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EVALUATION AND UTILIZATION OF SOME EGYPTIAN PUMPKIN (*Cucurbita moschata*) CULTIVARS

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ABSTRACT

Four Egyptian pumpkin (*Cucurbita moschata*) cultivars namely: Qena, Edwa, Kafr-Saad and Kafr-El-Batikh were used in this study. The objective of this study was carried out to evaluate physical properties, chemical composition, mineral contents, beta-carotene as well as ascorbic acid contents of the fruits. Beside, preparation and evaluation of pumpkin flour, pumpkin marmalade and Qamar El-Din sheets product containing 10, 20 and 30% of pumpkin pulp. From physical properties data, there are differences in fruit shapes and weight of seeds per fruit among the studied cultivars.

The pulp constituted ranged from 70 to 71.53%; peel from 26.49 to 27.99% and seed from 0.27 to 1.67% of fruits weight. The moisture content of fruits ranged from 91.33 to 94.88%, crude protein content from 0.60 to 1.35%; crude fat from 0.14 to 0.15%; crude fiber from 0.34 to 0.55%; Ash content ranged from 0.45 to 0.90% and carbohydrate from 3.59 to 5.68% (on wet weight basis).

The mineral salts analysis indicated that pumpkin fruits are rich source of potassium (K) which ranged from 2350 to 2540 mg/100g on dry weight. Beta-carotene content ranged from 18 to 106 mg/100g (on dry weight basis) while, Vitamin C content ranged from 2.3 to 29.7 mg/100g of fresh fruits.

Chemical composition of the prepared pumpkin flour indicated its high contents of protein, ash and crude fibers and could be a good complement for wheat flour as well as its used as a source of beta-carotene and yellow color supplement in bakery products. The highly organoleptic evaluation of the prepared pumpkin marmalade could be encourage to use this crop for producing marmalade, jams and preserves as a good application. An acceptability of panelists with no significant differences in taste and flavor between control and Qamar El-Din sheets product containing 10% of pumpkin pulp and could be produce this famous product in Arabic countries with lower price as well as find an other new use for pumpkin fruits.

Keywords: *Cucurbita moschata, pumpkin, chemical composition, beta-carotene, Ascorbic acid and Application uses.*

INTRODUCTION

Pumpkins belong to genus *Cucurbita* of the family *Cucurbitaceae* are grown throughout the tropical and sub-tropical countries (See *et al*., 2007). There are three common types of pumpkin world-wide, namely *Cucurbita pepo*, *Cucurbita maxima* and *Cucurbita moschata* (Lee *et al.,* 2002). Five major pumpkin producing countries in the world are China, India, Ukraine, Egypt and United States, Fang, (2008). In 2008, 651, 859 metric tonnes of pumpkin was produced in Egypt. Geisler,(2010)

The yellow-orange characteristic colour of pumpkin is due to the presence of carotenoids. Pumpkins provide a valuable source of carotenoids and ascorbic acid, which have major roles in nutrition as provitamin A and as an antioxidant, respectively (See *et al*., 2007).

Consumption of foods containing carotene helps prevent skin diseases, eye disorders and cancer (Bendich, 1989).Jun *et al*., (2006) found that in *C. moschata* D. high amount of pectin, carotene, vitamins, minerals and other substances beneficial to human health. Squash is cultivated throughout the world for use as vegetable as well as medicine. It has been used traditionally as medicine in many countries such as China, Yugoslavia, Argentina, India, Mexico, Brazil and America. *Cucurbita moschata* is popular used in several countries to control diabetes as well as for treating worms and parasites (Noelia *et al.,* 2011). Pumpkin are consumed in various ways such as fresh or cooked vegetable, as well as being stored frozen or canned (Figueredo *et al*., 2000).

Pumpkin can be processed into flour, which has a longer shelf-life and used to supplement cereal flours in bakery products, for soups, sauces, instant noodle and spice as well as a natural coloring agent (See *et al*., 2007). Composite flour is a binary or ternary mixture of wheat flour with flour from some other crops (Shittu *et al*., 2007).

Utilization of composite flour in food products reduces the use of wheat by partial or total substitution of wheat flour. This could be an economic advantage to those countries depending on import to meet the demand for wheat flour (Noor Aziah and Komathi. 2009). However, knowledge of nutritive value of local dishes, soup ingredients and local foodstuffs is necessary in order to encourage the cultivation and consumption of those that are highly nutritive (Achu *et al*., 2005).

According to (Noelia *et al.,* 2011), deferent researches agree in indicating that more scientific studies are needed to achieve greater and better utilization of this important crop. Beside the available information about the Egyptian cultivars are very scanty. This work is, therefore, aimed to evaluation the physicochemical properties of flour Egyptian pumpkin cultivars as well as preparation and evaluation of pumpkin flour, pumpkin marmalade and Qamar El-Din apricot sheets (a famous product in Arabic countries) containing 10, 20 and 30% of pumpkin pulp.

MATERIALS AND METHODS

Materials

200 kg of ripe pumpkin (*cucurbita moschata)* of four Egyptian cultivars namely: Qina, Edwa, Kafr-Saad and Kafr-El-Battikh were obtained from the farm of faculty of agriculture, Assiut University, at season of 2009. The fruits were washed and random five fruits were used for determination the physical properties of the studied pumpkin cultivars. The fruits were manually pulped with a knife to remove the peel and seeds, then the pulp was cut into small cubics, homogenized for analysis or filled in polyethylene bags and kept at 20±2˚c until used.

Apricot and orange peel samples as well as commercial orange marmalade and Qamer El-Din sheet were collected from local markets at Assiut city.

Analytical Methods:

Gross chemical composition:

Moisture content, crude protein (% N x 6.25), crude fat, crude fiber and ash were determined in pumpkin samples as well as pumpkin flour according to AOAC (1995) standard method. Carbohydrate content was determined by the difference.

Determination of minerals:

Determination of minerals by a Flame Photometer 410, spekol11 spectrophotometer and Atomic Absorption Spectrophotometer. In the Soil & Water Department; Faculty of Agric. Assiut University, as described in A.O.A.C. (1995).

Determination of β-carotene:

β-carotene was determined by high performance liquid chromatography (HPLC) according to the method of Pupin *et al*. (1999). A 5g homogenized sample of pumpkin was extracted with ethyl acetate (3×50 ml) containing 0.004% butylated hydroxytoluene (BHT). The organic phase was transferred through 50g anhydrous sodium sulphate and collected in an ambered round bottom flask. To the aqueous residue 50 ml of methanol was added (containing 0.004% BHT) followed by 100 ml of 1M NaCl. The solution was well mixed and further extracted with ethyl acetate (75 and 25 ml, containing 0.004% BHT).The ethyl acetate fractions were then transferred through the sodium sulphate and combined with the previous extracts.

Finally, sodium sulphate was washed with a further 50 ml of ethyl acetate(0.004% BHT).The pooled ethyl acetate was evaporated to dryness in a rotary evaporator at 40°C.The extract was transferred quantitatively to a 10ml volumetric flask using portions of 1.5 ml of mobile phase (acetonitrile : methano l : 1,2 dichloroethane, 60: 35:5,v/v/v) The injection standard (100µl, Sudan I , 50 mg/liter in acetonitrile) was added and the volume was made up to 10 ml**.**

The HPLC apparatus consisted of a Waters 625 LC System, equipped with an auto sampler Gilson 231XL and a Spectra Focus UV-Vis detector (Spectra Physics). A100 µl loop was used for injection. Solvents were HPLC grade. The mobile phase was a ternary mixture of acetonitrile: methanol: 1,2 dichloroethane (60:35:5, v/v/v) to which 0.1% BHT, 0.1% triethylamine and 0.05 M of ammonium acetate (in methanol) was added. The column was a C18 Vydac 201TP54 5 µm (250×4.6 mm id., Vydac) with a guard-column Alltima C18 5 µm (7.5×4.6 mm id., Alltech). The wavelength was adjusted to 450 nm. The peaks were measured by a Millennium Software v.2.0 (Waters). Peak identity was confirmed by a Spectra Focus Scanning Detector (Spectra Physics).

Determination of Ascorbic acid (V. C):

The concentration of ascorbic acid in pumpkin samples were measured following the direct method described by Romeu-Nadal *et al.* (2006). For this purpose, DL-dithiothreitol was used to reduce dehydroascorbic acid to ascorbic acid. The latter was resolved by reversed-phase high-performance liquid chromatography using a mobile phase of Milli-Q water with acetic acid (0.1% v/v) and methanol in a relative proportion of 95:5 v/v. The analytical column used was a Tracer Spherisorb ODS2 C18 (250 × 4.6 mm ID, 5 μm particle size) protected with a guard column (Tracer, C18, 5 μm), both from Tracer Analitica (Tecknokroma, Barcelona, Spain). An UV–Vis detector, SPD-10 AV VP (Shimadzu, Kyoto, Japan) and an HP-3365 Series II Chemstation were used. Ascorbic acid was identified by comparing the retention time of the sample peak with that of the ascorbic standard at 254 nm.

Technological methods:

Preparation of pumpkin flour:

The cubic pumpkin pulp sample were sliced and dried at 55˚C in a moved air oven for 24 hours. The dried sample were milled and reweighed, then kept chilled in an air-tight containers.

Preparation of marmalade:

Pumpkin in marmalade was prepared according to the method of Egbekun *et al*.,(1998) with some modification. Briefly, about 2 kg of the prepared pumpkin pulp was mashed in 1 liter of water (1: 0.5 w/v pulp: water ratio) and boiled at 100 ˚C for 20 min. The boiled mixture was mixed by blender for 2 min. and clarified through a stainless steel sieve to extract the juice.

About 800 g of sugar were added to 1.8 liters of the extracted juice and added 0.2% citric acid. The extract was concentrated in a stainless steel pot at 102 ˚C for 30 min to 68.5 °Brix (TSS %). The slices of orange peel were added to the mixture at the end of boiling process. The hot (87 ˚C) marmalade is filled in sterile glass bottles, allowing 1 cm headspace and stored at 28 ± 2 ˚C for 7 days.

Preparation of Qamar El Din:

Qamar El Din ingredients were apricot and water (650g+150ml). Qamar El Din products were supplemented with 10, 20 and 30% prepared pumpkin pulp. The product were manufactured as follows: the mixture was boiled for 10 min, mixed by a blander, and clarified through a stainless steel sieve, then the mixture was boiled again and 0.2% citric acid was added. This mixed was spread on aluminum trays and dried in a hot air oven at 55 °C for 24 hours.

Sensory evaluation:

Sensory evaluation of prepared pumpkin marmalade and Qamer El-Din sheets products were performed by a panel of ten judges. The order of presentation of the samples to the panel was randomized. The samples were descriptively characterized, pointing out the most relevant sensory characteristics (Sidel and Stone, 1976).

Statistical analysis:

The analysis of variance (ANOVA) was performed on all values using the statistical analysis system (SAS) version 6.12 (SAS, 1997). The level of significance was set at 0.05**.**

RESULT AND DISCUSSION

Physical properties of pumpkin fruits

The four Egyptian studied pumpkin cultivars are shown in Figure (1) and the physical properties of its in Table (1). As shown in Figure (1) there are different shapes for pumpkin cultivars.

The same observation was reported Lira and Monten (1992), who quote that the fruits of this specie of vegetable may have different sizes, color and forms. Fruit shape of pumpkin (*cucurbita moschata*) also, varied from rind, flat round oval and oblong type according to Pandey *et al* (2003).

The results in Table (1) indicated that, the weight of the fruits ranged between 4.18 to 6.36 kg and the height of the fruits ranged from 24.37 to 45.67 cm and the diameter ranged between 16.07 to 23.53 cm. while thickness of the pulp were ranged between 2.57 to 7.60 cm.. However, Pandy *et al .,(2003)* found that, the fruits weight from 1.25 to 9 kg, polar circumference ranged from 43 to 85 cm, equatorial circumference ranged from 43.33 to 95 cm with 2-5 cm thick flesh. From the data of Table (1) it could be noticed that the pulp, peel and seeds constituted 71.53, 27.99, 0.27%; 71.25, 26.49, 1.11%; 70.10, 27.32, 1.65% and 71.07, 26.57, 1.67% of the fruits of Qina, Edwa, Kafr-Saad and Kafr-El-Batikh, respectively. These values were in the same line of the results of Jacobo-Valenzuela *et al*.,(2008) and Aguilar-Gutierrez *et al*.,(2009) who found that the range of pulp ratio of *C. moschata* was 71.75-86.06% and ratio of shell 8.20-13.89% but they reported a high range for seeds (2.7-5.89%).

On the other hand, the data in Table (1) indicated that there were in significant differences among the four studied cultivar in their contents of seeds. However, Kafr-Saad and Kafr-El-Batikh cultivars consider a good source of seeds among the studied cultivars, while, Qina cultivar was poor in their content of seed. Beside, that data about physical properties may be useful for the food industrial uses of pumpkins.

Figure 1: Egyptian pumpkin cultivars.

Table 1: Physical properties of four Egyptian pumpkin cultivars.

Properties	Pumpkin cultivars			
	Qina	**Edwa**	**Kafr-Saad**	**Kafr-El-Batikh**
Fruit weight (kg)	04.18^{b}	04.87^{ab}	05.82^{ab}	06.36^{a}
Height of the fruit (cm)	45.67^{a}	43.07^{a}	24.37^{b}	44.93^{a}
Diameter of Fruit (cm)	16.07^{c}	22.50^{a}	23.53^{a}	18.00^{b}
Thickness of the pulp (cm)	07.60^{a}	02.57^{c}	04.07^{b}	03.87^{b}
weight of Seed (g/fruit)	11.47^{d}	54.17^{c}	96.03^{b}	106.03^{a}
Number of seeds/*fruit*	83.00^{d}	195.00^{c}	445.00^{a}	393.00^{b}
Weight of peel (kg/fruit)	01.17^{b}	01.29^{ab}	01.59^{a}	01.69^{a}
Weight of Pulp (kg/fruit)	02.99^{b}	03.47^{ab}	04.08^{ab}	04.52^{a}

Values with different subscripts on the same row are significant (p<0.05)

Gross chemical composition of the studied pumpkin fruits:

The proximate compositions of the studied pumpkin cultivars are shown in

Table 2. The moisture content ranged from 91.33 to 94.88%. Similar results were reported by Ana (1998); Rahman *et al*. (2008) and Noelia *et al.*(2011) who stated that moisture content were 93.2, 92.89 and 94 (g/100g), respectively. However, Kafr-Saad cultivars recorded the highest value of moisture while, Kafr-El-Batikh recorded the lowest one and no significantly, differences were observed between Qina and Edwa cultivar in their contents of moisture.

The protein content of the studied pumpkin cultivars ranged from 0.60 to 1.35%. The values were in agreement with that reported by Ana (1998); Jirapa *et al*. (2006) and Noelia *et al.* (2011)..

Data represented in

Table 2 indicated that crude fat content was about 0.15% in all studied cultivars with no significant differences. The results are very close to those reported by See *et al*. (2007).

The data also, indicated that the crude fiber contents ranged from 0.34 to 0.55%, ash contents ranged from 0.45 to 0.90% and carbohydrate contents from 3.59 to 5.68%. Similar results were reported by See *et al*. (2007); Rahman *et al*. (2008) and Usha *et al.* (2010).

Table 2: Gross chemical composition of the studied pumpkin fruits (g/100g on wet weight)

Estimates	Pumpkin varieties			
	Qina	**Edwa**	**Kafr-Saad**	**Kafr-El-Batikh**
Moisture	93.39^{a}	93.00^{a}	94.88^{b}	91.33^{c}
Crude protein	1.05^{a}	1.14^{a}	0.60^{b}	1.35^{c}
Crude fat	0.15^{a}	0.14^{a}	0.15^{a}	0.15^{a}
Crude Fiber	0.44^{a}	0.46^{ab}	0.34^{a}	0.55^{b}
Ash	0.61^{a}	0.68^{b}	0.45^{c}	0.90^{d}
Carbohydrate*	4.36^{a}	4.57^{a}	3.59^{b}	5.68^{c}

Values with different subscripts on the same row are significant (p<0.05)
***Calculated by differences**

Minerals content:

The results of determination of minerals content of the four studied pumpkin cultivars are presented in Table (3). The data indicated that, all studied cultivars were rich in their content of potassium element which was ranged from 2300 to 2540 mg/100g on dry weight basis. Similar result was reported by Jacobo-valenzuela *et al.,* (2011), who found that average potassium content in *C. moschata* was 42194 mg/kg. The same trend was also indicated by Rahman *et al*.,(2008). On other hand, the result of sodium content in this study (70-110 mg/100g dry weight) was much lesser than 7040.30±4.92 mg/100g of fluted pumpkin pulp which reported by Egbekum *et al.,(*1998).

Data in Table 3 also revaled that, Kafr-Saad and Kafr-El-Batikh cultivars were higher in their contents of P, Mg, Ca, Na, Fe and Zn than that of Qina and Edwa cultivars. However, no wide variation between all studied cultivars in their contents of Cu and Mn. On other hand, cadmium (Cd) element was absent in the all studied pumpkin in cultivars.

Table 3: Minerals composition of pumpkin fruits (mg/100g on dry weight)

Minerals	Pumpkin varieties			
	Qina	**Edwa**	**Kafr-Saad**	**Kafr-El-Batekh**
K	2300	2480	2540	2350
P	150	150	270	660
Mg	80	60	140	180
Ca	70	90	150	150
Na	80	70	110	110
Fe	0.108	0.134	0.157	0.155
Zn	0.019	0.020	0.029	0.030
Cu	0.013	0.015	0.015	0.015
Mn	0.004	0.003	0.005	0.008
Cd	00	00	00	00

β-carotene and Ascorbic acid contents:

β-carotene and ascorbic acid contents of the studied pumpkin cultivars are shown in Table (4). Data indicated that Qina cultivar recorded the highest value of beta-carotene (106mg/100g dry weight) and Kafr-El-Batikh cultivar recorded the lowest value (18 mg/100g dry weight). However, Edwa and Kafr-Saad cultivars recorded intermediate levels (64 and 82.8 mg/100g dry weight, respectively). Seo *et al*.,(2005) reported that the major carotenoid in pumpkin (>80%) is beta carotene and pumpkin is rich source of beta carotene and might be useful for preventing vitamin A deficiency. According to Munteen and Muntean (2005) the beta carotene content of *cucurbita maxima* was 164.29 µg/g dry weight. On other hand, the results of Egyptian pumpkin cultivars (except of Kafr-El-Batikh cultivar) were higher than that of Danmhat Maettol cultivar grown in Korea which recorded 58.2 mg/100g of freeze-dried pumpkin powder sample on a dry basis as mean value of beta carotene as reported by Lee *et al*.(2002). Beta-carotene content was ranged from 3.1 to 7.0 mg/100g for four cultivars of *Cucurbita moschata* as found by Murkovic *et al.*, (2002).

Data in table 4. Reveled the ascorbic acid content ranged from 2.30 to 29.70 mg/100g on wet weight basis. Two cultivars recorded high value (21.81 and 29.70 mg/100g) of vitamin C (Qina and Kafr-Saad, respectively). While Edwa and Kafr-El-Batikh cultivars recorded low values (2.30 and 3.90 mg/100g, respectively). The high values of vitamin C in Qina and Kafr-Saad cultivars were similar that reported by Walker (1978) and Roura *et al.* (2007) who found that vitamin C in pumpkin was 30 and 22.87 mg/100g, respectively. While the low values of Edwa and Kafr-El-Batikh cultivars were agreement with the results of Sudhakar *et al*. (2003) and Marina *et al*. (2009). In addition, we can observe that Qina and Kafr-Saad cultivars which were rich in beta carotene content, recorded also high content of ascorbic acid (Table 4).

Table 4: β-carotene and ascorbic acid composition of the studied pumpkin cultivars

Compound	cultivars			
	Qina	Edwa	Kafr-Saad	Kafr-El-Batikh
β-carotenemg/100g dry weight basis	106.00	64.00	82.8.0	18.00
Ascorbic acidmg/100g wet weight	21.81	2.30	29.70	3.90

Pumpkin flour:

Gross chemical composition and dehydration ratio of the prepared pumpkin flour are shown in Table 5. The results indicated, that no significant differences in moisture content in the flour prepared from the all studied cultivars which ranged from 11.23 to 11.70%. Similar moisture content (10.96±0.12%) in pumpkin flour was reported by See *et al*., (2007). However, higher moisture content (14.956%) was reported by Ravi *et al.*,(2010) and lower moisture content in pumpkin powder (6.01%)was found by Pongjanta *et al*.,(2006). Protein content in pumpkin flour ranged from 10.88 to 14.90%; crude fat from 1.57 to 2.30%; crude fiber from 7.95 to 8.69%; ash from 7.84 to 8.66% and carbohydrate from 55.12 to 56.71% (Table 5). The values of protein, ash and fiber in this study were higher than the values reported by Pongjanta *et al*., (2006) and See *et al.,(*2007). On the other side Ravi *et al*., (2010) reported that protein content in pumpkin flour was 15.69%. Data in Table 5 indicated that dehydration ratio was high (1:12) in Kafr-El-Batikh cultivar, moderate (about 1:15) in Qina and Edwa cultivars, but relatively low (1:22) in Kafr-Saad cultivar and that reflect its contents of moisture as indicated in table 2. However, in Egypt, wheat flour is often imported to meet local flour needs for bakery products, and the high ash and crude fiber contents in pumpkin flour indicated that this flour could be a good complement for wheat flour in a composite flour blend, as most of the minerals and fiber in wheat flour are lost during milling as indicated by Noor Aziah and Komath (2009). Beside, pumpkin flour could be used as a source of beta-carotene and yellow color supplement in bakery products (Pongjanta *et al*., (2006).

Table 5: Gross chemical composition and dehydration ratio prepared pumpkin flour

Estimates	Pumpkin cultivars			
	Qina	Edwa	Kafr-Saad	Kafr-El-Batikh
Moisture	11.23^{a}	11.40^{a}	11.70^{a}	11.37^{a}
Crude fat	1.98^{ab}	2.10^{b}	2.30^{b}	1.57^{a}
Crude protein	14.23^{b}	14.90^{c}	10.88^{a}	13.82^{b}
Crude Fiber	8.42^{ab}	7.95^{a}	8.61^{b}	8.69^{b}
Ash	8.66^{b}	8.53^{b}	8.27^{b}	7.84^{a}
Carbohydrate*	55.48^{a}	55.12^{a}	58.24^{b}	56.71^{c}
Dehydration ratio	1:15.75	1:14.98	1.21.63	1:12.10

Pumpkin marmalade:

Data indicated the organoleptic evaluation of pumpkin marmalade are presented in Table 6. and Fig (2). From such data it could be observed that the pumpkin marmalade had a high score in almost sensory compared with the orange marmalade (control). Sensory evaluation showed no significant difference (at 0.05) in color, taste, flavor, spreadability and overall acceptability between pumpkin marmalade and commercial orange marmalade. Similar results were reported by Egbekun *et al.*,(1998). The results in Table 6 could be encourage to use this important crop for producing marmalade, jams and preserves as a good application.

Table 6: Mean organoleptic scores of marmalade samples

			Organoleptic ratings*			
Sample	Color	Taste	Flavor	Consistency	Spreadability	Acceptability
Orange	4.55^{a}	4.7^{a}	4.5^{a}	4^{b}	4.3^{a}	4.75^{a}
Pumpkin	4.9^{a}	4.6^{a}	4.6^{a}	4.5^{a}	4.9^{a}	4.8^{a}

[a;b] Means within the same column with the same subscript are not significantly different (*p* > 0.05).
[*]1 = very poor, 5 = excellent

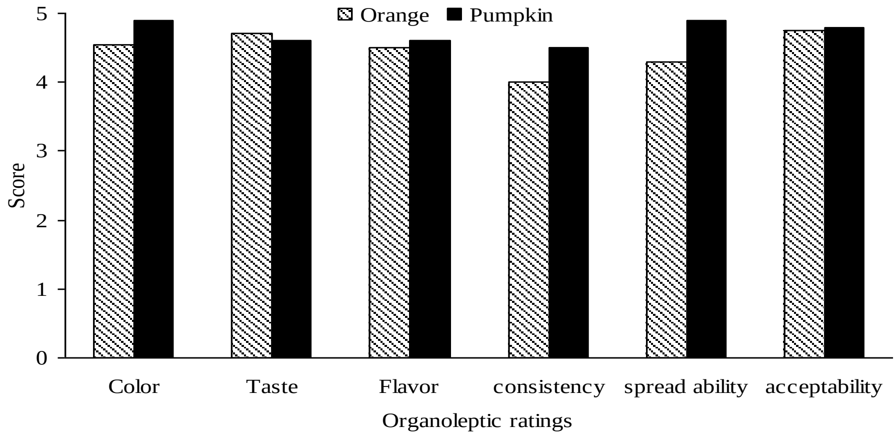

Figure 2: The result of the sensory evaluation scores of marmalade samples

Qamar El-Din sheets:

Qamar El-Din sheets (a famous product in Arabic countries) are manufacture from apricot fruits which relatively had high price. So, in our study Qamar El-Din sheets were prepared containing 10, 20 and 30% of pumpkin pulp and the organoleptic evaluation of the yield sheets are presented in Table 7. Sensory evaluation indicated that there no significant differences in taste and flavor until 10% addition of pumpkin pulp compared to the control. However, the products contained 20 and 30% of pumpkin pulp stay preserve acceptability of the panelists, thus the lowest score was 7.6 of 10 points scale test. This application may be produce Qamar El-Din product with lower price and find an other new use for pumpkin fruits.

Table 7: Mean organoleptic scores of Qamar El Din products containing 0, 10 ,20 and 30% pumpkin pulp

Products (Apricot:Pumpkin) ratio	Organoleptic ratings*				
	Color	**Taste**	**Flavor**	**Texture**	**Acceptability**
A (100:0)(control)	9.8^{a}	9.5^{a}	9.4^{a}	9.6^{a}	9.6^{a}
B (90:10)	8.6^{b}	8.4^{a}	8.7^{a}	8.05^{b}	8.4^{b}
C (80:20)	8.6^{b}	8.3^{b}	8.1^{bc}	7.9^{b}	8.1^{b}
D (70:30)	8.1^{b}	7.7^{b}	7.6^{c}	7.7^{b}	7.6^{b}

$^{a;b}$ Means within the same column with the same subscript are not significantly different (*p* > 0.05).
***1 = very poor, 10 = excellent**

Conclusion:

Results of this study could be concluded that among studied Egyptian cultivars, Kafr-Saad and Kafr El-Batikh cultivars are good source of seeds. Pumpkin fruits are rich source of potassium and some cultivars had high beta-carotene and ascorbic acid contents. Pumkins can be used in preparing pumpkin flour and high quality pumpkin marmalade as well as added to apricot fruit until 10% for Qamar El-Din sheets product processing.

REFERENCES

Achu, M.B.; Fokou, E.; Tchiegang, C.; Fotso, M. and Tchouanguep, F.M. (2005): Nutritive value of some cucurbitaceae oil seeds from different regions in Cameroon. African J. of biotechnology 4 (11) 1329-1334.

A.O.A.C.(1995): Official Methods of Analysis (16th Ed).Association of official analytical chemists. Washington, D.C.

Aguilar-Gutierrez, F.; Zazueta-Morales, J. J and Camacho-Hernandez, I. L. (2009). Characterization Quimica, Fisica, Funcional y Nutrimental de la Calabaza Cehualca (*Cucurbita moschata* D.) cv Cehualca Integral. Tesis de maestrيa. Maestria en Ciencia y Tecnologia de Alimentos, Facultad de Ciencias Quimico Biologicas, Universidad Autonoma de Sinaloa.

Ana Libia Marulanda Pérez.(1998): Elaboración De Espagueticon Harina De Calabaza Y Sus Propiedades Fisicoquímicas. M.Sc. Thesis, food Technol.

Bendich, A. (1989): Carotenoids and the immune response. J.Nutr; 119:112-115.

Egbekun, M.K.; Nda-Suleiman, E .O and Akinyeye, O. (1998): Utilization of fluted pumpkin fruit (*Telfairia occidentalis*) in marmalade manufacturing. Plant Foods for Human Nutrition. 52: 171-176.

Fang, S.E. (2008): Physicoshemical and organoleptic evaluation of wheat bread substituted with different percentage of pumpkin (*Cucurbita moschata*). M.Sc. Thesis. University Sains Malaysia.

Figueredo, E.; Minguez, A and Luis Vidarte, L. (2000): Allergy to Pumpkin and cross-reactivity to other Cucurbitaceae fruits. Journal of Allergy Clinical Immunology, 106: 402-3.

Geisler, M.. (2010). Agricultural Market Resource Center. Retrieved Oct 30, 2010. Web site: http://www.agmrc.org

Jacobo-Valenzuela, N.; Zazueta-Morales, J.J.; Pérez-Castañeda,V.; Camacho Hernández, L.; Gallegos-Infante, J.A.; Rocha-Guzmán, N.E.; González-Laredo, R.F. (2008): Rediscovering Winter Squash (*Cucurbita moschata* D.) cv. Cehualca as a Magic Food in Sinaloa State.FSFB,3rd International Congress, 14-17.

Jacobo-Valenzuela, N; Zazueta-Morales, J.J.; Gallegos-Infante, J.A.; Aguilar-Gutierrez, F.; Camacho-Hernández, I.L.; Rocha Guzman, E and Gonzalez-Laredo, R.F. (2011): Chemical and Physicochemical Characterization of Winter Squash (*Cucurbita moschata* D.). Not Bot Hort Agrobot Cluj, 39 (1):34-40.

Jirapa, P.; Angkana, N.; Siriporn, K.; Tippawan, M. and Thirawat, T. (2006): Utilization of pumpkin powder in bakery products .Songklanakarin J. Sci. Technol.: 71-79.

Jun, H.; Lee, C.H.; Song, G.S. and Kim, Y.S. (2006): Characterization of the pectic polysaccharides from pumpkin peel. Elsevier, 39, 554-561.

Lira, S. R and Montes, H. S.(1992): Cultivos marginados otra perspectiva de 1492. La agricultura en Mesoamérica. Cucúrbita (Cucurbita spp). Cultivos Andinos-FAO Accessed on: http:// www.rlc.fao.org/es/agricultura/produ/cdrom/contenido/libro09/Cap2_3.htm#auto(C.F.,Noelia *et al*, 2011).

Lee, C. H., Cho, J. K., Lee, S. J., Koh, W., Park, W., & Kim, C. H. (2002): Enhancing β- carotene content in Asian noodles by adding pumpkin powder. Cereal Chemistry, 79 (4), 593–595.

Marina, F. de Escalada Pla.; Carmen, A. Campos.; Lía, N. Gerschenso and Ana, M .Rojas (2009): Pumpkin (*Cucurbita moschata* Duchesne ex Poiret) mesocarp tissueas a food matrix for supplying iron in a food product . Journal of Food Engineering 92 . 361–369.

Muntean, E and Muntean, N.(2005): HPLC assessment of Provitamin A from raw and cooked fruits of Cucurbita maxima Duch. The Annals of the University "Dunărea de Jos" of Galaţi,-No 1/2005 Fascicle VI-Food Technology, 54-59.

Murkovic, M.; Mullederv, U and Neunteufl, H. (2002): Carotenoid Content in Different Varieties of Pumpkins. Journal of food composition and analysis journal. 15, 633–638.

Noelia, J.; Roberto, M.M.; de Jesus, Z.J and Alberto, G.J.(2011): Chemical and Physicochemical Characterization of Winter Squash (*Cucurbita moschata* D). Not Bot Hort Agrobot Cluj, 39 (1):34-40.

Noor Aziah, A.A. and Komathi, C.A. (2009) :Physicochemical and Functional Properties of Peeled and Unpeeled Pumpkin Flour. Journal of Food Science- 74, (7) 328-333.

Pandey, S.; Singh, J.; Upadhyay, A.K.; Ram, D and Rai, M (2003): Ascorbate and carotenoid content in an Indian collection of pumpkin (*Cucurbita moschata* Duch. ex Poir.). Indian Institute of Vegetable Research. Cucurbit Genetics Cooperative Report 26:51-53.

Pongjanta, J.; Naulbunrang, A.; Kawngdang, S.; Manon, T. and Thepjaikot, T. (2006): Utilization of pumpkin powder in bakery products. Songklanakarin J. Sci. Technol., 28(suppl.1) 71-79.

Pupin, A.; Dennis, M and Toledo, M. (1999): Food. Chem. 64, 269-275.

Rahman, A.H.M.M.; Anisuzzaman, M.; Ferdous Ahmed.; Rafiul Islam, A.K.M and Naderuzzaman, A.T.M. (2008): Study of Nutritive Value and Medicinal Uses of Cultivated Cucurbits. Journal of Applied Sciences Research, 4(5): 555-558.

Ravi. U.; Menon, L. and Anupama, M. (2010): formulation and quality assessment of instant dhokla mix with incorporation of pumpkin flour. J. Scientific & Industrial Research (69) 956-960.

Romeu-Nadal, M.; Morera-Pons, S.; Castellote A.I.; opez-Sabater, M .C .L. (2006): Rapid high-performance liquid chromatographic method for Vitamin C determination in human milk versus an enzymatic method. Journal of Chromatography B, 830. 41–46.

Roura, S. I.; Del Valle, C. E.; Aguero , L and Davidovich, L. A. (2007): Changes in apparent viscosity and vitamin C retention during thermal treatment of Butternut Squash (*Cucurbita moschata* Duch) pulp: effect of ripening stage. Journal of Food Quality, 30:538-551.

SAS (1997) :SAS/STAT Users Guide.Version 6.12ed:SAS Institute Cary ,NC.

See, E. F.; Wan Nadiah, W. A. and Noor Aziah, A. A. (2007). Physico-chemical and sensory evaluation of breads supplemented with pumpkin flour. ASEAN Food Journal, 14(2), 123–130

Seo, J.S.; Burri, B.J.; Quan, Z. and Neidlinger, T.R. (2005): Extraction and chromatography of carotenoids from pumpkin. Journal of chromatography A, 1073 (2005) 371-375.

Shittu, T.A.;Raji, A.O. and Sanni, A.O.(2007): Effect of baking time and temperature on some physical properties of bread loaf. Food Res Int40 (2), 280-290.

Sidel, Y. and Stone, H.(1976): Experimental design and analysis of sensory test. Food Technol. 30 (11):32.

Sudhakar Rao, G.V.; Selvaraj, J,; Senthil, R.P.; Radhakrishnan, N and Murali M.B. (2003): Efficacy of some indigenous medicines in wound in rats. India journal of animal Sciences, 73:652-653.

Usha Ravi .; Lakshmi Menon and Anupama. (2010): formulation and quality assessment of instant dhokla mix with incorporation of pumpkin flour. Journal of scientific and industrial research .vol.69.

Walker N. W. (1978): Fresh Vegetable and Fruit Juices, p. 84.

التقييم والاستفادة من بعض أصناف القرع العسلي المصرية

فضل صائل البربري ، أحمد حامد خليفة ، صفاء عبدالحميد محمد و السيد علي عبدالرحمن
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استخدم في هذه الدراسة أربعة أصناف مصرية من القرع العسلي هي على وجه التحديد أصناف: قنا، العدوة، كفر سعد، كفر البطيخ. وهدفت الدراسة إلى تقييم الخواص الطبيعية للثمار والتركيب الكيميائي الإجمالي والمحتوى المعدني للثمار وتقدير محتوى الثمار من البيتاكاروتين وفيتامين (ج).

بالإضافة إلى ذلك تطرقت الدراسة إلى إعداد وتقييم دقيق القرع العسلي ، مرملاد القرع العسلي وإضافة ثمار القرع العسلي (اللحم) بنسب ١٠، ٢٠، ٣٠ % إلى المشمش لتصنيع لفائف قمر الدين.

وأظهرت نتائج الخواص الطبيعة للثمار وجود اختلاف في أشكال الثمار وأوزانها ووزن البذور لكل ثمره بين الأصناف المدروسة . وشكل اللحم (الجزء المأكول من الثمار) نسباً تراوحت بين ٧٠,١٠الى ٧١,٥٣% والقشور نسباً تراوحت بين ٢٦,٤٩ إلى ٢٧,٩٩% والبذور نسباً تراوحت بين ٠,٢٧ إلى ١,٦٧% من وزن الثمار.

وبالنسبة للتركيب الكيميائي فقد تراوحت نسبة الرطوبة بين ٩١,٣٣ إلى ٩٤,٨٨% ، البروتين الخام بين ٠,٦٠ إلى ١,٣٥% ، الدهن الخام من ٠,١٤ إلى ٠,١٥ % ، الألياف الخام بين ٠,٣٤ إلى ٠,٥٥% ، الرماد بين ٠,٤٥ إلى ٠,٩٠% والكربوهيدرات بين ٣,٥٩ إلى ٥,٦٨%(على أساس الوزن الرطب).

واظهر التحليل لمحتوى الأملاح المعدنية إن ثمار القرع العسلي غنية في محتواها من عنصر البوتاسيوم حيث تراوحت كميته مابين ٢٣٥٠ إلى ٢٥٤٠ ملجم/١٠٠ جم (على أساس الوزن الجاف). وتراوحت محتويات الثمار من البيتاكاروتين مابين ١٨ إلى ١٠٦ ملجم/١٠٠جم (وزن جاف). بينما كان محتوى الثمار من فيتامين (ج) يتراوح مابين ٢,٣ إلى ٢٩,٧ ملجم/١٠٠جم (وزن رطب).

بين التحليل الكيميائي للدقيق المصنع من ثمار القرع العسلي ارتفاع محتواه من البروتين والرماد والألياف مما يجعله مكملاً جيداً لدقيق القمح بالإضافة غالى استخدامه كمصدر للبيتاكاروتين وكملون باللون الأصفر لمنتجات المخابز.

وأوضحت النتائج إن ارتفاع التقييم الحسي للمرملاد المصنع من القرع العسلي وعدم وجود اختلافات معنوية بينه وبين المنتج التجاري المصنع من البرتقال يشجع على استخدام هذا المحصول في إنتاج المرملاد والمربى والمعلبات المحفوظة كتطبيق جيد للاستفادة من القرع العسلي.

ومن ناحية أخرى اظهر قبول المحكمين في اختبار التذوق مع عدم وجود اختلافات معنوية في الطعم والنكهة لمنتج لفائف قمر الدين المحتوي على ١٠% من القرع العسلي على إمكانية إنتاج هذا المنتج المشهور في البلاد العربية بأسعار اقل مع إيجاد تطبيقاً جديداً لاستخدام ثمار القرع العسلي الذي تعتبر مصر من أهم خمسة بلدان أنتاجاً له في العالم.

قام بتحكيم البحث

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