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Chemistry and functional properties of bioactive compounds present in Prickly pear fruits

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Abstract

Prickly pear (Opuntia ficus -indica) pulp is a rich source of essential nutrients, bioactive compounds, high fiber and phytochemical as a source of food or a potential medicinal agent. The processing and preservation on the characteristics of prickly pear juice has drawn fresh attention. Thus, the goal of the current study was to assess the physicochemical characteristics, amino acids, fatty acids, vitamins, mineral, phytochemicals, and sensory evaluation of prickly pear fruit and juice. Chemical composition of Prickly pear fruit's was determined by dry weight and included the following amounts: 7.90% protein, 16.80% fat, 47.90% fibre, 3.70% ash, and 23.70% total carbs. Na, K, Ca, Mg, p, Fe, and Zn were found to be: 13.4, 12.5, 22.9, 7.0, 10.6, 2.35, and 0.84 mg/100 g. A notably high concentration of both essential (10g/100g) and non-essential (14.8g/100g) amino acids was found in the protein of prickly pears. Also, contained B- Carotene (28 µg/100g), B- Cryptoxanthin (2 µg/100g), total phenol (94.06 mg/100g) and total antioxidants (27.63%). The fruit is a good source of vitamins such as vitamins (E, C, Riboflavin, Thiamine, B6 and Niacine). The greatest sensory scores for colour, taste, odour, texture, appearance, and overall acceptability were substantially (P≤0.05) found in prickly pear juice. In conclusion, prickly pear juice can be used successfully as a good source of bioactive chemicals and antioxidant activity.

Keywords: Prickly pear fruit, chemical composition, bioactive compounds, amino acids, fatty acids and vitamins

1. Introduction

Prickly pear (*Opuntia ficus-indica*) is a tree originating in Mexico and yields an edible fruit, belongs to the family Cactaceae. It is widely distributed in Latin America, South Africa and the Mediterranean area including Egypt. The fruit is usually consumed fresh, during the ripening period, July–October and well appreciated by consumers because they are flavorsome good [1,2]. Prickly pear tolerates high temperatures and limited water supplies, plant grows in poor soil. It is an elongated oval berry covered with peel (skin) with thorns and the fruit pulp contains a number of seeds and pulp, fleshy fruit is edible and juicy. The fruit has different colors, such as green, canary yellow, lemon yellow, red, cherry red, or purple. They are the result of betalains pigments found in the skin, and the pulp of the prickly pear gives it a color ranging from yellow to purple [3, 4]. Because it is a significant source of nutrients such fibre, amino acids, vitamin E, ascorbic acid, carotenoids, sugars, organic acids, minerals, and oil composition, prickly pears are regarded as functional foods [1,5].Cactus pear juice helps prevent cramps and osteoporosis because the flesh of the prickly pear fruit is said to be a strong source of minerals, including phosphorus, calcium, and magnesium [6,7]. Prickly pear fruit juice is a source of betaxanthin pigments which can be used as water-soluble natural colorants in foods and rich in phenolic compounds, that consumption may play a vital role in health through the regulation of metabolism, weight, chronic disease [8, 9]. Betalains and polyphenols are antioxidants that contribute to nutritional prickly pears quality and to their products of transformation. Another important antioxidants in prickly pear fruits include pectin and flavonoids including kaempferol and quercetin [2, 5, 7]. Notably, natural cactus pear fruit compounds and derivatives have biologically activities such as antiulcerogenic, anticancer, antimicrobial, neuroprotective,

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hepatoprotective, anti-inflammatory, antioxidant properties that may help in preventing chronic pathologies such as diabetes [3, 10]. Prickly pears contain phenolic compounds like phenolic acid, ferroalloy-sucrose and snappily-di glycoside, fatty acids like palmitic acid, stearic acid, oleic acid, vaccinic acid, and linoleic acid (seeds, peel and juicy pulp) [11]. Prickly pear fruits are sold in various attractive colors (green, yellow, and white-orange, purple and red) either peeled or unpeeled. The color difference is a result of pigments content (chlorophylls, carotenoids and betalains), which is used as a natural food colorant [12]. Food scientists and technologists are becoming more interested in Opuntia spp. Due to its abundance in nutrients and bioactive components like fiber, vitamin C, phenolic compounds, vitamin E, amino acids, minerals and naturally occurring colors like battalions, plants are good sources of these nutrients [13]. These bioactive components have anti-inflammability, immunomodulation, and antioxidant properties. The natural antioxidant found in prickly pear fruits has been associated with a number of health advantages. Betanin, which has been linked to liver protection and anti-inflammatory effects, was present in the red and purple variants [14]. *Opuntia ficus indica* is only a food source but also has exponential components that serve as nutritional including phytochemicals such as phenolics, vitamin C, flavonoids, betalains, and carotenoids [15]. Recent publications described that consumption of the fruit improves human health, exhibiting antioxidant activity and other relevant pharmacological activities through enzymatic and non-enzymatic mechanisms [16]. In addition to its chemical nutritional value, prickly pears are a strong source of minerals and contain a range of vitamins, carotenoids, and amino acids [17].High concentrations of fibre, vitamins, amino acids, fatty acids, minerals (especially Ca, K, Mg, and Se), and physiologically active lipids can be found in prickly pear fruit [18].The fruit contains a significant phytochemical content in addition to its nutrient content, which includes a variety of bioactive substances with antioxidant properties [19]. Therefore, the objective of this study was to evaluate the physicochemical properties, mineral contents, amino acids, fatty acids, vitamins, phytochemicals of prickly pear fruit to produce juice product to be acceptable in nutritional quality and sensory attributes.

2. MATERIALS AND METHODS:

2.1. Materials: -

2.1.1. Plant collection and identification:

Prickly pear (*Opuntia ficus- indica*) was obtained from El- Sharqia Governorate of Egypt's local market, during the harvesting season (August 2022). The fruits have a red-orange color, with an overage weight of 90 grams per fruit unit.

2.2. Methods: -

2.2.1. Preparation of juice:

The fresh prickly pear fruits were gently washed with water, manually peeled, and blended for 10 S in a Moulinex blender (type LM2421 41, France). The seeds were separated from the juice by filtration. The juice temperature was raised up to 82 ˚C for 20 minutes. The juice was bottled in 100ml glass bottles heated up to 90˚C for another two minutes. Finally, the juice cooled down with tap water and stored at 4C˚until use. Prickly pear juice without addition was used as a control sample. Citric acid 0.1% was added as a solution to the strained pulp to prevent darkening during thermal processing [20].

2.2.2. Chemical analysis:

The moisture, protein, fat, fiber and ash of the samples were determined according to the methods of AOAC [21]. Carbohydrate was calculated by difference according to Tadrus [22]. Ascorbic acid, pH and acidity polyphenols as tannic acid were determined according to AOAC [21]. Sodium (Na), Potassium (K), calcium (Ca), magnesium(Mg), phosphor(P), iron(Fe), zinc (Zn), lead (pb), mercury (Hg), chromium (Cr), cadmium (Cd) and Copper (Cu) were determined using perkin Elmer 2380, atomic absorption spectrophotometer according to the method of AOAC [21].

2.2.3. Amino acids composition:

The amino acids composition of experimental samples was determined using HPLC-Pico-Tag method according to Millipore Cooperative [23]. The Pico-Tag method was described by Heinrikson and Meredith [24], White *et al*. [25] and Cohen *et al*. [26]. The Pico-Tag method, was

developed commercially by Waters Associates, was an integrated technique for amino-acid analysis. Phenyl iso thiocyanate (PITC, or Edman's reagent) was used for pre-column derivatization, while reversed-phase gradient elution high-performance liquid chromatography (HPLC) separates the phenylthiocarbamy (PTC) derivatives which were detected by their UV absorbance. The chromatographic analysis using HPLC was carried out using the following gradient of Pico-Tag solvent A and B (P/N 88108 and 88112). Sample was injected and loaded on Pico-Tag amino acids column (150 x 3.9 mm) stainless steel. Detection of the PTC derivatives is by ultraviolet absorption measurements using a fixed wavelength (254nm) Waters detector. Before injecting of the sample, the illustrated was calibrated by two injections of the standards.

2.2.4. Fatty acid composition:

The fatty acid composition was determined by the conversion of oil to fatty acid methyl esters (FAMEs) prepared by adding 1.0 mL of n-hexane to 15 mg of oil followed by 1.0 mL of sodium methoxide (0.4 mol), according to the method of Nzikou *et al* [27] with some modifications. The mixtures were vortexed for 30 seconds and were allowed to settle for 15 minutes. The upper phase containing the FAMEs was recovered and analyzed by gas chromatography (GC-FID). FAMEs were analyzed on a Perkin Elmer (model 8700), fitted with a non-bonded biscyanopropyle siloxane stationary phase, polar capillary column SP-2340 (60 m 0.25 mm), 0.2 mm film thickness and a flame ionization detector. Nitrogen (oxygen-free) was used as a carrier gas at a flow rate of 3.5 mL min^{-1}. Other conditions were as follows: initial oven temperature, 130 °C; ramp rate, 4 °C/min; final temperature, 220 °C; injector temperature, 260 °C; detector temperature, 270 °C; temperature hold, 2 minutes before the run and 17 minutes after the run. A sample volume of 1.0 mL was injected. FAMEs were identified by comparing their relative and absolute retention times to those authentic standards of FAMEs. All of the quantifications were done by a built-in datahandling program provided by the manufacturer of the gas chromatograph (Perkin Elmer). The fatty acid composition was reported as a relative percentage of the total peak area.

2.2.5. Analysis of total phenolic and antioxidant activity:

2.2.5.1. Extraction

Extracts for total phenolics and antioxidant activity were prepared using methanol. One ml from sample was mixed with 100 ml methanol and homogenized using the Ultra-Turrax homogenizer. The homogenates were kept at 4°C for 12 h and then centrifuged at 10,000 rpm for 20 min. The supernatants were recovered and stored at -20 °C until analysis.

2.2.5.2. Analysis of total phenolic content

The total phenolic content was determined according to the Folin-Ciocalteu procedure [28]. Briefly, the extract (500 µl) was transferred into a test tube and oxidized with the addition of 250 µl of Folin-Ciocalteau reagent. After 5 min, the mixture was neutralized with 1.25 ml of 20% aqueous Na_2CO_3 solution. After 40 min, the absorbance was measured at 725 nm against the solvent blank. The total phenolic content was determined by means of a calibration curve prepared with gallic acid, and expressed as mg of Gallic acid equivalent (GAE) per g of sample.

2.2.5.3. Determination of radical DPPH scavenging activity

Free radical scavenging activity was determined using the stable 1, 1-Diphenyl-2-picryl-hydrazyl (DPPH). The final concentration was 50 µM for DPPH and the final reaction volume was 3.0 mL. The absorbance was measured at 517 nm against a blank of pure methanol at 60 min. Percent inhibition of the DPPH free radical was calculated by the following equation:

$$\text{Inhibition (\%)} = 100 \times (\text{A control} - \text{A sample}) / \text{A control}$$

Where:

- A control is the absorbance of the control reaction (containing all reagents except the test compound).
- A sample is the absorbance of the test compound.

Also, the antioxidant activity was determined by means of a calibration curve prepared with ascorbic acid, and expressed as mg of Ascorbic acid equivalent (AAE) per g of sample [29].

2.2.5.4. Determination of vitamin B group using HPLC:

Vitamin B group was determined according to [30].In brief, the Sample (2 g) was placed in 25 mL of H2SO4 (0.1 N) solution and incubated for 30 min at 121°C. Then, the contents were cooled and adjusted to pH 4.5 with 2.5 M sodium acetate, and 50 mg Takadiastase enzyme was added. The preparation was stored at 35°C overnight. The mixture was then filtered through a Whatman No. 4filter, and the filtrate was diluted with 50 mL ofpure water and filtered again through a micropore filter (0.45 µm). Twenty microliters of the filtrate were injected into the HPLC system. Quantification of vitamin B content was accomplished by comparison to vitamin B standards.

Standard stock solutions for thiamine, riboflavin, niacin, pyridoxine, and cobalamin were prepared as reported previously. Chromatographic separation was achieved on a reversed-phase- (RP-) HPLC column (Agilent ZORBAX Eclipse Plus C18; 250 × 4.6 mm i.d., 5 µm) through the isocratic delivery mobile phase (A/B 33/67; A: MeOH, B: 0.023 M H3PO4, pH = 3.54) at a flow rate of 0.5 mL/min. Ultraviolet (UV) absorbance was recorded at 270 nm at room temperature.

2.2.5.5. Determination of Vitamin C:

Vitamin C using HPLC was determined according to [31].The sample (10 g) was blended and homogenized with an extracting solution containing met phosphoric acid (0.3 M) and acetic acid (1.4 M). The mixture was placed in a conical flask and agitated at 10,000 rpm for 15 min. The mixture was then filtered through a Whitman No. 4 filter, and samples were extracted in triplicate. The ascorbic acid standard was prepared by dissolving 100 mg of L-ascorbic acid in a Meta phosphoric acid (0.3 M)/acetic acid (1.4 M) solution at a final concentration of 0.1 mg/ mL . The calibration line was converted to a linear range based on four measured concentration levels. Quantification of ascorbic acid content was performed on an Agilent HPLC system. Chromatographic separation was achieved on an RP-HPLC column through isocratic delivery of a mobile phase (A/B 33/67; A: 0.1 M potassium acetate, pH = 4.9, B: acetonitrile: water (50: 50) at a flow rate of 1 mL/min. UV absorbance was recorded at 254 nm at room temperature.

2.2.6. Organoleptic properties of juice:

The organolptic evaluation of prepared juice was done according to the method described by [32].Prepared juices were evaluated for color (20), odor (20), taste (20), appearance (20) and consistency (20) and overall acceptability is the total of these four parameters. The sensory evolution of juice carried out by fifteen semi trained panelists from the staff members and students of the food and dairy science and technology faculty of technology and development, Zagazig University, Egypt according to [33].

2.3. Statistical analyses:

Standard Deviation (SD) calculations have been done using the software Excel 2010. Statistical analysis was conducted with the Co State program using a one-way analysis of variance (ANOVA). The statistical analysis of the obtained results was done with triplicate replications, except for the sensory evaluation data, which had 3 replicates [34].Data were represented as means followed by ± (SD).

3. RESULTS AND DISCUSSION

3.1. Physicochemical properties of prickly pear fruit

Physicochemical properties of prickly pear fruit (*Opuntia ficus -indica*) are presented in Fig.1 and Fig.2. The average fruit's weight was 90 g. The pulp, peel, and juice percentage were 71, 27.5 and 50%, respectively. The findings regarding weight of fruits in the present study are consistent with the findings of El-Gharras *et al*. [35], El Finti *et al*. [36], Gómez-Maqueo *et al*. [37] and Alwaseai and Al-gabr [38], they found that the weight of prickly pear fruits ranged between 81.5 and 107.5 g and the fruit pulp weight ranged between 47.98 and 63.44% in different varieties of prickly pear fruits.

The total soluble solids content of the fruits is an important factor in fruit juice production. Fruits with higher total soluble solids content are more palatable than fruits with lower soluble solids content [39]. This is because fruits with higher soluble solids content typically have more intense sweetness and are juicier. The results in Fig.1 showed that the total soluble solids (TSS) in the prickly pear pulp were 13%. The result obtained were consistent with those published elsewhere [39-42]. The results in Fig. 1 show that the pH value of prickly pear pulp was 6.6.

Similar results have been reported by Gómez-Maqueo *et al*. [37], Lekhuleni *et al*. [43] and Abdulkadir *et al*. [42].

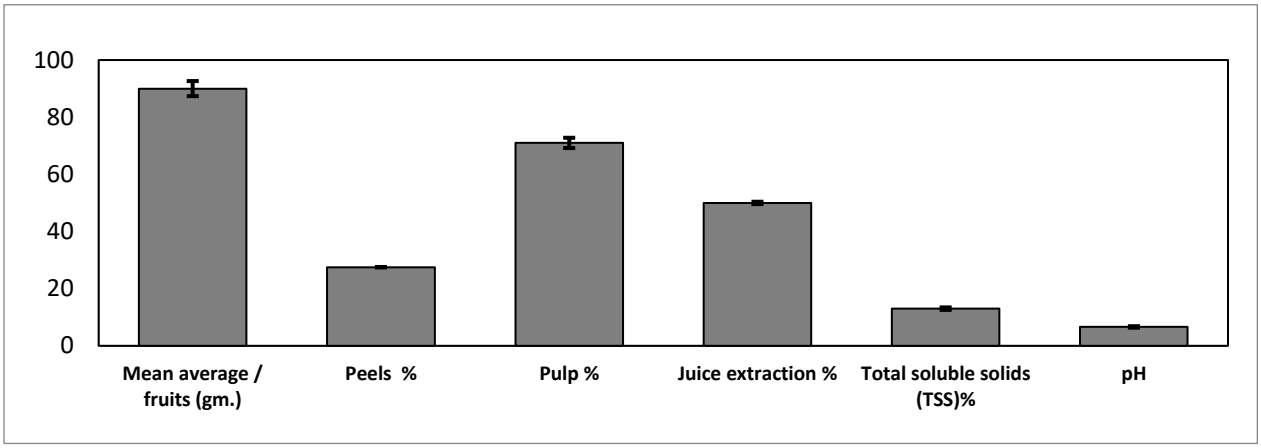

Fig (1): Physicochemical properties of prickly pear Fruit

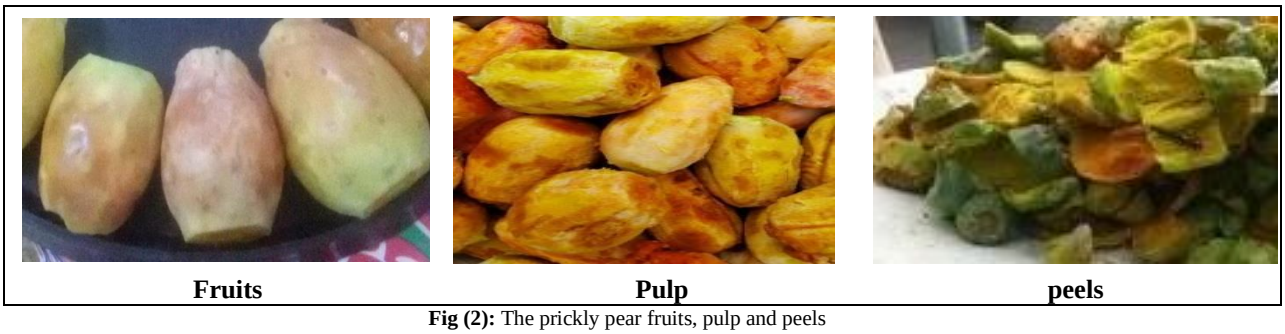

Fig (2): The prickly pear fruits, pulp and peels

3.2. Proximate chemical composition of prickly pear fruit

The proximate chemical composition of prickly pear fruit, i.e., protein, total lipid, fiber, ash, and carbohydrate, was presented in Fig.3. The chemical composition of prickly pear fruit was: 7.9% protein, 16.8% total lipids, 47.9% fiber, 3.70% ash and 23.7% total carbohydrates. These results were in agreement with those obtained by El Samahy *et al* [44], Patil and Dagadkhair [45] and Alwaseai and Al-gabr [38].

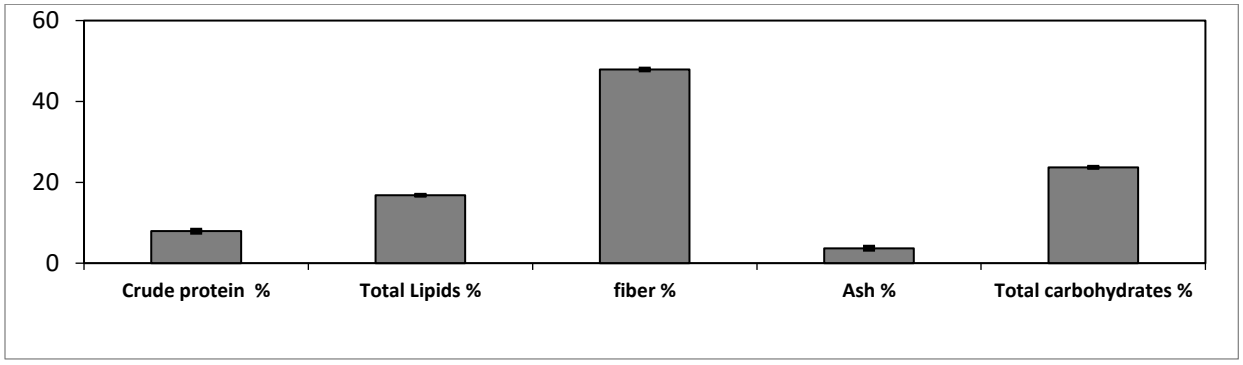

Fig (3): Chemical composition of Prickly Pear fruit (on dry weight basis)

3.3. Mineral contents of prickly pear fruit

Prickly pear fruit is considered an excellent source of mineral nutrition, being enriched in calcium,

potassium, and magnesium [46]. Values for percent Na, K, Ca, Mg, P, Fe, Zn, Pb, Hg, Cr, Cd and Cu values for prickly pear fruit are presented in Table 1. Results showed that, contents of Na (13.4 mg/100g), K (12.5 mg/100g), Ca (22.9 mg/100g), Mg (7.0 mg/100g), P (10.6 mg/100g), Fe (2.35 mg/100g) and Zn (0.84 mg/100g), while, the toxic heavy metals (Pb, Hg, Cr, Cd and Cu) were not detected. Prickly pear fruit are rich in K, Ca, P, and Mg minerals. Functions of these minerals in body and health benefits suggest that prickly pear fruits are important mineral sources essential to take place in nutrition. These results in agreement with the results recorded by Feugang *et al* [46], Aregahegn *et al* [47], Al-Juhaimi and Özcan [48] and Salim *et al* [49].

Table (1): Mineral contents of Prickly Pear fruit (mg/100g)

Minerals	Concentration (mg/100g)	Heavy metals	Concentration (mg/100g)
Na	13.4± 0.01	Pb	ND
K	12.5± 0.03	Hg	ND
Ca	22.9± 0.05	Cr	ND
Mg	7.0± 0.03	Cd	ND
P	10.6 ± 0.02		
Fe	2.35± 0.55	Cu	ND
Zn	0.84± 3.01		

Where: ND: Not Detected

3.4. Amino acids composition of prickly pear fruit

Table (2) shows the content of prickly pear of essential and non-essential amino acids. Data indicated that prickly pear had highly contained essential amino acids such as lysine (1.4 g/100g), tryptophan (0.6 g/100g), methionine (1.4 g/100g), Histidine (1.99 g/100g), threonine (2.8 g/100g) and phenylalanine (1.9 g/100g), respectively. Total essential amino acids were (10g/100g). In the same Table, data showed that non-essential amino acids of prickly pear such as aspartic acid (2.1 g/100g), glutamic acid (2.6 g/100g), serine (2.8 g/100g), arginine (2.4 g/100g), isoleucine (1.7 g/100g), glycine (0.5 g/100g), alanine (0.6 g/100g) and tyrosine (2.1 g/100g) respectively. Also, table (1) it could be noticed that prickly pear had a high amount of phenylalanine (1.9 g/100g), arginine (2.4g/100g) and threonine (2.8g/100g) than other essential amino acids. Total non-Essential amino acids were (14.8g/100g). Table (2) showed that prickly pear contained serine (2.8g/100g) as non-essential amino acid than other non-essential amino acids. The prickly pear does provide a full range of amino acids and therefore can make a dietary protein contribution towards enhanced food security [50].The literature reports the amino acid content of prickly pear fruit in fresh and commercially sourced fruit juices [1,5,13].Generally, prickly pear contained about (6) essential amino acids and about (8) non-essential amino acids.

Table (2): Amino acids composition of prickly pear fruit (g/100 g sample)

Non-essential amino acids (NEAA)	Concentration (g/100 g sample)	Essential amino acids (EAA)	Concentration (g/100 g sample)
Glutamic acid (GLU)	2.6	Lysine (LYS)	1.4
Serine (SER)	2.8	Tryptophan (TRP)	0.6
Glycine (GLY)	0.5	Methionine (MET)	1.4
Alanine (ALA)	0.6	Histidine (HIS)	1.9
Aspartic acid	2.1	Threonine (THR)	2.8
Arginine (ARG)	2.4	Phenylalanine (PHE)	1.9
Tyrosine (TYR)	2.1		
Isoleucine (ISO)	1.7	**Total EAA**	10
Total NEAA	14.8		

3.5. Fatty acids composition of prickly pear fruit

Fatty acids content of prickly pear fruit was determined and presented in Table (3). Fatty acid composition of prickly pear fruit was 22.22% saturated fatty acids (SFA), 77.78% unsaturated fatty acids (USFA) consisting of 33.59% monounsaturated fatty acids (MUFA) and 39.48% of polyunsaturated fatty acids (PUFA). . Data showed that, the saturated fatty acid Myristic acid, Palmitic acid and Stearic acid content was (0.62, 17.11 and 4.49 g/100g respectively). Unsaturated fatty acids, Palmitoleic acid, Oleic acid, Linoleic acid and Linolenic acid content was (0.71, 22.41, 54.03and 0.63 g/100g respectively). The profile of the seed oil indicates that the lipids from the prickly pear seeds are a good source of the nutritionally essential linoleic acid and the unsaturated oleic acid. The ratio of unsaturated to saturated fatty acids was about 3.50:1. Similar results have been reported by Matsuhiro *et al* [51], Kunyanga *et al* [52] and El Mannoubi *et al* [53].

Table (3): Fatty acid composition of prickly pear fruit (g/100g)

Saturated fatty acids (SFA)	Concentration (%)	Unsaturated fatty acids (USFA)	Concentration (%)
Myristic acid (14:0)	0.62	Palmitoleic acid (16:1)	0.71
Palmitic acid (16:0)	17.11	Oleic acid (18:1)	22.41
Stearic acid (18:0)	4.49	Linoleic acid (18:2)	54.03
Total Saturated fatty acid	22.22	Linolenic acid (18:3)	0.63
		Total Unsaturated fatty acids	77.78
Unsaturated / saturated ratio		3.50	

3.6. Bioactive component and antioxidant activity of prickly pear fruit

Table (4) shows β-carotene B- cryptoxanthin, total phenol and total antioxidant in prickly pear fruit. Data revealed that prickly pear contained β-carotene about (28 µg/100g). At the same time, data showed that prickly pear contained β-cryptoxanthin about (2 µg/100g). B-cryptoxanthin is a natural pigment found mainly in fruit and vegetables. B-carotene and β-cryptoxanthin are greater contributors to vitamin Aintake than retinol in the human diet for most people around the world. From the same Table, data revealed that prickly pear contained a high amount of total phenol about (94.06 mg/g) and total antioxidants about (27.63%) of prickly pear respectively. These results are agreement with those obtained by [54] who indicated that Prickly pear had antioxidant, bioactive and has high phyto-chemical content. The bioactive compounds in prickly pear juice mayprevent degenerative diseases such as cancer, diabetes or cardiovascular diseases [55]. Likewise, it reported that green prickly pear, red and purple varieties have high content of bioactive compounds, mainly ascorbic acid (AA) and phenolic compounds [56, 57].

Table (4): β-carotene, B- Cryptoxanthin, total phenol, total Antioxidant activity and vitamins in prickly pear fruit.

Parameters	Results	Vitamin	Results
Total phenol (mg GAE/g DW)	94.06	Vitamin C (mg\100g)	20
B- Carotene (µg\100g)	28	Vitamin B6 (mg\100g)	0.08
B- Cryptoxanthin (µg\100g)	2.0	Thiamine(mg\100g)	0.018
Vitamin E (IU)	48.0	Riboflavin (mg\100g)	0.08
Total Antioxidant (%)	27.63	Niacin(mg\100g)	0.48

3.6.1. Vitamin contents of prickly pear fruit prickly pear fruit

Table (4) shows the content of vitamin soluble in water of prickly pear fruit such as vitamin B1 (thiamine), B2 (Riboflavin), B3 (niacin) B6, B12, and vitamin C. Also, in the same Table, prickly pear contained vitamins soluble in fat such as vitamin E. From data in Table (4) the amount of vitamin soluble in water (B complex) were: B1 thiamin (0.018 mg/100g), B2 riboflavin (0.080 mg/100g), B3Niacin (0.48mg/100g), and B6 (0.08 mg/100g) in prickly pear, respectively. While Vit. C which is soluble in

water also prickly pear contained about (20mg/100g). In the same Table, it could be noticed that prickly pear contained vitamin E as soluble in fat about (48 IU). Generally, prickly pear contained a high content of vitamin E and vitamin C. Nutritionally important vitamins, such as vitamin C (ascorbic acid), E and beta-carotenes are also constituents of the cactus pear fruit. The antioxidant properties of both carotenes and vitamin E have been shown to ameliorate the stability of fatty oils [51]. Only trace amount of several types of vitamin B have been found in prickly pear fruits. Cactus pear fruits exhibit an ascorbic acid content of 20–30mg/100 g fresh [46].

3.7. Chemical composition of Prickly Pear juice

Fig.4. shows the chemical composition of Prickly Pear juice. Data revealed that prickly pear juice contains high moisture (90.63%) and it had fiber content (0.02%) and also total carbohydrates (7.9%), while prickly pear juice contains a slight amount of ash (0.3%), total lipids (0.21%) and crude protein content (0.94 %) respectively. Prickly pear fruit juice had high values of bioactive compounds, such as fibers, vitamins, minerals and carbohydrates [58]. These results agreed with the results mentioned by El-Mostafa et al [3], Oelofse et al. [59]and Kanwal et al. [60].

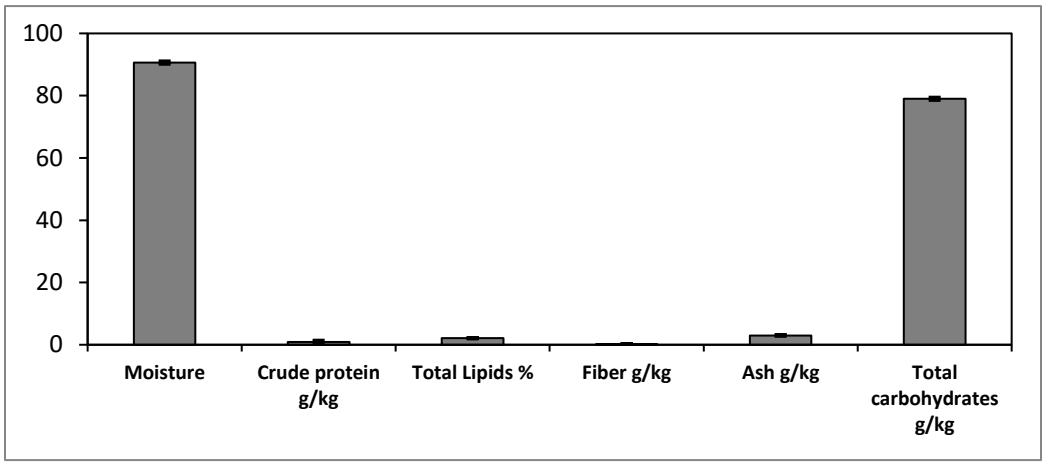

Fig. 4: Chemical composition of Prickly Pear juice (%).

3.8. Organoleptic properties of Prickly pear fresh juice

Data presented in Fig. 5. Show the organoleptic properties of Prickly pear fresh juice such as Color, Taste, Odor, Texture and Appearance, the sensory ratings for the juice were as follows out of (20), color 17.75, taste 16.15, odor 16.65, texture 16.80 and appearance 18.10. From this data it can be noticed that the prickly pear juice has Overall acceptability 85.45%. Therefore, we can say that prickly pear juice has good sensory qualities and general acceptance by consumers.

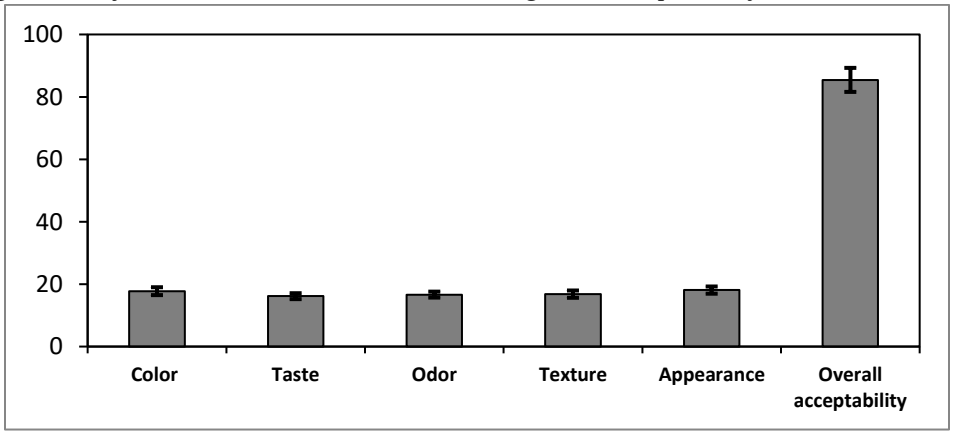

Fig. 5: Organoleptic properties of Prickly pear fresh juice

1. CONCLUSION:

From the above results, it could be concluded thatPrickly pear (Opuntia ficus -indica) pulp is a rich source of essential nutrients and bioactive compounds. The prickly pear protein contained a significantly high amount of the essential and non essential amino acids The profile of the seed oil indicates that the lipids from the prickly pear seeds are a good source of the nutritionally essential linoleic acid and oleic acid. Prickly pear fruit is a good source of some vitamins such as vitamin E, vitamin C, Thiamine, Riboflavin, Niacine and vitamin B6. Prickly pear juice significantly ($P \leq 0.05$) had the highest sensory scores of color, taste, odor, texture, appearance and overall acceptability. Prickly pear juice can be used successful as good source of bioactive compounds and antioxidant activity with acceptable sensory characteristics. In addition, use of prickly pear fruit juices as mineral supplements in different beverages are possible due to mineral contents.

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