C. pepo, the total ash content of 10% was higher than that found by some researchers, Idouraine *et al.*, (1996); Alfawaz, (2004); and higher than the others. Younis *et al.*, (2000); Al-Khalifa (1996). When compared to 12.1% for C. pepo and C. maxima Lazos, (1986), crude fiber content (1.93%) was low. The usage of dehulled seed samples may be to blame for the low level of crude fiber. A 2.01% starch content was discovered.

Roselle seed's Chemical composition:

Chemical composition of RS is given in Table 1. The moisture content was (6.74%) this percentage is agreed with Mokhtari *et al*., (2018) who report the moisture content in Roselle seeds is (6.32%) These seeds are suitable for long-term storage due to their low moisture content. The oil content was (23.09%) this percentage is higher than that found in Mokhtari *et al*., (2018) who found the oil content in Roselle seeds (21.03%) and also higher than that found in Naeem *et al.,* (2017) it was (20.25%). The varying farming circumstances in various places may be the cause of the variations in oil percentage in the seeds. The protein content was (27.41%) The great nutritional value of hibiscus seeds as a food source is demonstrated by the high percentage of protein and oil in these seeds. This protein proportion is less (30.33%) than that discovered by Naeem *et al*., (2017) but higher than (26.62) that found by Mokhtari *et al*., (2018). Crud fiber content (19.77%) was in good agreement with that mentioned by Mokhtari *et al.*, (2018) but also so much higher than (4.32%) that mentioned by Naeem *et al*., (2017). carbohydrate content was (20.55%) lower than (34.16%) that found with Naeem *et al*., (2017) Ash content was (2.44%) this low percentage of ash is reflecting the high nutritional value of Roselle seeds.

Chemical Composition of Apricot seed:

The chemical compositions of Apricot seeds are illustrated in Table 1. moisture was found to be (4.03%) this moisture Compared to the moisture content (4.30 - 5.43%) that reported by Stryjecka *et al*., (2019). but, lower than (9.43%) that found by Attia, (2000). Oil content was (40.15%) This percentage is agreed with that (44.2%), (48.95%) and (42.2-57.2%) that found by Stryjecka *et al*., (2019), Attia, (2000) and Musa, (2010) respectively. In contrast to other seed oils like soybean (18–22%), cottonseed (12–50%), rapeseed (40–48%), and olive (12–50%), it is a good source of oil. Protein content of apricot seeds reached (27.63%). This proportion is well-aligned with Musa, (2010), Stryjecka *et al*., (2019) and Attia, (2000) where they record the protein content (15.1-24.2%), (14.9-19.2%) and (28.2%) respectively. Ash content was (3.12) while in Attia, (2000) was (2.15%) and in Stryjecka *et al*., (2019) was (3.07-4.82%). Fiber content was (3.52%). That is agree with Attia, (2000) who found fiber content (2.85%). But also, this percentage is lower than (5.17-9.17) that found with Stryjecka *et al*., (2019). The carbohydrate content was found to be (20.11%). This percentage is larger than what several authors have claimed. Attia, (2000) who found the carbohydrate content is (16.7%). Similar outcomes were reported by Kamel and Kakuda (1992) and Femenia *et al*., (1995).

Fatty acid composition: -

Fatty acid Profile of pumpkin seed oil:

Table 2 lists the fatty acid composition of *(Cucurbita Maxima).* Twelve fatty acids were found in oil, of which oleic acid was the predominant one and represented 43.75% of the ratio in *(Cucurbita maxima)* seeds, followed by linoleic acid at 31.17% and total unsaturated fatty acids at 75.17%. The next significant fatty acid in PSO was palmitic acid, which made up 14.24% of the total, followed by stearic acid, which made up 9.06%, for a total of 24.5% saturated fatty acids. PSO also contained a negligible amount of linolenic acid (0.25%). These values resemble those discovered by Nyam *et al*., (2009).

Fatty acid Profile of Roselle seed oil

The fatty acid profile of roselle seed oil *(Hibiscus Sabdariffa L.)* was reported in table 2. The major fatty acids in roselle seed oils were linoleic acid (54.35 %) as polyunsaturated fatty acid and oleic (26.54 %) as monounsaturated fatty acids, and palmitic acid (12.39 %) and stearic acid (4.02%) as saturated fatty acid. Total unsaturated fatty acid was (81.9%). While total saturated fatty acid was (17.58%). Also, Linolenic acid was found in a small percentage (1.01%) this small percentage gives the oil an advantage in terms of nutritional value. These results were greater than that reported by Emmy *et al*., (2008) and El-Adawy and Khalil (1994). But it comes close to that reported by Ahmed and Hudson (1979) and Mohamed *et al*., (2007).

Fatty acid Profile of apricot seed oil

Chemical composition of apricot (*Prunus armeniaca)* seed oil was Tabulated in table 2. The predominate fatty acid of apricot kernel oil was oleic acid [65.43%]. Followed by linoleic acid [26.70%]. And palmitoleic acid was found in trace amount [0.80%]. While linolenic acid was [0.12%]. Thus, the proportion of unsaturated fatty acids was (93.29%). Oleic and linoleic acid-rich oils are crucial for human nutrition and comprise a large part of the diet. The main saturated fatty acid was palmitic acid with a low percentage (5.18%). Followed by stearic acid [1.30%). The percentage of saturated fatty acid was (6.69%). These outcomes correspond to those mentioned by Femenia *et al*., (1995), Musa, (2010), Kamel and Kakuda (1992) and Attia (2000).

Antioxidant activities of extracted oils

Antioxidant activities of pumpkin seed oils: The result of antioxidant activities of pumpkin seed oil was given in table 3. The radicals scavenging activity (R.S.A) of *(Cucurbita Maxima)* ranged from (28.14%) with 10 mg of oil to (69.92%) with 40 mg of oil. Using the ability to scavenge 2,2-diphenyl-1-picrylhydrazyl (DPPH) radicals, Potonik *et al*. (2018) studied the antioxidant activity of PSO owing to roasting temperature. PSO was generated from the extraction of Slovenian-produced Rustikal hybrid and Gleisdorf pumpkin seeds. At the same PSO concentrations, the results showed that the antiradical activity levels in the Gleisdorf and Rustikal samples were 31.4-70.6% and 19.3-47.7%, respectively.

Antioxidant Activities of Roselle seed oil: the radicals scavenging activities of the Roselle seeds are shown in Table 3. Four samples of oil were made according to the weight from (10mg) of oil to (40 mg) and the results were (24.75%,41.15%,57.55%,73.95%), respectively, This outcome was comparable to those attained by Rimamcwe and Chavan (2017) as well as Cissouma *et al*., (2013).

Antioxidant Activities of apricot seed oil: Antioxidant activity in ASO was determined and the percentage of radical scavenging activity (R.S.A%) was given in table 3. it was determined by making four sample (10,20,30 and 40mg oil) and the results were (15.23%,26.91%,38.58% and 50.26%), respectively, and the reason for this high antioxidant activity is because apricot seed oil contains a variety of bioactive substances, including as polyphenols, beta-carotene, and tocopherols.

Total Phenolic Content

Total Phenolic Content of pumpkin seed oil:

The results of total phenolic content in PSO were tabulated in Table 4. TPC in pumpkin was (209.09 ± 36.8 μg gallic acid/ 1g oil) and the amount of oil sample that can scavenge 50% of free radical DPPH (EC50) was (25.69) and antiradical power (1/EC50) was (38.93). TPC Changed from oil to oil. Although large variation (50-1000 mg/kg) have been observed, Normally, the values range from 100 to 300 mg/kg. The cultivar, the extraction technique, and the processing and storage conditions are important phenolic compound factors. Boskou (2006). Türkman *et al.*, (2017) reported that Six genotypes of Cucurbita pepo seeds have TPC ranging from 0.25 mg GAE/100 ml to 0.35 mg GAE/100 ml.

Total Phenolic Content of Roselle seed oil:

The results of Total phenolic content in roselle *(Hibiscus sabdarifa L.)* seed oil was given in table 4. TPC was found to be (115.50 ± 13.92 μg gallic acid/ 1g oil), the amount of oil sample that can scavenge 50% of free radical DPPH (EC50) was (25.4) and the antiradical power (1/EC50) was (39.37). A diet rich in polyphenols may aid in the treatment of diabetes or prevent obesity, according to research by Tsuda *et al*. (2003) and Al-Okbi *et al.,* (2017). Total phenolics (56.31 mgGAEg1) and total tocopherol (99.86 mg/100 g).

Total Phenolic Content of Apricot seed oil:

The percentage of total phenolic content of ASO was given in Table 4. TPC was found to be (365.8 ± 47.3 μg gallic acid/ 1g oil), the amount of oil sample that can scavenge 50% of

free radical DPPH (EC50) was (39.73) and Antiradical power = 1/EC50 was (25.17). The TPC of a few distinct apricot cultivars was examined by Rapisarda *et al*. (1999), who found levels ranging from 58.4 to 309.5 mg GAE/100 g. According to Drogoudi *et al*. (2008), results might range from 30.3 to 742.2 mg GAE/100 g, depending on the cultivar.

Tocopherol Content in Vegetable Oils:

Total Tocopherol Content in Pumpkin Seed Oil

The results of total tocopherol content of (Cucurbita maxima) was shown in table 5, and was found to be (250mg\kg). This discovery supported what was previously published by Lazos *et al.,* (1995), Vogel (1978), reported an average of 338 mg/kg of total tocopherol.

Total Tocopherol Content in Roselle Seed Oil:

Total tocopherol content in roselle *(Hibiscus Sabdariffa L.)* seed oil was illustrated in table 5. and was found to be (298mg\kg). Different authors were study tocopherol in RSO. Mohamed *et al*., (2007) found that Tocopherol concentrations in leaves and seeds (229 and 208 nmol/g, respectively) were relatively similar overall. While other study by Naeem, *et al*., (2019) found that the TTC was (290mg\kg). Al-Okbi *et al*., (2017) found that Total tocotrienol concentration was 3.48 mg/100 g oil, but TTC was 96.2 mg/0.26 g oil.

Total Tocopherol Content in Apricot seed oil:

TC in apricot *(Prunus armeniaca L.)* seed oil was given in table 5. And was found to be (159mg\kg). This result was in line with that published by Górna *et al.,* (2017) showed that the total tocochromanol content ranged from 78.8 to 258.5 mg/100 g in oils from 15 apricot genotypes. Based on cultivars and geographical locations, several tocochromanol isomers were present. however, it is lower than that of Turkish cultivars by Turan *et al*., (2007); Uluata (2016) found that oils had a tocopherol content that varied between 346.53-563.40 mg/kg. moreover, lower than 330.8-520.8 mg/kg in Pakistani oil types Manzoor *et al*., (2012).

CONCLUSION

The findings of this study support the fact that these unconventional resources constitute a significant source of edible oil, and the oil they produce contains many beneficial compounds like antioxidants and antibacterial agents. In addition, tocopherols, sterols, and polyunsaturated fatty acids are present. Due to the high levels of phenolic compounds and tocopherols, pumpkin seed oil is a valuable oil with useful oil characteristics and demonstrates a variety of biological activities, most notably antioxidant activity. A new affordable source of edible oil that is good for human consumption and health is roselle seed oil., also could be used as a source of tocopherol, phenolic content, antioxidant compounds and unsaturated fatty acid. Apricot seed is considered as a byproduct in jam industry, while it was clear from this study that the apricot seed could be an important source of oils. A large portion of the unsaturated fatty acids in apricot kernels. High oil yields (> 50%) in apricot kernels are equivalent to other commercial seed oils' oil yields. His oil contained significant levels of tocopherol and total phenolic content as well as antioxidant chemicals, which all reflect the excellent nutritional potential of apricot seed oil as edible oil.

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Table1: Nutritional composition of Pumpkin, Roselle, and Apricot seeds

Parameter	pumpkin	Roselle	Apricot
Moisture Content (%)	4.38	6.74	4.03
Oil Content (%)	34.82	23.09	40.15
Protein Content (%)	45.23	27.41	27.63
Ash Content (%)	10	2.44	3.12
Fiber Content (%)	1.93	19.77	3.52
Carbohydrate content (%)	2.01	20.55	20.11

Table 2: Fatty acid composition of Pumpkin, Roselle and Apricot seed oil

Fatty acid	Pumpkin	Roselle	Apricot
Myristic acid [C14:0]	0.1	0.12	0.02
Palmitic acid [C16:0]	14.24	12.39	5.18
Palmitoleic acid[C16:1]	0.06	0.23	0.8
Margaric acid [C17:0]	0.09	0.06	0.04
Heptadecenoic acid [C17:1]	0.07	0.1	0.12
Stearic acid [C18:0]	9.06	4.02	1.3
Oleic acid [C18:1]	43.75	26.54	65.43
Linoleic acid [C18:2]	31.17	54.35	26.7
Linolenic acid [C18:3]	0.25	1.01	0.12
Arachidic acid [C20:0]	0.78	0.63	0.13
Gadoleic acid [C20:1]	0.18	0.17	0.12
Behenic acid [C22:0]	0.23	0.36	0.02
Total saturated fatty acids	24.5	17.58	6.69
Total unsaturated fatty acids	75.17	81.9	93.29

Table 3: Antioxidant Activities of extracted oils

Sample name	Oil weight (mg)	RSA %
Pumpkin Cucurbita Maxima	10	28.14 ± 1.2
	20	42.07 ± 0.5
	30	55.99 ± 0.1
	40	69.92 ± 0.8
Roselle	10	24.75 ± 0.2
	20	41.15 ± 0.1
	30	57.55 ± 0.5
	40	73.95 ± 0.8
Apricot	10	15.23 ± 3.9
	20	26.91 ± 3.4
	30	38.58 ± 2.9
	40	50.26 ± 2.4

Table 4: Total Phenolic Content of Vegetable seed oil

Sample	TPC	EC50	1/EC50 *1000
	μg gallic acid/ 1g oil		
Pumpkin	209.09 ± 36.8	25.7	38.93
Roselle	115.50 ± 13.92	25.4	39.37
Apricot	365.8 ± 47.3	39.7	25.17

Table 5: Total Tocopherol Content of extracted oils

sample name	total tocopherol content (mg\kg)
Pumpkin	250
Roselle	298
Apricot	159

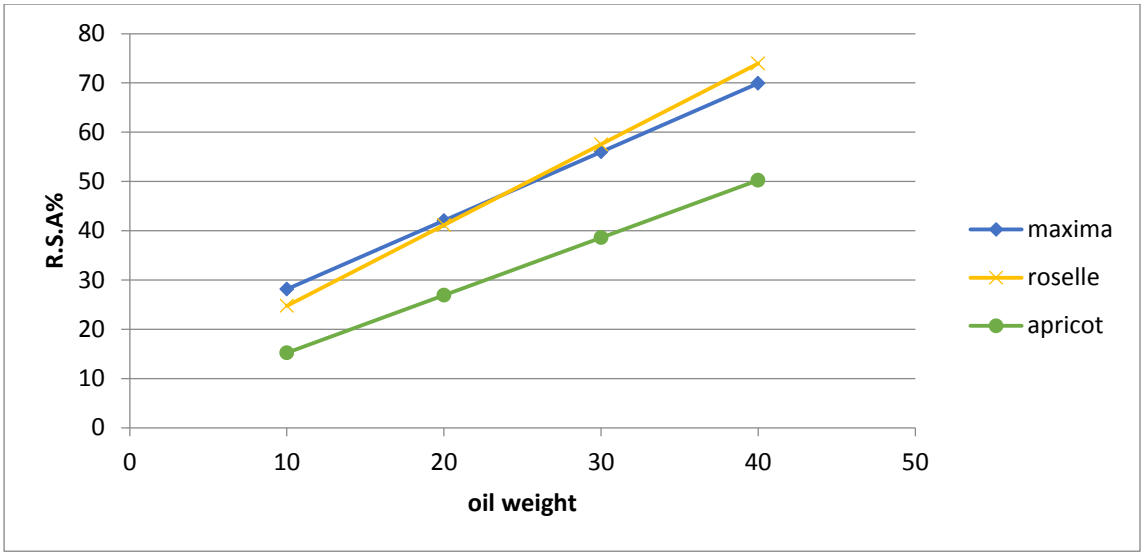

Figure 1: Radical scavenging activity (R.S.A %) of vegetable seeds oil

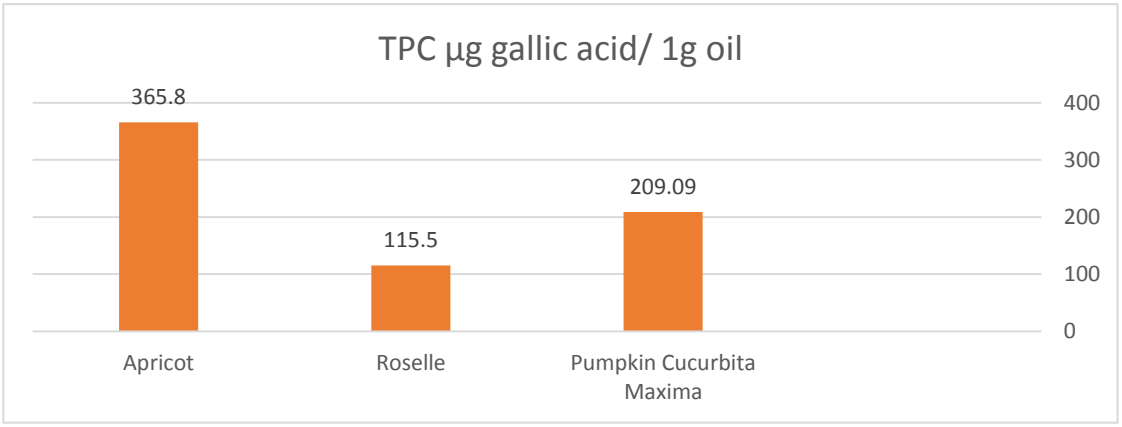

Figure 2: Total Phenolic content (TPC)

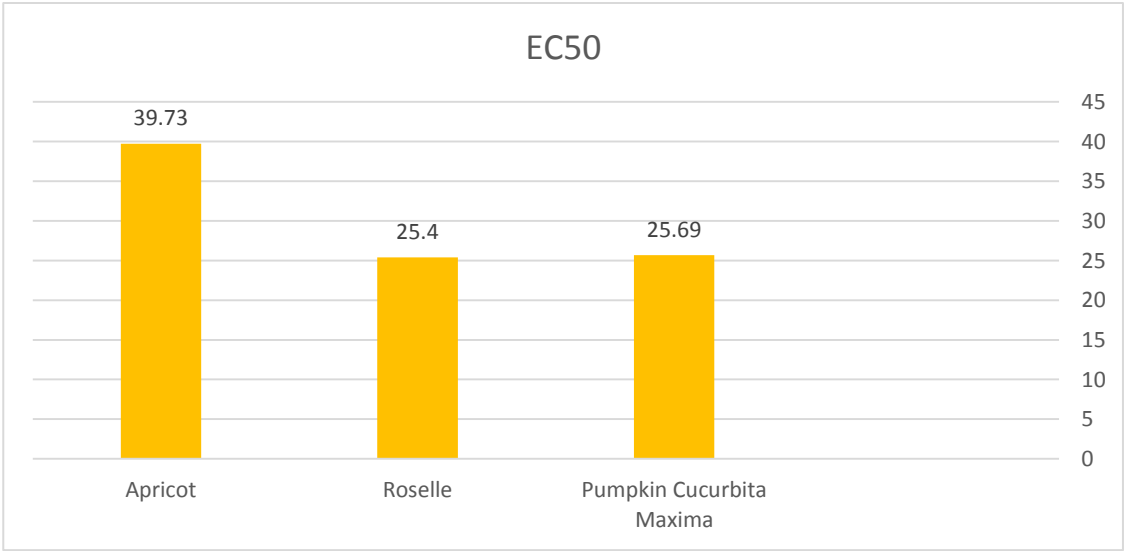

Figure 3: EC50= the amount of oil sample that can scavenge 50% of free radical DPPH·

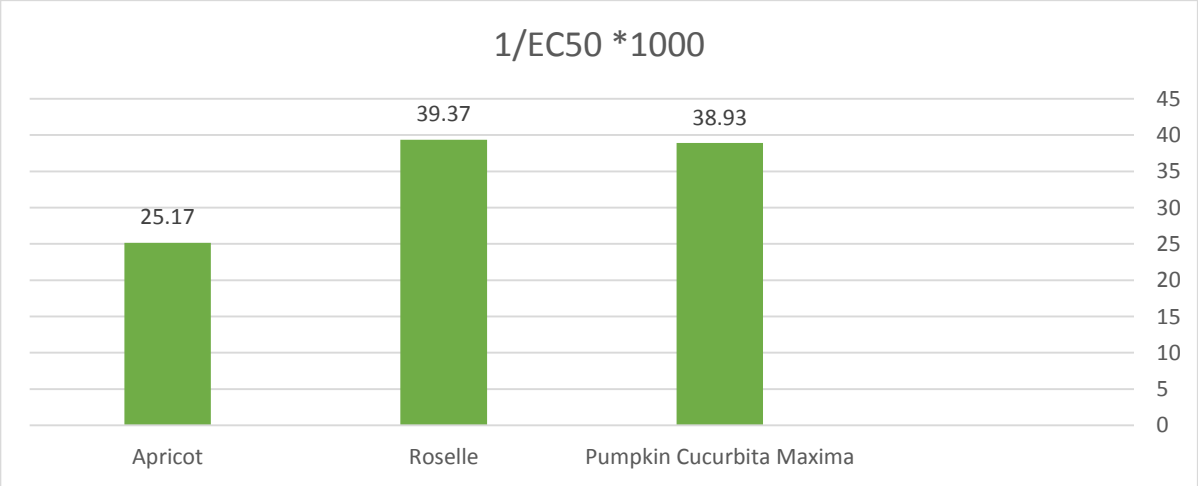

Figure 4: Antiradical power = 1/EC50

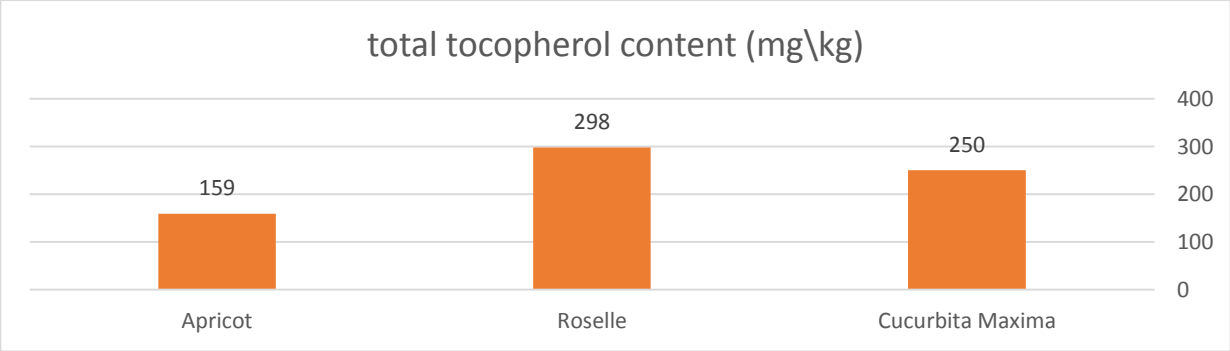

Figure 5: total tocopherol content of pumpkin, roselle and apricot seed

تقدير التوكوفيرولات والمركبات الفينولية الكلية والنشاط المضاد للأكسدة لبعض الزيوت النباتية غير التقليدية

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الملخص العربي

في السنوات الأخيرة لوحظ تزايد الطلب على الزيوت لذلك بدأ الباحثون في البحث عن مصادر جديده للزيوت. في هذه الدراسة هناك أنواع من زيوت البذور النباتية تم دراستها هم زيت بذور (القرع العسلي، الكركدية/ المشمش) وكانت نسبة الزيت في البذور الثلاثة كالتالي 34.82, 23.09, 40.15 على التوالي. وقد وجد ان هذه الزيوت من نوع الزيوت غير المشبعة، حيث بلغت نسبة الاحماض الدهنية غير المشبعة حوالي 79.21,82.24,93.29% على التوالي. وجد أيضا ان هذه الزيوت تحتوي على نسبه عالية من الفينولات حيث تراوح المحتوي الكلي للفينولات في زيت بذور القرع العسلي من (209-529ميكروجرام حمض جاليك\1جرام زيت) في حين بلغت في زيت الكركدية النسبة (115.50ميكروجرام حمض جاليك\1جرام زيت) بينما في المشمش فكانت نسبة الفينولات (365.8ميكروجرام حمض جاليك\1جرام زيت) أيضا محتوي عالي من مشتقات فيتامين (هـ) التوكوفيرول في هذه الزيوت وقد تبين ان نسبة التوكوفيرول في زيوت بذور كل من القرع العسلي والكركديه والمشمش هي (250,298,159 مليجرام\كجرام زيت) على التوالي. من هذه النتائج اتضح ان هذه الزيوت مصدر غني بالمغذيات مثل الفيتامينات ومضادات الأكسدة وكذلك يمكن استخدامها كزيوت غذائية.

الكلمات الاسترشادية: الزيوت الغذائية، المصادر الغير تقليدية، مضادات الأكسدة، الفينولات الكلية، القرع العسلي.