Physio Chemical Properties of Pomegranate Varieties Collected from Peshawar Local Market

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Abstract

The present study was conducted at the Agricultural chemistry Lab in the University of Agriculture Peshawar, Pakistan to evaluate the physico-chemical properties of two pomegranate varieties: Bedana and Kandahari. The colour, average weight, edible index and waste index of Bedana observed yellowish, 200.00g, 31.45% and 65.00% while of Kandahari was dark red, 250.00g, 35.55% and 60.55% respectively. The average total soluble solid (TSS), reducing sugar, acidity, pH, moisture and ash of Bedana showed 150 Brix, 7.00%, 15.68, 2.87, 78.63% and 0.4% while of Kandahari 170 Brix, 8.20%, 11.76, 2.22, 80.26% and 0.6% respectively. The proximate composition of Na and K were found 100mg/g and 80mg/g of Bedana while 150mg/g and 220mg/g of Kandahari. Among different parameters of Bedana and Kandahari, the dark red colour of Kandahari were eyes appealing to consumers, compared to Bedana Variety. With the various nutritional benefits, the fruits could be recommended for commercial exploitation and preparation of different value added products.

Keywords: Pomegranate; Quality; Physical properties via chemical properties

Introduction

Pomegranate (Punica granatum L.) belongs to the Punicaceae family. It is an important commercial fruit crop that is extensively cultivated in parts of Asia, North Africa, the Mediterranean and the Middle East [1]. Iran is one of the most important pomegranate producers and exporters in the world, and its total production in 2005 was 670,000 tons [2].

The fruit is a good source of sugars and vitamin C and a fair source of iron and poor in calcium. The juice contains amino acids such as glutamic acid, aspartic acid, tryptophan, methionine, etc. It is rich in phosphorus. The seeds are rich source of lipids, protein, crude fiber and ash, and also contain sugars and pectin. The seeds yield oil which is composed of several fatty acids. The rind contains polyphenols and mineral matter, which is composed of potassium, calcium, iron and copper.

Pomegranate is proved to have high antioxidant activity and good potency for cancer prevention. The edible part of the fruit contains considerable amounts of acids, sugars, vitamins, polysaccharides, polyphenols and important minerals. Great interest has recently been focused on the addition of polyphenols to foods and biological systems, due to their well-known abilities to scavenge free radicals, i.e. antioxidant power. The generation of free radicals plays an important role in such as atherosclerosis and brain dis-function. Several studies have reported the reduced-risk efficacy of various extracts or pure compounds from the different parts of pomegranate plant against the growth of microbial pathogens. Pomegranate (Punica granatum Punicaceae) has been known to considerable pharmacological properties with antimicrobial, antiviral, anticancer, potent antioxidant and anti-mutagenic effects and been used in the markets in the preparation of tinctures, juice, cosmetics and therapeutic formulae. Keeping in view the medicinal importance the present study was aimed for its Proximate Composition, Minerals Content, Antibacterial and antifungal Activity Evaluation of Pomegranate (Punica granatum L.) Peels Powder [3].

Fruits are rich in minerals, which are essential for a wide variety of metabolic and physiologic processes in the human body. Among the nutrients found in fruits, minerals represent a class of inorganic substances that is present in all kinds of...
Determined by oven dry method. Method of AOAC (2012) method no 925.45. Moisture was determined using official method of analysis AOAC (8) method no 900.02. Ash content of the samples was determined by furnace (vulcan, 3-130) ignition method.

**Material and Methods**

This research work was carried out in the laboratory of the Department of Agriculture Chemistry, The University of Agriculture Peshawar, Pakistan during 2014.

**Collection of fruits**

Pomegranate varieties (Bedana and Kandahari) were purchased from the local market of Peshawar (Board bazar) and brought to the laboratory of the Department of Agriculture Chemistry, The University of Agriculture, Peshawar. Pomegranate varieties were carefully sorted and diseased, damaged, bruised, and immature commodities were discarded.

**Physical properties of pomegranate fruits**

Two fresh fruits of each variety were individually analyzed for their physical properties. Fresh fruits were weighted on an electric balance (Sartorius). Then fruits colors were noted. After that cut the fruits with stainless steel knife and manually removed seed, peel and measured percent edible portion, percent waste and percent juice.

**Extraction of juice**

The fruits were washed with water and wiped completely. Each sample was then divided in to two equal portions for juice extraction. Two methods of extraction were applied for extracting of pomegranate juice. First method consisted of manually peeling the fruit, separated the seed and extracted the juice by electric juice centrifuge (blending of seeds). In the second method, fruits were cut in two halves and the juice was immediately extracted using a hand operated juice extractor/mechanical press. The obtained raw juice from each extraction was filter through muslin cloth. The juices were immediately stored at 4°C in the dark until analysis.

**Chemical properties of pomegranate fruits**

Pomegranate fruits were analyzed for its total soluble solid (TSS) (°Bx), acidity, pH, moisture, ash, sodium and potassium.

**Determination of ash**

The ash content was determined using official method of analysis AOAC (8) method no 900.02. Ash content of the samples was determined by furnace (vulcan, 3-130) ignition method.

**Reducing sugar**

AOAC (8) method no 920.183, as explained by Lane and Eyon, were observing reducing sugar of all the samples. Filling A: Dissolve 34.65gm of CuSO4 in 500ml distilled water. Filling B: Dissolve 173gm sodium potassium tartrate + 50gm of NaOH in 500ml distilled water.

In 100ml flask ten ml of pomegranate juice sample were taking and the flask was filled with distilled water and filled the burette with this solution. Then 5ml of both Fehling A and B with ten ml of clean distilled water were taken in conical flask and then heated the flask up to boiling. Than sample solution of burette were poured drop wise to the boiling solution of filing A and filing B until the colour become brick read. Without stirring of flask 2-3 drop of methylene blue was added as indicator. When the color become blue for a while titration was not completed, then poured the sample solution till the color of the solution remain brick red in this way repeated the experiment three time an mean value was taken.

Calculation

Fehling A (5ml) + Feling B (5ml) = (zml) percent sample solution = .05gm of reducing sugar ×100ml of 10 percent sample will contain .05 ×100/(x)ml of sample solution = (x) grams of reducing sugar

% reducing sugar in sample = X×100/10.

**Determination of PH**

The PH was determined by using the standard method of AOAC (2012) method no 2005.02 pH meter (JENWAY 3510) was used for calculating PH.

**Determination of Total Soluble Solid (TSS)**

Standard method of AOAC (8) method no 932.14 and 932.12 were used to observe the total soluble solid (TSS). The total was determined by using Atago refracto-meter at room temperature. Distilled water was used to calibrate the instrument. A clean soft lint or tissue paper was used to clean the refracto-meter after each reading. A small amount of pomegranate juice was dropped on to the prism of refracto-meter, in this way all the samples was observed three time and mean value was taken.

**Determination of minerals**

The sample of pomegranate varieties was observed for sodium (Na) and potassium (K) by flame photometer.

**Determination of Na and K**

Flame photometer was used to determined sodium and potassium.
Reagents

Potassium standard (1000ppm): 1.901gm of KCl was weighed dissolved in distilled water and then diluted up to one liter.

Sodium standard (1000ppm): 2.54gm of dried NaCl was weighed, dissolved in distilled water and then diluted up to 1 liter. A series of standard solution: 0.1ppm, 1ppm, 3ppm, 5ppm, 10ppm, 15ppm, 30ppm, 50ppm, for both of the sodium and potassium made from stock solution.

Digestion of samples

In digestion flask taken 5ml sample and 10ml nitric acid. Then it was kept for overnight. Next day was added 4ml perchloric acid and kept all samples on digestion assembly to evaporate the perchloric acid. When the colour become transparent then removed all sample from digestion assembly and then added distilled volume up to 100ml all the samples were kept in plastic bottle for furthered analysis.

Assay

The flame photometer (Barloworld-PFP-7) was started and kept it on for about 30 mints and then calibrated with the Na standard (0.1-50ppm). The standard emission reading were used for the preparation of calibrate curve. After the calibration with Na different dilutions.

Variety   Fruit color Weight of Fruit (g), Weight of peel (g), Waste index (%), Edible index (%)

Bedana   Yellowish 200.00 70.55 60.55 31.4
Kandahari Dark red 250.00 85.88 35.55 65.00

the samples were run on the flame photometer to get their emission reading for Na in the sample. The same procedure was repeated for K in the sample. Concentration of Na and K in the sample were calculated from their respective calibration curves in the micro gram per gram and then written as ppm.

Determination of acidity

In a conical flask, 5ml sample and added 50ml methylated spirit were taken and gently shacked. The attached an air condenser at the mouth of flask and then heated it on a water bath for half an hour. When the sample has been digested completely and then added a drop of phenolphthalein to it. Titrate it against 0.1NKOH. Noted the amount of KOH used. The end point was pink color.

Calculation;

\[ \text{Acidity} = \frac{\text{Amount of KOH used} \times \text{No of KOH} \times \text{Eq Wt of KOH}}{\text{wtof sample}} \]

Results and Discussion

Table 1: data on physical characteristics of pomegranate shows that the colour of fruits of Bedana variety was yellowish with pink patches and that of Kandahari verity was dark red. The average weight of fruit of Bedana was 200.00 g while weight of Kandahari was 250.00g. The edible portion and waste index in Bedana were 31.40% and 60.55% respectively while in Kandhari these were 65.00% and 35.55% respectively. The edible portion was found to be more in Kandhari than in Bedana. The results of present study were in good accordance with results reported by Patil et al. [9].

Table 2 shows the acidity of Bedana and Kandhari juice15.68% and 11.76% respectively. The pH of juice of Bedana and kandahari fruit was 2.22 and 2.87 respectively. The moisture content of Kandhari 80.26% was slightly higher than that of Bedana 78.63%. The ash content of Bedana and Kandhari was 0.4% and 0.6%, respectively.

Table 3 shows that amount of sodium content found in Bedana (100ppm) was less than that of Kandhari (150ppm). The second graph show that amount of Potassium present in Kandhari was 220ppm and 80ppm in Bedana. Similar results were reported by Fadavi et al. [10] for different cultivars of pomegranate.

It is observed from Table 4 that the TSS of juice from Kandahari (17° Brix) was slightly higher than that of Bedana (15° Brix). The reducing sugar content of Bedana and Kandhari was 7.00 and 8.20%, respectively [11-22].(Figure 1-4)
Figure 1: Fruit color, fruit and peel weight (g), waste and edible index of Bedana and Kandhari.

Figure 2: Percent acidity, moisture, ash and pH of the Bedana and Kandhari.

Figure 3: Na and K (mg/g) content of the Bedana and Kandhari.

Figure 4: Total soluble solids (TSS) in Brix and percent reducing sugar of Bedana and Kandahari.
Conclusion

Nevertheless, the pomegranate has commercial potential for production of health related food products, but the systematic and organized approach should be followed with other sophisticated methods for retention of other bio-active components, storage life, clinical studies and packaging requirements.

It was concluded that the chemical parameters of fruit determined were TSS, acidity, pH, moisture, ash content, reducing sugar, which were quite similar for both varieties but sodium and potassium content in both varieties were quite different. Among different parameters of Bedana and kandahari, the dark red colour of Kandahari were eyes appealing to consumers, compared to Bedana Variety. With the various nutritional benefits, the fruits could be recommended for commercial exploitation and preparation of different value added products.

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