Quality evaluation of sheets, jam and juice from prickly pear and melon blends

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Abstract: Chemical composition of prickly pear and melon fruits was investigated. Results showed high amount of water in prickly pear and melon (85.64 and 82.82%) respectively. Glucose and fructose in prickly pear were (34.0 and 30.4 g/kg) higher than melon values were (16.2 and 12.1 g/kg) respectively. Whereas minerals as (P, Fe, Mg, Ca, K, Na, Cu, Se, Mn, and Zn) in prickly pear higher than those in melon. In this work we used blend of prickly pear and melon to make juice, jam and dried sheets to supplement the lack of mineral in melon by prickly pear and supporting prickly pear aroma by melon aroma. The organoleptic test showed that the products were made from prickly pear had high score followed with 25%, 50% and 75% melon, the products improved in taste and minerals content compared with control sample. Color and other sensory properties improved in blend samples compared to control samples. **[**Atef, A. M. Abou-Zaid, Nadia, I. Ibrahim, Ramadan, M.T. and A. Nadeer. **Quality evaluation of sheets, jam and juice from prickly pear and melon blends.** *Life Sci J* 2013;10(2):200-208]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 31

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1. Introduction:

Consequently, as knowledge of its nutritive value grows, interest in Sexpanding its possibilities was also raised, lending it even greater value through its transformation into attractive products of longer shelf-life **(Schirra, 1998).**

In Egypt, prickly pear (*Opuntia ficus-indica)* trees are usually grown in sandy areas since the tree tolerates lack of water. The fruit pulp is quite soft and contains hard seeds which make it unarguable **Abd el-Naby (2001).** Up to date relatively little work has been reported regarding the manufacturing of prickly pear products. However, some studies had been carried out on the canning of prickly pear fruits **(Joubert, 1993).** Storage of fruits, jam manufacture and dried sheets had been reported by **Sawaya *et al*, (1983)** and **Ewaidah and Hassan (1992).** Dietary fiber is composed of several chemical components that are resistant to digestive enzymes such as cellulose, hemicelluloses, pectin, lignin, gums…ets. **Periago *et al*., (1993).** The benefits associated with fiber content are well known, especially for the prevention of illnesses such as diabetes, treatment of gastrointestinal disorders, illnesses associated with low dietary fiber intake, reduction of glucose values in the blood, anti-hyperlipidemic and anti-hypercholesterolemic effects **Feugang *et al*., (200**6) and **Gebremariam *et al*., (2006).** In addition, the fiber content gives juices a favorable mouth feel and help to reduce blood sugar and plasma cholesterol levels **(Piga, 2004 and Stintzing *et al*., 2001).**

Prickly pear an important source of several nutritional elements like calcium (Ca), pectin, mucilage and minerals. **Rodríguez-García (2007)** and **Stintzing and Carle (2005).** While the high content from calcium, Calcium and phosphorus were represented three-quarters of minerals of the body and were found fundamentally in bones, which serve as an important reservoir. **(Rodriguez *et al*., 1996)** and magnesium make cactus pear juice useful in prevention of osteoporosis and cramps, respectively. Potassium content was high and low level of sodium which an advantage for people with renal and blood pressure problems, **(Abd El-Nabey 2001).** *Opuntia ficus-indica*, has anti flammatory and analgesic effects. Anti-ulcerous effects have been demonstrated in nopal of *O. Ficus-indica.* **Medina *et al*., (2007).**

Other study **(Panico *et al*., 2007),** domenstrated the effect of hyaluronic acid and polysaccharides from *Opuntia ficus-indica* (L.) cladodes on the metabolism of human chondrocyte cultures. Prickly pear shows a vitamin C content ranging from 180 to 300 mg. kg-1 which is higher than other common fruits, such as apple, pear, grape and banana **(Cantwell, 1995; Piga, *et al*., 1996 and Piga, 2004).**

Pectin isolated from prickly pear had been found to lower plasma cholesterol levels **(Fernandez *et al*., 1990).** While other components such as lipids, protein, dietary fibers and ash content are similar to other tropical fruits **(Cantwell, 1995 and Stintzing *et al*., 2001).** Nutritional importance of cactus pear fruits were reported in last few years. Authors had reported that the nutritional value in fruits due to its high content from carbohydrates, vitamins, pigments, minerals and amino acids **(Stintzing *et al*., 2001 and Rodríguez-Félix, 2002),** such as high content from proline, glutamine and taurine. Taurine has specific functions in the heart, retina and central nervous system, and interacts with hormonal system.

Recipes range from appetizers, soup and salads through entrees, Vegetables dishes and breads and desserts, beverages, alcoholic drinks and candies can be prepared from prickly pear **(Russell and Felker 1987).**

The fairly high sugar content and low acidity of the fruit **(Joubert, 1993; Munoz de Chavez *et al*., 1995)** make it very sweet and delicious. Moreover, Prickly pear fruit containing betalain pigments is a good potential for the use as a natural food colorant. This fruit contains the red-violet β-cyanins in addition to the yellow β-xanthins **(Forni *et al*., 1992 and Turker *et al*., 2001).**

Rich diet in fresh fruits and vegetables help to prevent human from chronic diseases. That due to action of antioxidant compounds, such as carotenoids, L-ascorbic acid (A.A), tocopherols, polyphenols and other compounds. These compounds can delay or inhibit molecules oxidation in cells which happen by free oxygen radicals cause un-equilibriums in body system and a lot of diseases such as cataracts, cancer, rheumatism, etc, **(Lana, 2005).** Nutritional importance of cactus pear fruits due to high content of vitamins and antioxidant compounds. It has about (25-30 mg 100g -1) vitamin C, (0.29- 2.3 mg100g-1) carotenoids, (111-115µg 100g-1) vitamin E,(53 µg100g-1) vitamin K, on fresh weight and trace amounts from thiamin, riboflavin and niacin **(Stintzing and Carle, 2004).** Vitamin C is minor vitamin in cactus pear fruits **(Cantwell, 1995).** It plays a higher role in antioxidant capacity of fruits with polyphenols and flavonoids **(Galati *et al*., 2003 and Tesoriere *et al*., 2004).**

(Schirra *at el*., 1999b) one of the major problems with cactus pear is high perish ability of its fruit. Storage at room temperature favors decay, fruit weight loss, wilting, softening and off-flavor development. While storage at temperature below 8-10°C promotes physiological breakdown. Physical damage to the peel induced during spine removal predisposes cactus pear to attack by decay-causing pathogens.

The chemical and mineral composition which was described by different authors showed that cactus pear fruits had a similar nutritive value to other fruits. However, its soluble solids content was greater than 16%, and greater than that present in other fruits such as prune, apricot, and peach **(Pimienta, 1990 and Sepulveda and Sáenz, 1990).**

On the other hand cucurbit fruit are not significant sources of calories or protein, they can be important sources of dietary fiber, minerals, pro-vitamin A (β-carotene) and vitamin C **(Adams and Richardson, 1981).** The economic value, particularly of melons, to local and corporate economies can be substantial **(Taylor, 1994).** The purpose or this article is to examine the nutritional quality and human health benefits of melons, specifically, muskmelon or cantaloupe and honeydew melon types.

Melons are naturally low in fat and sodium, have no cholesterol and provide many essential nutrients such as potassium, in addition to being a rich source of β-carotene and vitamin C. Although melons are and excellent source of some nutrients, they are low in others, like vitamin E and folic acid, since the U.S. diet is already high in fat and protein contents, melons should be included in everyone's diet, a long with five to eight servings per day of variety of other fruit and vegetables, to ensure adequate nutrition, promote individual health, and reduce one's risk of cancer and certain other chronic diseases **Lester (1997).**

2. Materials and methods

1. Materials:

Prickly pear fruits (*Opuntia ficus indica*) were grown in El-Nobarea, El-Behera governorate- Egypt were purchased at 2010-2011, and melon fruits were grown in El-Nobarea, El-Behera governorate-Egypt were purchased at 2010 -2011, were obtained from the local market and kept at 5^{o}C until used.

2. Sample preparation:

Fruits were washed in running tap water. The raw materials were washed and peeled, then prickly pear flesh was cut to cubes, prickly pear seeds and peels were removed. Prickly pear and melon samples were blended using kitchen machine to obtain their juices as recommended by **Kowalska *et al*., (2008).**

3. Chemical properties:

3.1. Determination of the chemical properties:

The chemical composition (moisture content, total carbohydrates, lipids, proteins, ash, crude fiber, Total soluble Solids (TSS) and pH) for all fresh materials and dried sheet samples were determined according to **AOAC (2005)** methods.

3.2. Titratable acidity:

Titratable acidity as % citric acid was determined by titrating the pulp with 0.1 N NaOH according to the standard procedure of **AOAC (2005).**

3.3. Minerals analysis:

Minerals analysis for Na, K, Ca, Mg, P, Fe and Cu were measured in ash solution using Perkin Elmer atomic absorption spectrophotometer (Model 2380). According to **AOAC (2005)** Ascorbic Acid content was also determined in pulp according to **AOAC (2005).**

3.4. Total carotenoids content:

Carotenoids were extracted using 80% acetone and colormetry determined at the wavelengths of 470, 646 and 663 nm according to the method described by **Rumin´ska *et al*., (1990).**

3.5. Glucose and fructose contents:

Glucose and fructose contents were determined according to **AOAC (2005).**

4. Technological experimental:

4.1. Blends preparation:

Three products were prepared of (juice, jam and sheet). The blends preparation was carried out as follows: 100% (P) which was composed Prickly pear; 100% (M) which was composed melon pure; 75% (P) + 25% (M); 50% (P) +50% (M) and 25%(P) + 75% (M).

4.2. Drying process:

To prepare the produced sheets were dried in a air-forced drier oven model (Shel Lab 1370 FX Sheldon Manufacturing, Inc.). The studied juice blends were placed in thin layers on trays in the oven at 60-70^{o}C as described by **Akpinar *et al*., (2006).**

5. Physical properties:

5.1. Color parameters:

The color of the tested sheets was measured using a spectro-colorimeter (Tristimulus color Machine) C/E lab color scale (Hunter, Lab Scan XE, Germany) Calibrated with a white standard tile of hunter lab color standard (LX No. 16379): X=77.26, y-81.94 and Z=88.14 (L*=92.71; a*=-0.89; b*=-0.18). The color parameters were calculated using Hunter Scot field's equation as follows:

$H^* = \tan^{-1} (b^*/a^*)$

Saturation = square root of (a2* + b2*)

Where: L* indicates lightness, a* is the + redness, and b* is the +yellowness. The Hue (H)*, and used to describe the color change during drying as explained by **Soysal (2004) and Hunter (1975).**

5.2. Rehydration ratio:

Rehydration ratio was calculated according to the method descried by **Charm (1971).** Rehydration ratio and hydration coefficient were calculated from the following equation:

Rehydration Ratio = R/M

Hydration Coefficient = R (100-M1) / 100 (A – M2)

M= ((R-D) × 100)/R

Where:-

M = Percentage of moisture content of the rehydrated sample.

R = weight of the rehydrated sample.

D = weight of the dry matter content of rehydrated sample.

A = weight of the dried sample.

M1 = Percentage of moisture content of the fresh sample.

M2 = Percentage of moisture content of the dried sample.

5.3. Sensory evaluation:

Sensory evaluation test carried out according to **Nadir et al., (2005).** Taste, color, texture, odor and overall acceptability of prickly pear fruit products including syrup, sheet and jam were assessed using ten panelists of Food Science and Technology Department, national research center, Dokki, Giza, Egypt.

6. Statistical analysis:

Results were statistically analyzed using SPSS statistical package (Version 9.05) according to **Rattanathanalerk *et al*., (2005),** analysis of variance (ANOVA), Duncan's multiple range test and least significant difference (LSD) was chosen to determine any significant difference among various treatments.

3. Results and discussion

1. Chemical analysis of prickly pear fruits (*Opuntia* sp):

Results of chemical analysis (moisture, ash and protein, crude fibers, total carbohydrates, pectin and crude fat) of examined samples were investigated. Results in table (1) showed that the moisture, ash, protein, crude fibers, total carbohydrate, pectin, and fat (85.64, 7.61, 0.84, 3.88, 85.43, 0.41 and 1.92) respectively for prickly pear pulp. While those in prickly pear juice were (87.72, 8.51, 0.00, 1.08, 88.69, 0.18 and 1.54) respectively, these results were agreed with **(Kuti, 1992; Piga, *et al*., 1996, Piga, 2004** and **Lester and Hodges 2008).**

On the other side, results in table (1) showed that the melon pulp were (82.82, 7.02, 5.71, 3.21, 81.36, 0.64 and 2.06) respectively, while these in melon juice were (85.23, 7.64, 0.25, 0.91, 89.55, 0.24 and 1.41) respectively. These results were agreed with the result of **Villanueva *et al*., (2004).**

Data in Table (2) exhibited the proximate analyses of prickly pear pulp and melon pulp. Data indicated that the prickly pear pulp was higher in (crude protein and ash) compared to melon pulp while the melon pulp was higher in (crude fiber, pectin and crude lipids) compared to prickly pear pulp. These results are in agreement with the data obtained by **Ahmed (2000)** and **Villanueva *et al*., (2004).**

Minerals content:

Results in table (2) showed that Phosphorus, Iron, Magnesium, Calcium, Potassium, Sodium, Copper, Zinc, Manganese and Selenium contents of prickly pear pulp on dry weight were (340.9, 12.8, 230.8, 385.2, 782.8, 60.4, 0.192, 8.2, 6.3mg/100g and 0.9 µg/100g) respectively, These results were agree with **(Sepulveda and Sáenz, 1990 and Rodriguez *et al*., 1996).** While melon pulp it was (35.42, 0.51, 18.11, 29.02, 301.80, 5.24, 0.043, 0.09, 1.08 mg/100g and 0.22 µg/100g) on dry weight, respectively. These results were agreed with **(Abdel-Nabey, 2001** and **Lucas *et al*., (2008).** Data indicated that the prickly pear pulp was higher in minerals compared to melon pulp.

Table(1): Proximate Composition of Prickly pear pulp, Prickly pear juice, Melon pulp and Melon juice.

Samples	Moisture	Protein	Crude fibers	Ash	Total carbohydrates	Pectin	Crude fat
Prickly pear pulp	85.64	7.61	0.84	3.88	85.43	0.41	1.92
Prickly pear juice	87.72	8.51	0.00	1.08	88.69	0.18	1.54
Melon pulp	82.82	7.02	5.71	3.21	81.36	0.64	2.06
Melon juice	85.23	7.64	0.25	0.91	89.55	0.24	1.41

*On dry weight bases.
Carbohydrate contents were calculated by difference

Table (2): Minerals contents in prickly pear pulp and melon pulp.

Mineral	prickly pear pulp (mg/100g)	Melon pulp (mg/100g)
Phosphorus	340.9	35.42
Iron	12.8	0.51
Magnesium	230.8	18.11
Calcium	385.2	29.02
Potassium	782.8	301.80
Sodium	60.4	5.24
Copper	0.192	0.043
Zinc	8.2	0.09
Manganese	6.3	1.08
Selenium	0.9 µg	0.22 µg

2. Physicochemical properties:

Ascorbic acid content, Acidity, pH, TSS and total carotenoids of prickly pear pulp and melon pulp are presented in Table (2) a, b.

Ascorbic acid content:

Results from table (2a) showed that the ascorbic acid content in prickly pear pulp higher than these in melon pulp. Ascorbic acid content of pulp was (168.74mg/100g and 82.6 mg/100g) of Prickly pear and melon, respectively. While in juice it was (172.82 mg/100g and 85.02 mg/100g) for (Prickly pear and melon) respectively, These results were agree with the results **Abdel- Naby, (2001).**

Acidity content:

Data in table (2a) showed that the acidity content of the studied samples was (0.61 and 0.7%) for (Prickly pear and melon pulp) respectively and (0.65 and 0.74%) for (Prickly pear and melon juice) respectively. Acidity of prickly pear pulp was lower (0.1) than that of melon pulp. These results were agreed with **(Cantwell, 1995; 2004; Rodriguez-Felix, 2002 and Codex Standard, 2005).**

pH values.

Results from table (2a) showed that the pH values of prickly pear pulp was the highest (5.43), whereas, their values lower 5.05 in melon pulp, these result was agree with **(Sáenz, 1996; Abdel-Nabey, 2001 and El-Samahy *et al*., 2006).** In general, the pH values of the blended juices were ranged between 5.05 in melon pulp and 5.43 in prickly pear pulp respectively.

Total soluble solids:

(TSS) % of prickly pear and melon pulp was (12.4% and 5.8%) for (Prickly pear and melon) respectively, but in the fruits juice was (12.5% and 6.0%) for (Prickly pear and melon) respectively. These results were agreed well with **(Abdel-Nabey, 2001 and El-Samahy *et al*., 2006).**

Table(2a): Ascorbic acid content, Acidity content, pH value, T.S.S., total carotenoids, glucose and fructose content of prickly pear pulp, prickly pear juice, melon pulp and melon juice.

Sample	Ascorbic acid content (mg/100g)	Acidity content%	pH value	T.S.S	Total carotenoids (mg/100g)	Glucose g/kg	Fructose g/kg
Prickly pear pulp	168.74	0.61	5.43	12.40	0.91	34.0	30.4
Prickly pear juice	172.82	0.65	n.d	12.50	0.96	n.d	n.d
Melon pulp	82.60	0.70	5.05	5.80	0.56	16.2	12.1
Melon juice	85.02	0.74	n.d	6.00	0.59	n.d	n.d

*On dry weight bases. Where: n.d = not determined

TSS values in prickly pear pulp higher than in melon pulp. Consequently, blends originated by higher ratio of prickly pear pulp possessed higher values of specified parameter, would containing higher values of the corresponding parameter. At last total carotenoids in prickly pear pulp higher than these in melon pulp.

Glucose and fructose content:

Data in table (2a) showed that the glucose and fructose contents of prickly pear pulp were higher than these in melon pulp. However, glucose and fructose in prickly pear pulp were, 34.0 and 30.4 g/kg respectively, whereas, these values are lower in case of melon pulp 16.2 and 12.1 g/kg respectively, so that prickly pear more sweaty compared to melon, these

result was agree with **Munoz-de-chavez *et al*., (1995).**

Table (2b): T.S.S. values of prickly pear pulp, melon pulp and its blends.

Sample	T.S.S.
Prickly pear juice %	12.40
75% (P) + 25% (M)	10.40
50% (P) + 50% (M)	8.70
25% (P) + 75% (M)	8.40
Melon juice %	5.80

Where: (P) = Prickly pear, (M) =melon.

Total carotenoids content:

Data in table (2a) showed that the carotenoids in prickly pear pulp higher than that in melon pulp. However, carotenoids contents were (0.91 and 0.56 mg/100g) in (prickly pear pulp and melon pulp) respectively. But it was (0.96 and 0.59 mg/100g) for (Prickly pear and melon) respectively. These results were agreed well with the results of **Lester and Eischen (1996), Ahmed (2000)** and **El-Samahy *et al*., (2006).**

3. Physical properties:

Color*:*

Data presented in tables (3-5) contained the L*, a*, b*, Hue, saturation and ΔE parameter values of the tested samples. It indicates the lightness of prickly pear pulp, melon pulp and its blends juices, jam and sheets. Samples obtained from prickly pear juice and its blends with melon juice were lighter (higher L* value) than pure prickly pear pulp. There is a slightly variation such parameter which seemed to be attributed to the higher pigments like carotenoid content in prickly pear juice than that found in absolute pulp and juice of melon pulp. The current data on carotenoids content are in agreement with that obtained by **Patras *et al*., (2009)**, **Timmermans *et al*., (2011) and Abou-Zaid *et al*., (2012).**

Such confirming was concurrent with **Alibas (2007)** who found that using the sheet making from prickly pear pulp and its blends have darker properties, L* values ranging from 2.63 to 6.63 for jam, 9.81 to 29.18 for juice and 36.46 to 41.96 for sheet as a result of increasing the prickly pear pulp ratio. It was due to the darkest dried materials which were comes from prickly pear pulp or juice in comparison to samples had less prickly pear pulp or juice **(Abou-Zaid *et al*., 2012).** Data presented in the same table showed that the sheets contained higher ratios of prickly pear pulp possessed higher redness values (a* value 5.64, 8.01, and 11.41 for jam, juice and sheet, respectively contained 75%(P) + 25% (M) 3.43, 0.00 and 10.99 for jam, juice and sheet, respectively contained 50% (P) + 50% (M) and (2.63, 5.49 and 10.11) for jam, juice and sheet, respectively contained 25% (P) + 75% (M) blend). It was due to the increasing in carotenoids in blends. Sheets of 100% prickly pear exhibited the highest values of the parameter a* value, which is attribute to the high content of carotenoids in prickly pear pulp (0.91 mg/100mg).

The highest values of yellowness were detected in sheets of pure prickly pear pulp. Values of the yellowness parameter b* value were 11.60, 15.96 and 15.77 for the pure prickly pear pulp of jam, juice and sheet, respectively to 12.49, 16.79 and 14.86 for jam, juice and sheet, respectively contained 75%(P) + 25% (M) to 10.42, 14.46 and 19.66 for jam, juice and sheet, respectively contained 50% (P) + 50% (M) and 11.86, 6.01 and 17.83 for jam, juice and sheet, respectively contained 25% (P) + 75% (M) blends. The results were harmonized to results of **Shi *et al*., *(*2010*).***

Table (3): Hunter instrument measurements of prickly pear pulp and its blends with melon pulp jam.

Sample	L*	a*	b*	a/b	Hue	Saturation	ΔE
Prickly pear jam 100%	19.80	6.63	11.60	0.57	60.25	13.36	-
75% (P) + 25% (M)	21.58	5.64	12.49	0.45	65.70	13.70	2.22
50% (P) + 50% (M)	18.74	3.43	10.42	0.33	71.78	10.97	3.57
25% (P) + 75% (M)	21.99	2.63	11.86	0.22	77.50	12.15	4.56

Where: (P) = Prickly pear, (M) =melon.

Table(4): Hunter instrument measurements of prickly pear and its blends with melon juice.

Sample	L*	a*	b*	a/b	Hue	Saturation	ΔE
Prickly pear juice 100%	25.15	-3.99	7.45	0.54	61.82	8.45	15.48
75% (P) + 25% (M)	28.83	8.01	16.79	0.48	64.49	18.60	22.01
50% (P) + 50% (M)	29.18	0.00	14.46	0.00	0.00	14.46	21.83
25% (P) + 75% (M)	9.81	5.49	6.01	0.91	47.58	8.14	-
(M) juice 100%	27.06	11.09	15.96	0.69	55.21	19.43	20.68

Where: (P) = Prickly pear, (M) =melon.

Table(5): Hunter instrument measurements of prickly pear pulp and its blends with melon pulp sheets.

Sample	L*	a*	b*	a/b	Hue	Saturation	ΔE
Prickly pear sheet 100%	36.46	9.78	15.77	0.62	58.19	18.56	6.18
75% (P) + 25% (M)	41.15	11.41	14.86	0.77	52.48	18.74	4.43
50% (P) + 50% (M)	40.14	10.99	19.66	0.56	60.79	22.52	2.99
25% (P) + 75% (M)	38.08	10.11	17.83	0.57	60.45	20.50	4.10
(M) 100%	41.96	8.94	18.45	0.49	64.15	20.52	-

Where: (P) = Prickly pear, (M) =melon.

The values of b* and L* values parameters of melon pulp were slightly differed. The a* (redness values) parameter 27.06 to 41.96 for juice and sheet, respectively containing 100% melon to 19.80, 25.15 and 36.46 for jam, juice and sheet, respectively contained zero% melon. It was due to the increment of dietary fiber in melon pulp which adsorb more carotenoids color and thus led the pulp appeared to be less red than the other sample which contained the same contents of carotenoids but had less content of fibers. Sheets of 100% melon pulp exhibited the lowest values of the a* value parameter, which is attributable to the low content of carotenoids 0.56 mg/100mg in melon. This confirmed the results of **Nawirska *et al*., (2009)** who reported that the a* value parameter was very well correlated with the carotenoid contents.

Rehydration ratio:

The effect of melon juice addition to prickly pear juice on the quality of rehydrated sheets properties are presented in table (6). The obtained results indicated that there were significant differences for rehydration ratio of sheets manufacturing by the different blends. The hydration ratio was increased by increasing melon pulp ratio. Since, it was increased in case of 50:50 P:M and 25:75 P:M sheets were 6.3 and 7.6, respectively. It could be also noticed that the moisture content of rehydrated sheet produced from prickly pear blended with ratios 50:50 P:M and 25:75 P:M sheet reached to 87.12 and 88.33%, respectively, While it was decreased to 83.80% in pure prickly pear sheet. Hydration coefficient of rehydrated sheet of 75: 25 P:M was 1.35, while it was 1.28 in rehydrated pure prickly pear sheet.

The hydration ratio was increased by increasing specified components possessed more dietary fibers, total soluble solids and total soluble sugars like melon since dietary fiber had hydrophilic properties and caused increasing in hydration coefficient **(Abou-Zaid *et al*, 2012).**

Table (6): Rehydration ratio, moisture content and hydration coefficient of the tested rehydrate of prickly pear pulp and its blends with melon pulp sheets.

Sheet samples	Rehydration ratio	Moisture content of rehydrate sample %	hydration coefficient
Prickly pear sheet 100%	1 : 4.3	83.80	1.28
75% (P) + 25% (M)	1 : 5.1	85.68	1.35
50% (P) + 50% (M)	1 : 6.3	87.12	1.42
25% (P) + 75% (M)	1 : 7.6	88.33	1.47
(M) %100	1 : 8.2	89.91	1.51

Where: (P) = Prickly pear, (M) =melon.

Organoleptic evaluation:

Statistical analysis of organolyptic evaluations data of (sheets, jam and juice) from prickly pear and its blendes with melon are shown in tables (7 - 9). The obtained data revealed that all properties of 100% P and 75% + P25% (M) have higher scores and have not any significant difference in 50% P +50% M samples with slightly differences and in 25% (P) + 75% (M) samples while 100% (M) samples had high significant differences. The pure prickly pear products had the highest score in all organolyptic properties values. It could be concluded that the samples produced from 100% prickly pear and 75% (P) + 25% (M) were accepted and have highest scores. Whereas blends samples contained prickly pear 50% (P) + 50% (M) ratios were having slightly differences and 25% (P) +75% (M) and 100% (M) these unacceptable from panelists compared to samples produced by 100% (P).

Conclusion:

Results indicated that products of 100% prickly pear were the best for panelists followed by prickly pear and melon blends. The obtained data indicated that the best blends were those composed of 100% prickly pear, followed by 75% prickly pear+ 25% melon, followed by 50% prickly pear + 50% melon. However, products were made from (25% prickly pear + 75% melon) possessed a lower acceptable. While products contained 100% melon had the lowest ability compared to and was highly differed compared to products contained pure prickly pear.

Table (7): Organoleptic test values of the tested blend sheets.

Sample	Color	Taste	Odor	Texture
Prickly pear sheet 100%	9.0^{a}±0.2	9.0^{a}±0.2	9.0^{a} ±0.4	9.0^{a}±0.5
75% (P) + 25% (M)	8.6^{ab}±0.3	9.0^{a}±0.2	9.0^{a} ±0.8	9.0^{a}±0.6
50% (P) + 50% (M)	8.3^{b}±0.5	8.5^{a}±0.4	9.0^{a} ±0.1	8.2^{ab}±0.3
25% (P) + 75% (M)	8.0^{b}±0.4	8.0^{b}±0.8	8.0^{b}±0.6	8.0^{b}±0.2
(M) 100%	6.0^{c}±0.7	6.0^{c}±0.75	6.0^{c}±0.5	5.0^{c}±0.1
L.S.D.	0.501	0.950	0.998	0.782

Where: (P) = Prickly pear pulp, (M) =melon pulp.
Values, within the same coulmn, followed by the same letter is not significant different at 0.05 level:

Table (8): Organoleptic test values of the tested blend jam.

Sample	Color	Taste	Odor	Texture
(P) 100%	9.0^{a}±0.1	9.0^{a}±0.2	8.0^{b}±0.3	8.0^{a}±0.4
75% (P) + 25% (M)	9.0^{a}±0.2	8.0^{b}±0.3	9.0^{a}±0.4	8.0^{a}±0.3
50% (P) + 50% (M)	8.0^{b}±0.2	8.0^{b}±0.2	9.0^{a}±0.6	9.0^{b}±0.5
25% (P) + 75% (M)	8.0^{b}±0.4	7.0^{c}±0.6	6.0^{c}±0.8	7.0^{c}±0.7
L.S.D.	0.964	0.848	0.902	0.888

Where: (P) = Prickly pear pulp, (M) =melon pulp.
Values, within the same coulmn, followed by the same letter is not significant different at 0.05 level:

Table (9): Organoleptical characteristics values of the tested blend juice.

Sample	Color	Taste	Odor	Texture
(P*) 100%	9.0^{a}±0.2	8.2^{a}±0.4	8.5^{ab}±0.5	9.0^{a}±0.1
75% (P*) + 25% (M*)	9.0^{a}±0.3	9.0^{a}±0.5	9.0^{a}±0.6	8.0^{ab}±0.5
50% (P*)+ 50% (M*)	8.6^{ab}±0.4	9.0^{a}±0.2	9.0^{a}±0.4	8.0^{ab}±0.3
25% (P*) + 75% (M*)	8.0^{b}±0.4	7.0^{b}±0.4	8.4^{ab}±0.4	6.0^{b}±0.3
(M*) 100%	4.0^{c}±0.9	4.0^{c}±0.8	5.0^{c}±0.9	5.0^{c}±0.7
L.S.D.	0.784	0.910	0.624	0.871

Where: (P*) = Prickly pear juice, (M*) =melon juice.
Values, within the same coulmn, followed by the same letter is not significant different at 0.05 level:

References.

1. **Abdel-Nabey, A. A. (2001).** Chemical and technological studies on prickly pear [*Opuntia ficus-indica* (L.) Mill] fruits. Alex. J. Agric. Res., 46(3): 61-70.
2. **Abou-Zaid, A.A.M., Nadir, A.S. and Mostafa, T. Ramadan. (2012).** Studies on Sheets Properties made from Juice and Puree of Pumpkin and Some other Fruit Blends. Journal of Applied Sciences Research, 8(5): 2632-2639.
3. **Adams, C.F. and Richardson, M. (1981).** Nutritive value of foods. USDA Home and Garden Bul. 72. Government Printing Offic, Washington. D.C.
4. **Ahmed (2000).** Some studies on prickly pear fruits 'process and uses'. Ph.D. Thesis, Food Science Department, Faculty of Agriculture, Benha University.
5. **Akpinar, E.K., A. Midilli and Bicer, Y. (2006).** The first and second law analyses of thermodynamic of pumpkin drying process. Journal of Food Engineering, 72: 320-331.
6. **Alibas, I., (2007).** Microwave, air and combined microwave-air-drying parameters of pumpkin slices. LWT, 40 (8): 1445-1451.
7. **AOAC, (2005).** Official Methods of Analysis of AOAC INTERNATIONAL. 18th Ed., AOAC INTERNATIONAL, Gaithersburg, MD, USA.
8. **Cantwell, M. (1995).** Postharvest management of fruits and vegetable stems. in: agroecology, cultivation and uses of cactus pear. G. Barbera, P. Inglese and E. Pimienta-Barrios (eds) FAO plant production and protection paper no. 132, Rome Italy, pp. 120-136.
9. **Cantwell, M. (2004).** The commercial storage of fruits, vegetables, and florist and nursery stocks. Agr. Handbook No. 66 USDA, ARS.
10. **Charm, S.E., (1971).** Dehydration of foods. In The fundamentals of Food Engineering. 2nd ed. The AVI Publishing Company.
11. **Codex standard for prickly pear (2005).** (Codex stand 186-1993, A. MD. 1.
12. **El-Samahy, S. K.; Abd El-Hady, E. A. ; Habiba, R. A. and Moussa, T.E. (2006).** Chemical and rheological characteristics of orange yellow cactus pear pulp from Egypt. J. Profess. Assoc. Cactus Develop., 8:39-51.
13. **Ewaidah, E.H. and Hassan, B.H. (1992).** Prickly pear sheets: a new fruit product. *International*

Journal of Food Science and Technology, 27: 353.358.

14. **Fernandez, M.; Trejo, A. and Mc-Namara, D. (1990).** Pectin isolated from prickly pear (Opuntia sp.) modifies low density lipoprotein metabolism in cholesterol fed guinea pigs. J. Nutr., 120: 1283-1290.
15. **Forni, E., Polesello, A., Montefiori, D. and Maestrelli, A. (1992).** High Performance liquid chromatographic analysis of the pigments of bloodred Prickly pear (Opuntia ficus-indica). J. Chromatogr. 593: 177-183.
16. **Feugang, J.M.; Konarski, P.; Zou, D.; Stintzing, F.C. and Zou, C. (2006).** Nutritional and medicinal use of cactus pear (*Opuntia* spp.) cladodes and fruits. *Front. Biosc*. *11*, 2574–2589.
17. **Galati, E.; R.,Mondello, M.; Giuffrida, D.; Dugo, G.; Miceli, N.; Pergolizzi, S. and Taviano, M. (2003).** Chemical characterization and biological effects of Sicilian *Opuntia ficus-indica* (L.) Mill. fruit juice: antioxidant and antiulcerogenic activity. J. Agric. Food chem. 51: 4903. 4908.
18. **Gebremariam, T.; Melaku, S. and Yami, A. (2006).** Effect of different levels of cactus (*Opuntia ficus-indica*) inclusion on feed intake, digestibility and body weight gain in tef (*Eragrostis tef*) straw-based feeding of sheep. *Anim. Feed Sci. Tech. 131*, 42–51.
19. **Hunter, R.S., (1975).** Scales for measurements of color differences. In measurement of appearance, J. Wiley Ed., pp. 133. Inter. Science, New York.
20. **Joubert, E. (1993).** Processing of the fruit of five prickly pear cultivars grown in South Africa. International J. of Food Sci. and Technol., **28**:337-387.
21. **Kowalska, H., A. Lenart and D. Leszczyk, (2008).** The effect of blanching and freezing on osmotic dehydration of pumpkin. Journal of Food Engineering, 86: 30-38.
22. **Kuti, J. O. (1992).** Growth and compositional changes during the development of prickly pear fruit. J. Hort. Sci., 67: 861-868.
23. **Lana, M.M. (2005).** Modelling quality of fresh-cut tomato based on stage of maturity and storage conditions. Ph.D. Thesis. Wageningen University.
24. **Lester, G.E., (1997).** Melon (Cucumis melo L.) fruit nutritional quality and health functionality. Hort Technology 7, 222–227.
25. **Lester, G.E. and Eischen, F., (1996).** Beta-carotene content of postharvest orange-fleshed muskmelon fruit: effect of cultivar, growing location and fruit size, Plant Foods Hum. Nutr. 49, 191–197.
26. **Lester, G.E. and Hodges, D.M. (2008).** Antioxidants associated with fruit senescence and human health: Novel orange-fleshed non-netted honey dew melon genotype comparisons following different seasonal productions and cold storage durations, Postharvest Biology and Technology 48 (2008) 347–354 Postharvest Biology and Technology (48) 347–354**.**
27. **Lucas, E.A., Dumancas, G.G., Smith, B.J., Clarke, S.L., and Arjmandi, B.H. (2008).** Bioactive Foods in Promoting Health: Fruits and Vegetables, Health Benefits of Bitter Melon (Momordica charantia), 525- 549.
28. **Medina, E.; Rodrý´guez, E. and Dý´az Romero, C. (2007).** Chemical characterization of Opuntiadillenii and puntiaficusindica fruits, Food Chemistry 103: 38-45.
29. **Munoz-de-chavez M, Chavez A, Valles A, Roldan JA (1995).** Plants in human nutrition. World Rev. Nutr. Diet 77: 175-181.
30. **Nadir, A.; I.M.F. Helmy and K.I. Hamad (2005).** Production of improved prducts from date.J.Agric.Sci.Mansoura Univ., 30 (9): 5443-5485.
31. **Nawirska, A., A. Figiel, A.Z. Kucharska, A. Sokl-Letowska and A. Biesiada, (2009).** Drying kinetics and quality parameters of pumpkin slices dehydrated using different methods. Journal of Food Engineering, 94: 14-20.
32. **Panico, V.; Garufi, F.; Puglia, C.; Bonina, F. and Ronsisvalle, S.(2007).** Effect of hyaluronic acid and polysaccharides from Opuntiaficusindica (L.) cladodes on the metabolism of human chondrocyte culture, Journal of Ethnopharmacology Volume: 111, Issue: 2, : 315-321.
33. **Patras, A., B.K. Tiwari, N.P. Brunton and Butler, F. (2009).** Modelling the effect of different sterilization treatments on antioxidant activity and colour of carrot slices during storage. Food Chemistry, 114: 484-491.
34. **Periago, M.J.; Ros, G.; López, G.; Martínez, M.C. and Rincón, F. (1993).** The dietary fiber components and their physiological effects. Rev. Esp. Ciencia Tecnol. Aliment., 33, 229–246.
35. **Piga, A. (2004).** Cactus pear, a fruit of nutraceutical and functional importance. J. Prof. Assoc. Cactus. Dev. 6, 9–22.
36. **Piga, A.; D.aquino, S.; Agabbio, M. and Schirra, M. (1996).** Storage life and quality attributes of cactus pears cv.. Gialla. as affected by packaging. Agriculture Mediterranea 126: 423.427.
37. **Pimienta, E. (1990).** *El Nopal tunero* (1st Edn) Jalisco Méxcio: Universidad de Guadalajara. 246 pp.
38. **Rattanathanalerk, M., C. Naphaporn and Walaiporn, S., (2005).** Effect of thermal processing on the quality loss of pineapple juice. J. Food Eng., 66: 259-265.
39. **Rodríguez-Félix, A. (2002).** Postharvest physiology and technology of cactus pear fruits and cactus leaves. Acta Hort. (Proc.4th IC on Cactus Pear and Cochineal), 581: 191-199.

40. **Rodriguez, S., Orphee, C., Macias, S., Generoso, S. and Gomes García, L. (1996).** Tuna: Propiedades fiscio-químicas de dos variedades. *La Alimentación Latinoamericana*, 210**:** 34-37.
41. **Rodríguez-García M.E.; De Lira, C.; Hernández-Becerra, E.; Cornejo-Villegas, M.A.; Palacios-Fonseca, A.J.; Rojas-Molina, I.; Reynoso, R.; Quintero, L.C.; Del real, A. and Zepeda, T.A. (2007).** Physicochemical characterization of prickly pads (*Opuntia ficus indica*) and dry vacuum prickly pads powders as a function of the maturation. *Plant Foods Hum. Nutr. 62*, 107–112.
42. **Rumin´ska, A., K. Suchorska and Z. Weglarz, (1990).** Rosliny lecznicze i specjalne cz. I Wiadomosci ogolne. Wydawnictwo SGGW AR, Warszawa.
43. **Russell, C.E. and Felker, P. (1987).** The prickly-pears (Opuntia sp., cactaceae): A source of human and animal food in semiarid regions. Economic Botany. 41: 433-445.
44. **Sáenz, C. (1996).** Food products from cactus pear (*Opuntia ficus indica). Food Chain*, 18: 10-11.
45. **Sawaya, W.; Khatchadourian, H.;Safi, W. and Al- Muhammad, H. (1983).** Chemical characterization of prickly pear pulp, *Opuntia ficus-induca*, and the manufacturing of prickly pear Jam. J. Fd. Technol., 18: 198-193.
46. **Schirra, M. (1998).** Storage trials of cactus pear [*Opuntia ficus-indica Miller* (L.)] fruit with `non-conventional` methods, p. 17-21. In: Proceedings of the International Symposium on Cactus pear and nopalitos, processing and uses. Santiago. Chile, 1998.
47. **Schirra, M.;D.hallewin, G.;Inglese, P. and La Mantia, T.(1999a).**Epicuticular changes and storage potential of cactus pear [*Opuntia ficus-indica* Miller (L.)] fruit following gibberellic acid preharvest sprays and postharvest heat treatment. Postharvest Biol. Technol., 17: 79. 88.
48. **Schirra, M.; Inglese, P. and La Mantia, T. (1999b).** Quality of cactus pear [*Opuntia ficus-indica* (L.) Mill.] fruit in relation to ripening time, CaCl2 pre-harvest sprays and storage conditions. Sci. Hort., 81:425-436.
49. **Sepulveda, E. and Sáenz, C. (1990).** Chemical and physical characteristics of prickly pear (*Opuntia ficus indica*) *pulp. Revista de Agroquimicayy Tecnologia de Alimentos*, 30: 551.555.
50. **Shi, J.; Yi, C.; Ye, X.; Xue, S.; Jiang, Y.; Ma, Y. and Liu, D. (2010).** Effects of supercritical CO2 fluid parameters on chemical composition and yield of carotenoids extracted from pumpkin. LWT - Food Science and Technology, 43: 39-44.
51. **Soysal, Y., (2004).** Microwave drying characteristics of parsley. Biosystems Engineering, 89: 167-173.
52. **Stintzing, F.C.; Schieber, A. and Carle, R. (2001).** Phytochemical and nutritional significance of cactus pear. Eur. Food Res. Technol. 212, 396–407.
53. **Stintzing, F. and Carle, R. (2004).** Functional properties of anthocyanins and betalains in plants, food, and in human nutrition. Trends in Food Science and Technology, 15, 19.38.
54. **Stintzing, F.C. and Carle, R. (2005).** Cactus stems (*Opuntia* spp.): A review on their chemistry, technology, and uses. *Mol. Nutr. Food Res.* 49, 175–194.
55. **Taylor, M. (1994).** Estimate of revenue, dollar impact and jobs created for some crops grown in the Rio. Grande Valley of Texas. Texas Agr. Ext. Serv. Publ. Weslaco.
56. **Tesoriere, L.; Butera, D.; Pintaudi, A.; Allegra, M. and Alivrea, M. (2004).** Supplementation with cactus pear (*Opuntia ficus-indica*) fruit decreases oxidative stress in healthy humans: a comparative study with vitamin C_{1-3}. Am. J. Clin. Nutr.80: 391. 395 "www. ajcn. org"
57. **Timmermans, R.A.H., H.C. Mastwijk, J.J. Knol, M.C.J. Quataert, L. Vervoort, I. Van der Plancken, M.E. Hendrickx and Matser, A.M. (2011).** Comparing equivalent thermal, high pressure and pulsed electric fieldprocesses for mild pasteurization of orange juice. Part I: Impact on overall quality attributes. Innovative Food Science and Emerging Technologies, 12: 235-243.
58. **Turker, N., Coskuner, Y., Ekiz, H.I., Aksa, S. and Karababa, E. (2001).** The effect of fermentation on the thermostability of the yellow-orange pigments extracted from cactus pear (Opuntia ficus-indica). Eur. Food Res. Technol. 12: 213-216.
59. **Villanueva, M.J., Tenorio, M.D., Esteban, M.A. and Mendoza, M.C. (2004).** Compositional changes during ripening of two cultivars of muskmelon fruits. Food Chemistry (87)179–185.

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