Effect of Home-Processing on The Antioxidant Properties of Apricot Products

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ABSTRACT

This paper seeks to examine the effects of processing apricots at home in different ways on the antioxidant activity. Raw, boiled, puree, juice and apricot jam that were processed at home were examined for their total carotenoids, total flavonoids (TF), total phenolics (TP) and total antioxidant activities. The results showed that apricots are rich in fiber and mineral, the most important of which are potassium and phosphorus. Puree and jam had the highest total phenolics and total flavonoids content compared to raw apricot, boiled and juice. In addition, puree, and jam had the highest total antioxidant activities compared to other products. There were no significant differences in the carotenoids content among raw, boiled, puree, jam and Juice of apricot. This research provides detailed analysis to examine the effects of different methods of apricots' home processing on the antioxidant potential of different apricot products.

Keywords: Apricot; Total phenolic; Total flavonoids; Carotenoids; Total antioxidant activities; Home-processing.

INTRODUCTION

Apricot is the commonly used name of *Prunus armeniaca*L. (Rosaceae), which is a fruit known for its sweet taste. It is also known as *Armeniaca vulgaris* L. in Latin It is a fruit that is cultivated in a well differentiated seasonal environment. Apricot grows in a relatively cold weather and quite high temperatures in spring and early summer (Ahmadi *et al.*, 2008). The plant is between 2 to 10 m tall and its fruits kernel are generally hard not soft. Apricots ripen toward the end of July and the beginning of August. Yet, the harvest varies depending on the climate in these months. The flavor of the apricots is distinctly sweet with a delicious smell, and taste. Its color varies between yellow, orange, with an exterior reddish cover, which is connected with apricot quality parameters (Erdogan-Orhan & Kartal, 2011).

Customers across the globe like this delicious fruit and it has its own great economic value for many years. People like to eat fresh, frozen and dried apricots or they may make it juice, jam, nectars, pulp, orange and apricot jam, jellies, and other edible products (Chauhan *et al*., 2001). Moreover, according to Yildiz *et al*. (1994), oil for cooking, cosmetic products, benzaldehydes and active carbon are extracted from the kernels of the apricot.

Apricots have mutli-nutritional and medicinal values; Iordanescu and Micu (2012) argued that apricots are recommended for vitamin A deficiency, anemia, mental and physical fatigue, stress, and depression. Apricots are useful for the nervous system and they strengthen immunity of the body and natural response, since apricots result in an alkaline action, as they maintain the balance of the acid in the body tissues and blood. Apricots can reduce the acidity arising from eating meals that contain too much meat and flour ingredients. Apricot is rich with the main minerals such as Mg, Ca, and K (Drogoudi *et al*., 2008). Also, Apricot is rich with the lycopene substance that protects from cancer, heart disease, and reduces cholesterol in the body. Samples of apricots have been examined to find out their antioxidant impact, their effect on improving human health has been shown (Leccese *et al*., 2010). It has been found out that apricots are very rich with compounds that have an antioxidant effect such as vitamin C, carotenoids, and polyphenols (Fratianni *et al.,* 2018).

The fresh apricot contains rich volatile compounds, vitamins K and C, carotene, thiamine, and niacin. Terpenoids, phenols, carbohydrates, esters, and organic acids have also been isolated (Sefer *et al*., 2006). Apricot kernels contain a huge quantity of dietary protein, along with important quantities of oil and fiber (Hacıseferoğulları *et al*., 2007). Apricot is a seasoned fruit that does not last long due to the increasing rate of breath and short period of ripening (Egea *et al*., 2007).

Apricot is anexpensive fruit that is not accessible as a raw fruit in many nations. As a result, there is acapability for the manufacture of apricot to make products from raw apricots in order to satisfy market demands and for economic gain. Products from apricot are extremely demanded by customers due to their unique aroma, taste, and nutritional benefit.

Various techniques of conservation, including canning, packaging, drying, freezing in controlled air environments (Jimenez *et al*., 2008) and processing into different products, have been created to extend the shelf life of apricot. Nevertheless, we cannot

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ignore the fact that processing may affect the ratio of the nutrient components. The loss of nutrients in fruit and vegetables depends on the kind of food, processing temperature, processing time and how the food is stored (Murcia *et al*., 2001). Some methods of preservation may also cause the depletion of the antioxidants that occur naturally in foods, and consequently reduce their health protection effect (Kalt, 2005).

The present work was conducted to assess the impact of home-processing on the antioxidant capacity apricot pulp and compared it with non-processed apricot.

MATERIALS AND METHODS

Materials

About 5kg of fresh apricot which were brought from a small market of vegetables and fruits in Alexandria Governorate, Egypt.

Solvents and chemical substances used in this study were obtained from El-Gomhorya Company and faculty of Agriculture Alexandria, Egypt.

Methods

Preparation of apricot products

The apricot fruits were variously processed at home resulting in different types of apricot products including puree, boiled, juice, and jam as shown in Figure 1.

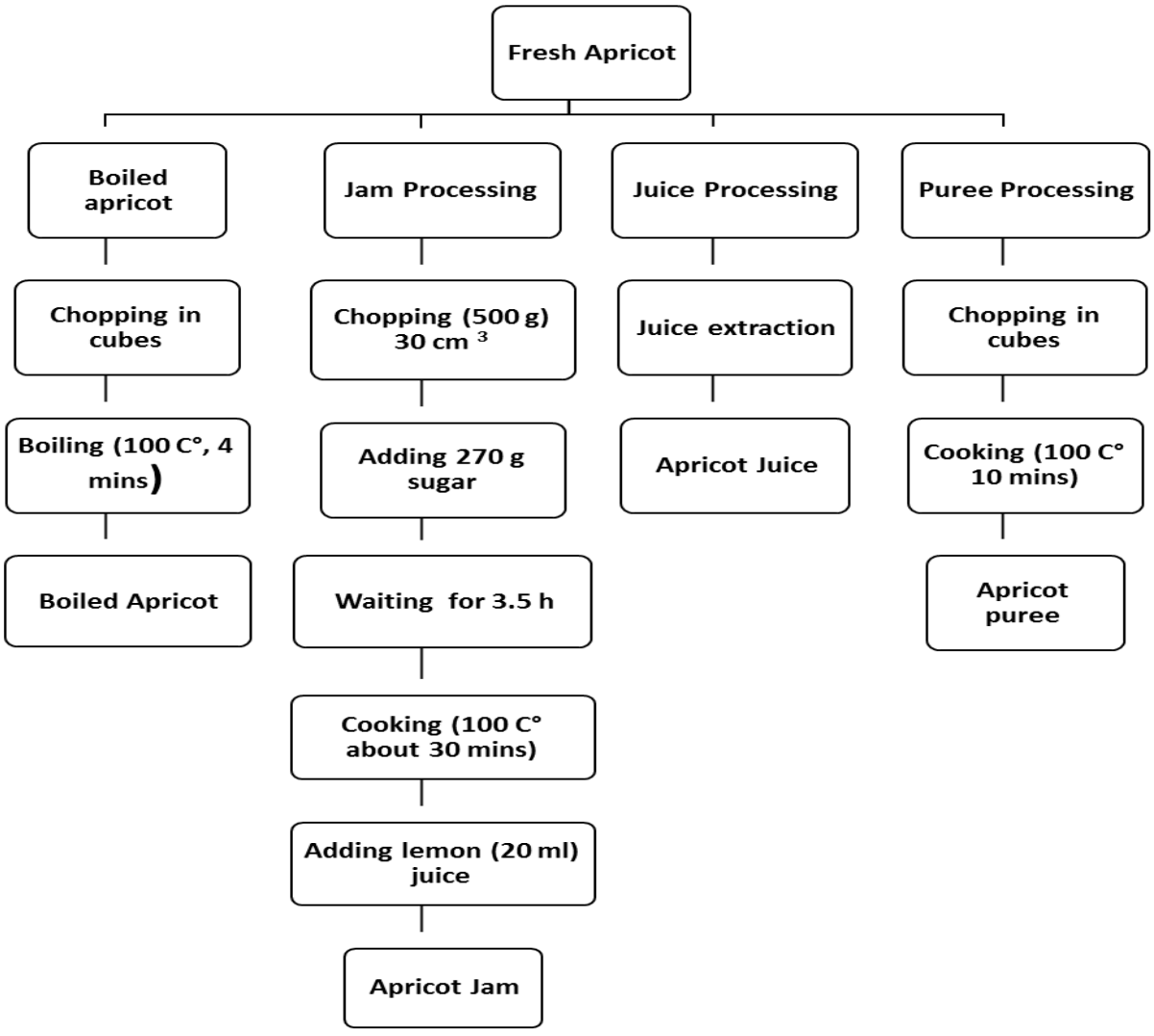

Fig. 1. Home processing methods of boiled, jam, juice and pureed apricot products

Determination of proximate composition

Moisture, ash, protein and fat content were determined according to AOAC (2007). The total carbohydrates content was calculated by subtracting 100% of the total protein, fat, moisture and ash content.

Mineral analysis

The AOAC (1990) method was used in the determination of mineral contents of apricots.0.8–1 g of apricot samples were heated at a temperature of 550 ± 10°C for 6 hours in a muffle furnace and the remaining ash was left in a water bath with 5-ml 6 M HCl. 7-ml 0.1 M HNO_3 was added then the contents were diluted to 100 ml with double-deionized water as outlined by Nielsen, (1994). Manganese (Mn), iron (Fe), copper (Cu), calcium (Ca) , selenium (Si), magnesium (Mg), and zinc (Zn), were determined by (ECIL Atomic Absorption Spectrophotometer -4141). potassium (K) and sodium (Na) were determined by flame photometer (Systronics-130) and phosphorus (P) using a spectrophotometer (SystronicsIndia UV-vis 108).

Extract Preparation

Three separate quantities from each sample were conducted using acidified (0.1 per cent formic acid) aqueous-methanol (75 per cent) as outlined by Capanoglu *et al*. (2008). Five grams of each sample were extracted with 5 mL of extraction solvent and were put in an ultrasonic bath (Azakli, Istanbul, Turkey) for fifteen min, then the samples were centrifuged by Hettich Zentrifugen Universal 32R, Hettich Zentrifugen, Tuttlingen, Germany for 10 min at 4000 rpm at 5 °C and the supernatant has been gathered. A further 5 mL of extracting solvent was added to the pellet and the extraction operation was repeated. Two supernatants were combined and stored at -20 °C until assessment was done.

Determination of total phenolics content

To determine the total phenolics content (TP), the reagent Folin-Ciocalteau was used, based on a technique modified by Singh *et al*. (2002). An extract of 200µL of the sample was added to 1 mL of newly prepared Folin-Ciocalteau reagent (the proportions were 1:10, υ/υ with MQ water). Subsequently, 0.8 mL 7.5% sodium carbonate solution was added. The extraction was left for thirty minutes at room temperature and the absorbance was recorded using a UV-Vis spectrophotometer at 765 nm, (Shimadzu UV-1700; Shimadzu Corporation, Kyoto, Japan). Results were presented as mg gallic acid equivalents (GAE) per 100 g of wet weight of the fresh sample.

Determination of the total flavonoids content

The total content of the flavonoids (TF) was identified using the technique of Čanadanovic´-Brunet *et al*. (2011). one mL of sample extract was added to 4 mL of distilled water and 300 µL 5% NaNO2 solution. The mixture was left for five minutes and then 300 µL of 10% $AlCl_3$ and 2 mL of 1 M NaOH were added to the mixture after an additional 6 min of incubation. The final volume was reached up to10 mL with MQ water. The TF content of extracts was determined as rutin equivalents (RE) and absorption was evaluated at 510 nm per 100 g of wet weight of fresh apricot.

Determination of the total antioxidant capacity

The total antioxidant capacity (TAC) of the extracted samples was assessed through the use of DPPH (1,1-diphenyl-2-picrylhydrazyl) test. The DPPH assay was conducted as outlined by Ravichandran *et al.* (2012). Six mL of the stock solution of DPPH (1^{x} 10-3 M) were diluted in 100 mL of 75% methanol to get the reaction of DPPH solution. After that, 100 µL of each sample extract was blended with 3.9 mL of DPPH reaction solution. After 30 minutes of dilution the absorbance of the blend was measured at 515 nm.

The IC_{50} is described as the concentration of antioxidant required to reduce the initial DPPH concentration at least to 50%. The IC_{50} of the samples was obtained from the percentage scavenging activity vs. concentration plot and it is expressed as mg/ml.

Determination of the total carotenoids content

The carotenoid content was measured according to Choi *et al*. (2002). One gram of the sample was added to 10 ml of extracting solution (hexane: ethanol: acetone, 50:25:25, v/v/v). The top layer of hexane containing carotenoids was restored after the expulsion for 10 min at 5000 rpm, next the absorbance was estimated at 430 nm. To measure the carotenoid content reference a calibration curve was employed by using β-carotene.

Statistical analysis

By using IBM SPSS program (version 20.0), the data were analyzed (Armonk, NY: IBM Corporation). Also, using mean and standard deviation of quantitative data were explained. The obtained results are considered significant when measured at the 5% level (Kotz *et al.*, 2006). To compare between two groups under study, the normally distributed quantitative variables were used (t-test).

RERSULTS AND DISCUSSION

The proximate chemical composition of apricot fruit

The proximate chemical composition of raw apricot is shown in Table (1).The values of moisture, protein, lipids, ash, carbohydrate and calories were found to be 84.00 ± 0.15, 0.80 ± 0.35, 0.55 ± 0.13, 5.16 ± 0.51, 9.49 ± 0.50 (g/100g WW) and 46.11±0.48 (K cal/ 100g), respectively.

An overview of the chemical composition of apricot fruit in previous researches shows that the chemical composition of apricot fruit varies according to its varieties (Iordanescu *et al*., 2012), agricultural practices (Leccese *et al.* 2010), ripening (Ayour *et al*., 2017), geographical region (Campbell *et al*., 2011), and processing or conservation technology (Hussain *et al.* 2013).

Hacıseferoğulları *et al.* (2007) noted that the concentration of carbohydrate in fresh apricots ranges from 11 to 13 percent and provides 50 kcal of energy per 100g on wet weight basis. Fats and proteins are exist in small quantities in the apricot fruit; but, the kernel of the apricot has significant quantities that vary from 20-30 percent to 40-52 percent (Alpaslan and Hayta, 2006).The percentage of protein and fat in apricot fruit ranged between 1.4-2.0% and 0.4-0.6%, respectively. Also, Ali *et al*. (2015) found that on dry weight basis, it has an elevated dietary content of sugars (over 60%), total minerals (4%), proteins (8%),crude fat (2%), crude fiber (11.50%), vitamins(extremely rich in vitamins B, C, and K complex) and sensible amounts of organic acids (malic acid and citric acid).

The mineral content of apricot fruit

The elements contents in fresh apricot are shown in Table 2. Potassium was the most abundant mineral in apricot. The range of potassium content was 292.0±0.69, further, it is followed by phosphorus, calcium and magnesium (17.0± 0.14, 13.0± 0.84 and 8.0 ± 0.05, respectively). The contents of Fe and Si were 0.51 ±0.03 and 0.39 ± 0.25 mg/100g WW, respectively. Fresh apricot contained a low amount of sodium and manganese (1.0 ± 0.04 and 0.05 ± 0.04 mg/100g WW, respectively).

These results are consistent with the findings found by Ali *et al.*, (2011) that apricots contain different quantities of essential minerals. The main components are magnesium, phosphorus, selenium, potassium, iron and calcium),while copper, manganese, sodium and zinc are also present in small quantities (USDA, 2005).

Wani *et al*. (2015) found a major variation ($P \leq 0.05$) in the mineral quantities in the examined apricot flesh (Chinese, Tilton, Rival, Cuminis Haley, Margulam, Harcot, Narmu, Halman, Khante, Cuba and BadamChuli). In the apricot species, Ca, Zn, Fe, Cu, Na, Mg,, K, P and Mn were found in the range of 15.62–372.66, 0.5–6.74, 0.9–12.62, 0–0.82, 14.85–28.06, 23.35–64.29, 2,150–5,416.66 , 9–696, and 0–0.98 ppm, respectively. Zn, Cu, and Mn minerals were found in the samples but in very small amounts while Fe, K, P, Ca, and Mg levels were found in macro amounts in the species studied. Potassium, Mg, and Ca are considered as the major apricot fruit minerals (Drogoudi *et al.*, 2008). It is known that magnesium is vital to the metabolism of chlorophyll and to the proteins synthesis, lipids, and carbohydrates. The deficiency of this element results in a reduced concentration of carotenoid (Negrea *et al.*, 2012). Hussain *et al.* (2010) revealed that the amount of Fe in apricots ranges from 1.4 to 2.4 mg 100 g-1, based on the apricot types. Minerals level in the varieties of the studied apricot may be genetically changed and affected by environmental situations. It is known that minerals in crops differs according to the composition of the soil in which the plant is implanted (Soetan *et al.*, 2010).

Table 1. Proximate composition of fresh apricot (WW %)

	Chemical composition (WW %)					
Fresh apricot	**Moisture (%)**	**Proteins (%)**	**Lipids (%)**	**Ash (%)**	**Total carbohydrates (%)**	**Calories (Kal/100g)**
	84.00 ± 0.15	0.80 ± 0.35	0.55 ± 0.13	5.16 ± 0.51	9.49 ± 0.50	46.11±0.48

Values represent means ± standard deviation of triplicates. *** Total carbohydrates calculated by difference.

Table 2. Mineral analysis (ppm WW) of fresh apricot

	Minerals Concentration (mg/100gWW)								
parameters	**Calcium (Ca)**	**Phosphorus (P)**	**Magnesium (Mg)**	**Iron (Fe)**	**Potassium (K)**	**Selenium (Si)**	**Manganese (Mn)**	**Sodium (Na)**	**Copper (Cu)**
Apricot	13.0± 0.84	17.0± 0.14	8.0 ± 0.05	0.51 ±0.03	292.0±0.69	0.39 ± 0.25	0.05 ± 0.04	1.0 ± 0.04	0.06± 0.03

Values represent means ± standard deviation, WW= Data presented on wet weight basis

PHYTOCHEMICALS IN APRICOT

Apricot contains different concentrations of phytochemicals like polyphenols (phenolic acids and flavonoids) and carotenoids which are responsible for their color, taste and nutrient benefits (Dragovic-Uzelac *et al.*,2007).

Total Phenolic Content

The findings obtained for the total phenolic contents of fresh and other apricot products showed that the puree sample contains 94.55 ±0.42 mg gallic acid equivalent (GAE)/100 g (Figure 2) compared to fresh sample. In addition, the total phenolic values were higher in jam (75.37 ± 0.87) than in the fresh sample (55.21 ± 0.62 mg GAE/100 g sample). This can be explained by the finding of Xu *et al.* (2007) that the free fraction of phenolic acids increased after heat treatment. Cooking has been shown to increase the vegetable phenolic content due to food dehydration and the increase of phenolic extraction in products (Schweiggert *et al.*, 2006).

Figure 2 shows that the steps of processing apricot (especially boiling) did not have considerable effect on the total phenolics value in comparison with fresh apricot ($P \leq 0.05$). In a similar study, Ornelas-Paz *et al.* (2010) pointed out that boiling apricots resulted in a gradual increase in the content of TP of all pungent taste from 1745.9 to 2549.7 µg GAE/g WW. Also, Turkmen *et al*. (2005) found that some processing methods (such as boiling) resulted in an increase (2–26%) in phenolic peppers content.

Moreover, when compared the total phenolic contents of puree (94.55 ±0.42) and boiled samples (58.61 ± 0.33), which had comparable preparation steps except for the last step in making puree, it could be stated that there was a statistically significant variation between them ($P \leq 0.05$). It is also noted that mechanical compression in making puree changed the total phenolic composition substantially ($P \leq 0.05$).

The lowest total phenolics content was exhibited for apricot juice (on wet basis), with a reduced total phenolics content compared to other samples (Figure 2). This outcome can be clarified by the degradation of phenols induced primarily by the enzyme polyphenol oxidase (Fang *et al.*, 2008).

The phenolic compounds found in apricots are (flavonoids and phenolic acids) and total phenolic content was registered at 50.00-563.00 mg GAE/100g on the basis of wet weight (Ali *et al*., 2011). Factors that result in variations in phenolic concentrations include agricultural and climatic factors, genotype, storage conditions and ripeness degree (Spanos and Worlstad,1992). Phenolics concentration level usually improves as the fruit grows and reaches the stage of full maturity; but, the level of phenolic components sometimes decreases as the fruit fully ripens (Dragovic-Uzelac *et al.*, 2007). However, some experiments have also shown elevated levels of phenolics in semi-mature apricots (Kalyoncu *et al.*, 2009).

The phenolic acids like isochlorogenic, neochlorogenic, chlorogenic, caffeic, β-coumaric, ferulic acids and p-coumaric components are the most common found in apricot (Sass-Kiss *et al*., 2005)

Iordanescu *et al*. (2018) indicated that the dynamics of total phenolics for different cultivated apricot species were linked with the maturation process and an important increase in total phenolics as the apricot fruit grows. Similar findings were achieved from Hegedüs *et al.* (2011). On the other hand, Cosmulescu *et al*. (2018) point out that the greatest amount of polyphenols was shown in non-ripen apricots, that reduced in semi-mature fruit, and did not alter significantly in ripe fruit.

The total content of flavonoid

The contents of total flavonoids in raw and in apricot processed at home are shown in (Figure 3). The Figure shows that puree preparation raised the content of total flavonoids in a wet sample to (83.21 ± 0.82 mg) in comparison with the total content of flavonoids of raw wet sample (49.16 ± 0.80 mg). In a similar study, puree preparation has been revealed to provide up to a double rise in the total flavonoids content of raw tomatoes on a fresh weight basis (Kamiloglu *et al*., 2014). On the other hand, the boiling method, which has comparable handling parameters with the process of making puree with the exception of the last step of pureeing, has comparable influence on puree preparation (Figure1). Moreover, puree and boiling preparation caused a significant statistically variation in the total contents of flavonoids of the raw apricot ($P < 0.05$). This increase in total flavonoids values may be linked to high levels of free extracted flavanols (Turkmen *et al.*, 2005).

The highest total flavonoids content was exhibited for apricot jam, having a high total flavonoids content in comparison to raw, boiled and juice. The methods of cooking is capable of inactivating the oxidase enzyme of polyphenol during heating, which inhibits the degradation of polyphenols (Chuah *et al*., 2008). Thermal processing may release more bound polyphenols from the breakdown of cellular constituents. Furthermore, heating may also deactivate apricot polyphenol oxidase and prevent the loss of polyphenols by enzymatic browning.

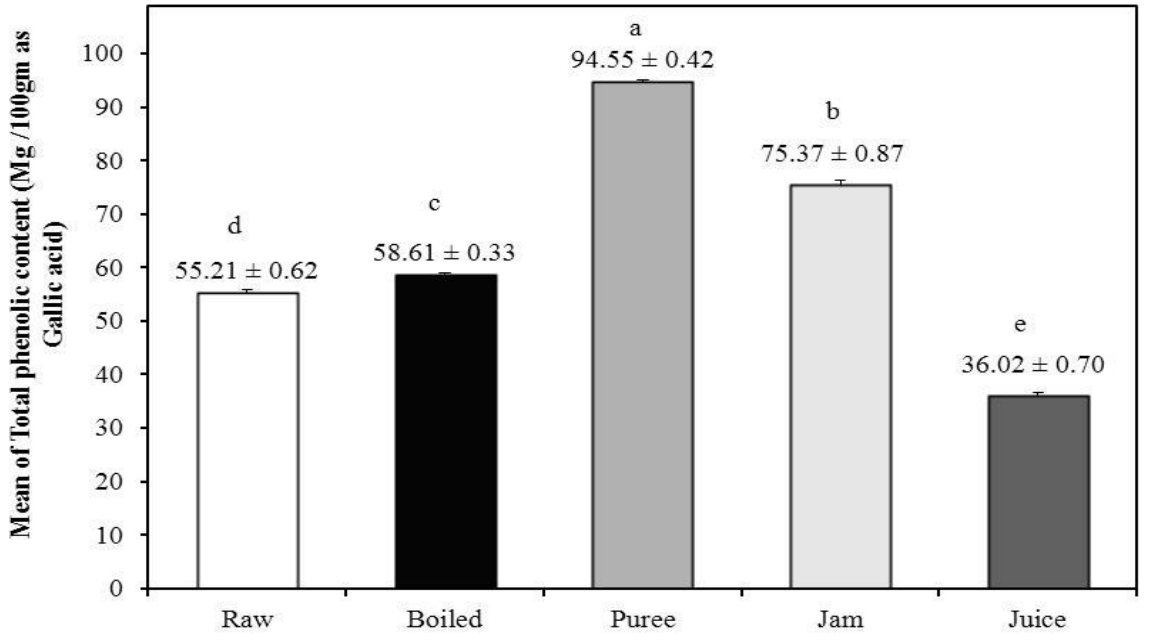

Fig. 2. Total phenolic content of home processing methods for apricot products (mg /100g as Gallic acid)

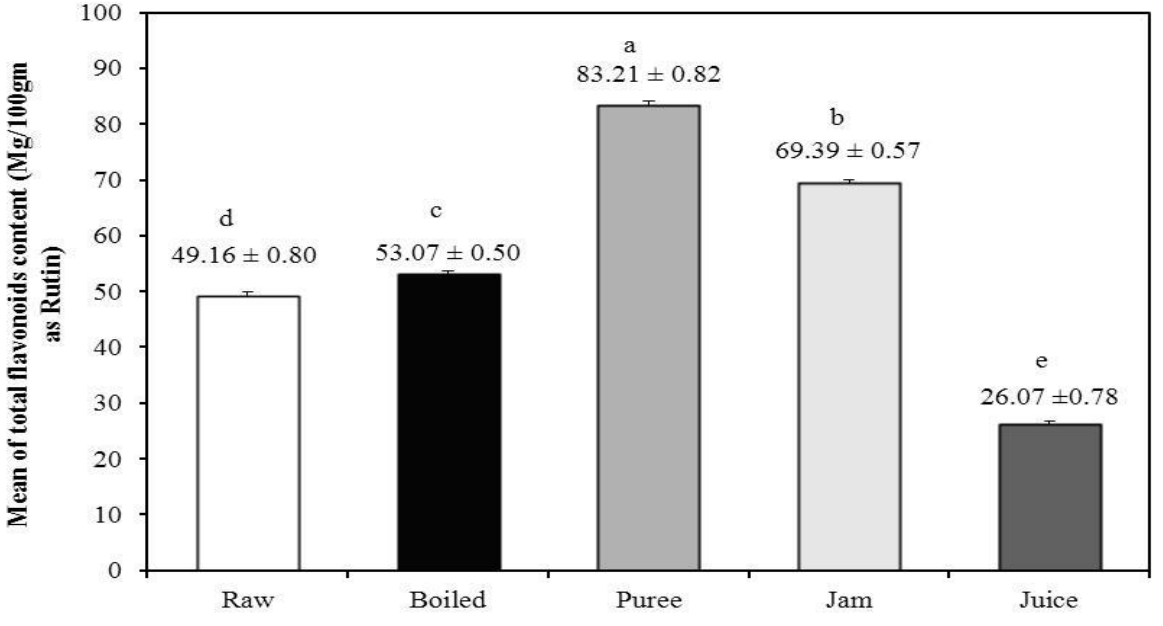

Fig.3. Total flavonoids content of home processing methods for apricot products (mg/100g as Rutin)

Ravichandran *et al*. (2012) found that the contents of quercetin for tomatoes and onions were assessed after heating many times through boiling, frying, and cooking in the microwave, and the result were 75%–80%, 20%–35% increases and a 65% decrease, respectively.

Total flavonoids content of apricot juice, which also included mechanical stress during juice extraction step, caused a reduced total flavonoid content on a wet basis (26.07±0.78 mg RE/100 g sample) than that of the raw apricot. The processing of the apricot samples included boiling, pureeing, and juicing *via* heat and/or mechanical compression. The preparation of juice is made by mechanical compression; while puree preparation is not done only by mechanical compression but also *via* thermal process. Although the heat treatment resulted in a change in the total flavonoids content in boiled apricot, mechanical compression caused a double reduction in the total content of flavonoids in the sample of apricot juice; the heat treatment together with the mechanically stress caused an increase of total flavonoids content in apricot puree compared to the raw apricot sample on wet basis.

Total Antioxidant capability

The impacts of the various ways of processing apricot fruit at home on total antioxidant capacity of apricot was assessed *via* DPPH test as shown in (Table 3). puree and jam preparation significantly changed the total antioxidant capacity values on a wet basis compared to fresh apricot. In addition, boiling, puree, jam were found to cause a significant increase in total antioxidant capacity compared to the raw apricot on wet basis (Table 3) ($P \leq 0.05$).

The apricot puree samples represented the highest wet weight content (85.29 ± 0.13), while the lowest TAC values were recorded for boiled apricot and juice (79.10 ± 0.19 and 52.03± 0.65, respectively).This reduction in antioxidant activities for juice sample could be related to their relatively lower total phenolic compared to the other home-processed apricot samples.

The TAC of apricot products has been shown to be mainly affected by the TP levels in this product. This agrees with Barba *et al*. (2013), who reported that the TP content can be regarded as a major pointer for antioxidant capacity that can be utilized as a preparatory screen for any sample when intended as a natural source of antioxidants in functional foods.

Table (3) shows the IC_{50} values of the samples of raw apricot, boiled, puree, jam and juice. The IC_{50} shows that there was a highest increase in apricot juice (96.10 ± 0.36) followed by the boiled (37.93 ± 0.84), fresh apricot (37.35 ± 0.66), jam (24.07 ± 0.35) and the lowest in puree (23.45 ± 0.53). Many studies have shown the great dietary values of apricot as a protective food as long as there are radical scavenging activities (Leccese *et al.*,2007). However, the variations in the level of effect have been reported while comparing distinct experiment technologies (Kalyoncu *et al.*, 2009). The variations could be ascribed to the genotype, the phase of maturity, the geographical area and the standard which utilized as a reference compound.

Carotenoids content

The carotenoids content of apricot products is presented in (Figure 4). Boiled apricot showed a higher carotenoids content (46.72±0.88µg/g) than puree and Juice (44.57±0.35 µg/g and 43.42±0.77 µg/g, respectively). There were no significant differences between puree and raw apricot. This is in agreement with the previous published data by Giuferida *et al*. (2013), who found that the carotene content remained virtually unchanged in all samples and was not affected by various treatments during the production of peach juice, jam and other products. Moreover, the differences were small in the relative contents of the components selected between the samples examined.

The lowest value of carotenoids content was traced in jam (38.35±0.37µg/g).This may be due to the addition of sugar in large quantities, which reduced the concentration of carotenoids**.**The increase in carotenoids content in the boiled apricot is in accordance with the outcomes of Sanchez-Moreno *et al*. (2006)

Table 3. Antioxidant activity of apricot products

Parameters	Home processing methods					F	p
	Raw (n = 3)	Boiled (n = 3)	Puree (n = 3)	Jam (n = 3)	Juice (n = 3)		
DPPH%	80.32 ±0.43 ^{c}	79.10±0.19^{d}	85.29 ±0.13^{a}	83.09 ±0.64^{b}	52.03±0.65^{e}	2590.87*	<0.001*
IC_{50} mg/ml	37.35 ±0.66 ^{b}	37.93 ±0.84^{b}	23.45 ±0.53^{c}	24.07 ±0.35^{c}	96.10 ±0.36^{a}	8062.35*	<0.001*

F: F for ANOVA test, Pair wise comparison bet. each 2 groups was done using Post Hoc Test (LSD)
p: p value for comparing between the studied groups
Means with Common letters are not significant (i.e. Means with Different letters are significant)
*: Statistically significant at $P \leq 0.05$
Data were expressed using Mean ± SD.

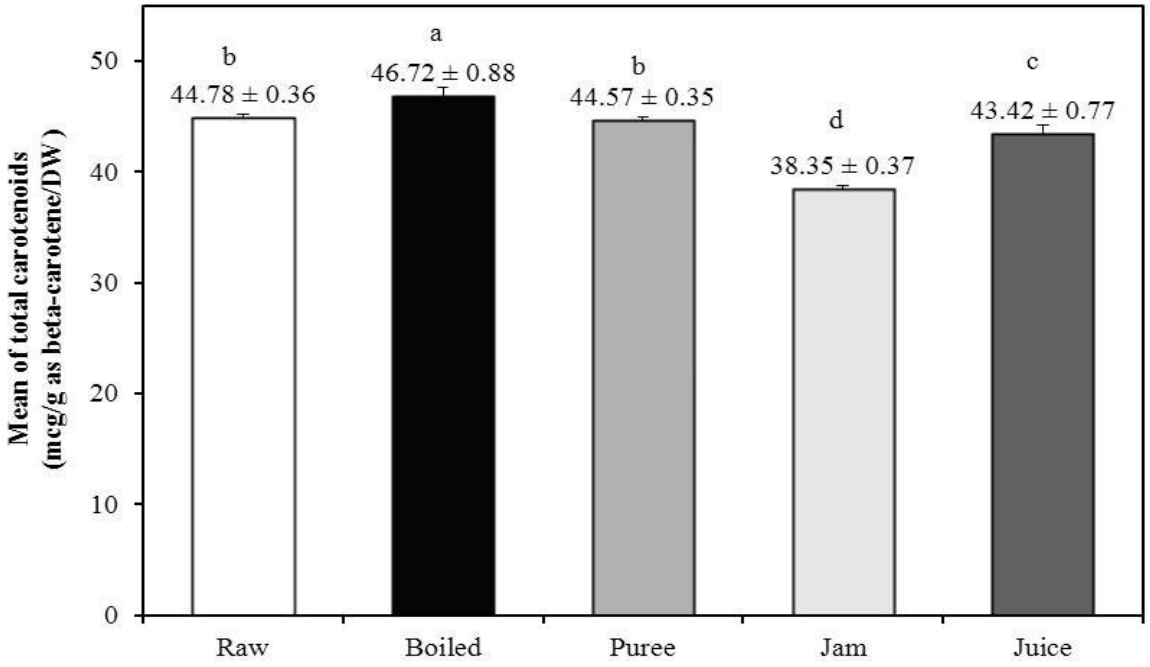

Fig. 4. Total carotenoids content of home processing methods for apricot products (µ/g as beta-carotene/DW)

who indicated that after exposure to 400 MP a pressure at 25 ◦C for 15 min, there was a 35% rise in β carotene extractability, but heat treatment at 90 ◦C for 1 min caused 9% increase in β-carotene. Several results have also shown that by cell wall disturbance and heating there was an improvement in the bioavailability of some carotenoids (Russell, 2001).

Hwang *et al*. (2012) have shown that high temperature and long baking time make it easier for tocopherols and carotenoids to be released from tomatoes. In accordance, many researchers found significant ($P \leq 0.05$) increment of β-carotene and lycopene in pumpkin as a result of cooking and stir frying. Such an effect can be explained on the basis that heat enhances the availability of the aforementioned compounds (Azizah *et al.,* 2009).

Apricot is one of the fruits rich in carotene and the content ranges from 2.00-20.77mg/100g of β-carotene (Ali *et al.,* 2011). The main carotenoids are β-carotene, lycopene and *γ*-carotene, but beta-carotene is found more often than other carotenoids. Apricot contains also lutein, β-cryptoxanthin, zeaxanthin, phytofluene and phytoene (Muller, 1997). In spite of the fact that there's no recommended daily intake for β-carotene, but a 3-6 mg every day admissions of β-carotene within the blood is thought to decrease the hazard of chronic disease (De Rigal *et al.,*2000). Apricot is one of the most important food rich in provitamin A, because 250g of fresh or 30g of dried apricots give sufficient carotenoids to meet the body's vitamin A demands. (Fraser and Bramley, 2004).

CONCLUSION

In conclusion, the aim of this study was to examine the impact of the various ways of processing apricot fruits on total amount of apricots' antioxidant when produce as boiled, jam, juice and pureed. The results showed that the heat has a catalytic effect for total phenols, flavonoids and antioxidant activity. In addition, apricot juice provided lower values for total phenols and flavonoids contents, as well as for total antioxidant capacity when compared to the other apricot products. It is important to do a lot of research using different nutrients have antioxidants properties, using them fresh or cooked, in order to increase knowledge about the availability of these bioactive substances in different foods.

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الملخص العربي

تأثير طرق الإعداد المنزلي على الخصائص المضادة للأكسدة لبعض منتجات المشمش

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يهدف هذا البحث إلى دراسة تأثير إعداد ثمار المشمش بطرق مختلفة في المنزل على العناصر المضادة للأكسدة. تم فحص المشمش الخام والمسلوق والبيورية والعصير والمربى بعد إعدادهم منزليا من حيث محتواهم من الكاروتينويدات والفلافونويدات والفينولات الكلية واجمالى النشاط المضاد للأكسدة. أوضحت النتائج أن المشمش غنى بالألياف والعديد من العناصر المعدنية وأهمها البوتاسيوم والفسفور .ووجد أن البيورية والمربى يحتويان على أعلى قيمة للمركبات الفينولية والفلافونيدات بالمقارنة بالمشمش الطازج والمسلوق والعصير. بالإضافة إلى ذلك، وجد أن البيورية والمربى ذات محتوى أعلى من النشاط المضاد للأكسدة بالمقارنة بباقي المنتجات. ولم توجد فروق معنوية ذات دلالة في محتوى الكاروتينات بين كلا من المشمش الطازج والمسلوق والبيورية والمربى والعصير. يقدم هذا البحث نتائج مقارنة لتقييم تأثير الطرق المختلفة للإعداد المنزلي على النشاط المضاد للأكسدة لبعض منتجات المشمش.

الكلمات المفتاحية: المشمش– الفينولات الكلية– الفلافونيدات الكلية– الكاروتينات– النشاط المضاد للأكسدة– الإعداد المنزلي.