Physico-chemical analysis of fresh persimmon (*Diospyros kaki* L*)* fruit pulp from Jammu region

Abstract

This study was conducted in the division of the food science and technology SKUAST-Jammu in which the physicochemical analysis of the fruit of persimmon (*Diospyros kaki* L) was done. The colour values L^*, a^*,b^* values, crude protein content, crude fat content, solubility per cent, crude fibre, TSS, and ash per cent, total sugars per cent, ascorbic acid mg/100gm, total phenolic compounds mg GAE/g, Carbohydrates per cent ,FRAP nmol FeSo4/g were assessed.

Keywords: Persimmon, Fruit pulp, Physico chemical analysis

Introduction

Fruits are important part of the every balance diet as they contain all the required amount of the nutrients for daily life as well as having the aesthetic and medicinal value.The fruits also have medicinal and aesthetic value. Economically speaking, the cultivation of crops that provide high returns is more important in a country like India where the demand for high-value foods is increasing more quickly than the need for basic commodities. (Kumar and Mruthyunjaya, 2002). Due to its high levels of vitamins, dietary fibre, minerals, phytochemicals, antioxidants, fruit should be included in diet (Slavin *et al*., 2012). Several reviews have shown poor fruit and veg intakes can lead to a variety of chronic conditions including cardiovascular illnesses, hypercholesterolemia, hypertension, osteoporosis, malignancies, chronic pulmonary obstruction, respiratory issues and mental health (Payne *et al*., 2012).

The persimmon, sometimes known as the "apple of the Orient," is a delicious, high-quality fruit. It is regarded as the king of the fruit in several places of the world where it is commercially farmed. The Ebenaceae family includes the tropical, deciduous persimmon fruit, which has a meaty, fibrous feel. The countries with warm temperatures that grow it most frequently are Korea, Japan, china, Brazil, Italy and Turkey, and Italy. (Yokozawa *et al*., 2007). In 2007, there were more than 3.3 million tonnes of persimmons produced worldwide, with 10% from Korea, 70% originating in China, and 7% from Japan. The soil and climate of northern states like Himachal Pradesh, Jammu & Kashmir, and Uttaranchal, as

well as parts of the North Eastern provinces and some of the Nilgiri Hills in the south, are suitable for persimmon cultivation. In addition to being beneficial against the resurgence of cancer, bioactive components including tannin and carotenoids are helpful in lowering free radicals, blood pressure, cholesterol, and diabetes mellitus risks (Lee *et al*., 2006). This present study was done to assess the physico-chemical analysis of fresh persimmon fruit pulp from Jammu region.

Materials and Methods

Raw material

Procurement of raw materials

The fully ripe and high-quality persimmon fruits were received in the division of FST, SKUAST-J Chatha from the Regional Horticulture Research Substation in Bhaderwah for processing.

Hunter Color Values (L*, a*, b*)

Using a colorimeter from Hunter's Lab, the sample colour was measured (Hunter Lab Color Flex Reston VA, USA). To calibrate the equipment, standard white and black ceramic tiles were used. In the Hunter's laboratory colorimeter, a sample's colour is noted with the three sizes L*, a*, and b*. L* stands for a sample color's lightness, which ranges from the white = 100 to black = 0. a * values negative value shows a green colour while positive values do so as red-purple. A positive value of b* represents the colour yellow, whereas a negative value denotes the colour blue.

T.S.S

A hand refractometer by Erma was used to measure TSS(0-32^{o}B), and the findings were represented in degree Brix (^{o}B). The data were recorded and corrected for temperature change using a correction factor.

Solubility

The powered samples' water solubility was evaluated using a standard procedure (Kha,T. C. *et al*., 2010, with small changes). Two grams of powder and 30 millilitres of distilled water were thoroughly combined in a 100-mL centrifuge tube before being incubated at 370°C for 30 minutes and centrifuged at 11,410 for 20 minutes. Collection of supernatant was carefully done in a pre-weighted petriplate, and it was subsequently dried in an oven at

103 ± 2 °C. By dividing the amount of dried supernatant by the quantity of powder sample obtained, the water solubility (%) was calculated.

Moisture content

The humidity content was determined using a moisture analyzer (Citizeon MB 50 C) operating at 105°C. An aluminium sample container had a sample of approximately 2 g dispersed and was inserted in an analyzer. At 105°C sample heated and loss of evaporative humidity was automatically recorded as a percentage of humidity level.

Crude protein

The micro-Kjeldahl technique was used to determine crude protein, with factor of 6.25 used for transform nitrogen content to crude protein. A 1.0 gram weighted sample is digested in a Kjeldahl digestion flask using digestion mixture (10.0 g) and concerted sulphuric acid (20 ml). The mixture was cooled before being transferred to a volumetric flask with a 250 mL capacity. With distilled water, the volume was brought to the necessary amount and then mixed. A distillation flask was filled with a determined aliquot, to which 40.0 percent sodium hydroxide was subsequently added. A flask containing 10 ml of a solution of 4% boric acid was used to collect ammonium borate through a condenser. Sulphuric acid 0.1 N titrated with the distillate. Along with the sample, a control sample was also used.

$$\text{Nitrogen \%} = \frac{\text{Titre value X 0.00014 X volume made}}{\text{Aliquot taken (g) X Weight of sample (g)}} \times 100$$

$$\text{Per cent protein} = \text{Per cent Nitrogen} \times 6.25$$

Carbohydrate (AOAC, 2012)

The carbohydrate content was estimated using the difference methodology. It was calculated by deducting 100 from the sum of the moisture, fat, protein, fibre, and ash percentages.

Percentage of carbohydrate =100- (moisture % + fat % + protein % + ash%+ fiber %).

Crude fat (AOAC, 2012)

The soxhlet extraction method was used to assess crude fat. The sample's fat content was easily extracted into an organic solvent (petroleum ether) at 60˚C to 80°C and then refluxed for 6 hours. The formula was used to compute the fat content percentage.

$$\text{Crude fat percent} = \frac{\text{Ether extract amount (g)}}{\text{Weight of Sample (g)}} \times 100$$

$$= \frac{W2-W1}{W} \times 100$$

Sample Weight = W (g)

Empty Beaker Weight = W_1 (g)

Empty Beaker weight+ content fat (ether extract) W2 (g)

Ash content (AOAC, 2012)

One gram of a moisture-free sample was taken and placed in a silica crucible that had already been weighed. Preliminary ash was accomplished by slowly heating on a flame to allow fat to be smoked off without being burned. After the sample ceased evolving smoke, it was incinerated for 8 hours at 600˚C in a muffle furnace. The crucibles were removed out and weighed after desiccating and cooling them. Ash content was determined using the crucible wand's weight in percentage difference.

$$\text{Ash Per cent} = \frac{\text{Wt. of ash (g)}}{\text{Wt. of Sample (g)}} \times 100$$

Wt = Weight

Estimation of total sugar

The Lane and Eynon method was used to calculate sugar reduction. In this process, copper in a Fehling's solution is changed into red, soluble cuprous oxide. Calculating the volume needed to fully reduce the measured volume of Fehling's solution allowed researchers to determine the amount of sugar reduction in the experimental sample. Used Fehling's reagents "A" and "B," as well as Methyl Blue Indicator: In 100 ml of water and 45% neutral lead acetate solution, 10 grammes of methylene blue were dissolved: A solution of 22 per cent potassium oxalate solution ($K_2C_2O_4$.H2O) was dissolved in water and diluted to a concentration of 500 millilitres distilled water together with 225 grams of neutral lead acetate. Standard invert sugar solution was used to make a 25 ml aliquot, which was then neutrlized with 20% NaOH and an indicator called phenolphthalein.In the end, it was diluted to a final concentration of 100 millilitres with water, making 1 millilitre of this solution equal to 2.5 milligrams of invert sugar. To standardise Fehling's solution, equal parts of Fehling's A and B were mixed. Pipette exactly 10 ml of Fehling's mixed solution into a 250 ml conical

flask. Between 25 and 50 millilitres of distilled water were added. When titrating Fehling's solution, 19-18 millilitres of the standard sugar solution were added to the mixture.The whole titration performed in a boiling environment. Methylene blue indicator solution (1%) was added in three drops. Reaction mixture boiled together for 3 min without interruption in the titration. Volume of the titre was noted. Fehling's factor (mg of invert sugar) was determined by following formula:

$$\text{Fehling's Factor} = \frac{\text{Titre}}{1000} \times 2.5$$

The total sugar calculated by:

A. Reducing sugars (%) = $\frac{\text{Dilution} \times \text{mg of invert sugar}}{\text{wt.of sample(g)} \times \text{Titre} \times 1000} \times 100$

B. Total sugar by way of invert sugar is calculated in a production use of titre volume obtained in the determination of total sugar after inversion.

C. % sucrose = (% Total invert sugar - % Reducing sugar originally present) ×0.95

D. % Total sugar = (% Reducing sugar + % Sucrose)

Ascorbic acid (AOAC, 2012)

Sadasivam and Manicham procedure (2008) used the 2, 6-dichlorophenol indophenols dye to assess ascorbic acid concentration. The material was extracted in a 4% oxalic acid solution and titrated with standard dye towards get a pink color that lasted 15 seconds. The results were given in milligrams per 100 gram of sample.

$$\text{Dye factor} = \frac{0.05}{\text{Titre}}$$

(A.A) Ascorbic acid (mg/100g) = $\frac{\text{Dye factor x Titre x volume made up}}{\text{Weight of sample x Aliquot of extract taken}} \times 100$

Total phenols

Folin-Ciocalteau reagent reaction with an oxidising agent, phosphomolybdate, in a water bath which is boiling, for one minute on the basis of their reaction, the total phenols extracted in 10-15 times volume of 80 percent ethanol were measured. A spectrophotometer was used to measure the generated blue colour at 650nm. Different concentrations of catechol

(20-100ug/ml) were used to create the standard curve, and the findings were represented as mg per cent on a fresh weight basis. (Mc.Donald *et al*., 2001)

Crude fiber (AOAC, 2012)

In a 500 ml beaker, 200 ml of 1.25 percent H_2SO_4 was added after 2 g of fat-free dried sample was added. Beaker and its contents were put on a digestive apparatus with a hot plate that had been previously adjusted, and it was left to boil for 30 minutes. After boiling, whatman filter paper no. 4 was used to filter the beaker's contents. The residue was thoroughly cleaned of acid by washing it with hot distilled water. The filter paper was then put into a beaker with 200ml of sodium hydroxide solution at 1.25 percent. After being given 30 minutes to digest, the contents were filtered and repeatedly rinsed with hot water and alcohol until they were alkali-free. The remaining material was then put into previously weighed silica crucibles, weighed again, and dried at 100°C in a hot air oven. The crucibles were then kept for 30 minutes at 600±15ºC while being held in a muffle furnace. According to AOAC (2002), the crude fibre in the sample is represented by the weight loss following ignition.

$$\text{Crude fibre per cent} = \frac{\text{Loss in weight after ignition (g)}}{\text{Weight of sample (g)}} \times 100$$

FRAP (Ferric Reducing Antioxidant Power)

The power of ferric reduction was calculated using the Oyaizu method. Each reaction mixture contained 2.5 millilitres of 0.2 M phosphate buffer (pH 6.6), K3Fe (CN)6 (1 percent w/v), and 2.5 millilitres of each fruit extract (20 g/ml-100 g/ml). The mixture was then incubated at 50°C for 20 minutes. The mixture was mixed with 2.5 mL of TCA (10% w/v), and it was then centrifuged at 3000 rpm for 10 minutes. The mixture's absorbance at 700 nm was calculated after adding the supernatants (2.5 ml), 0.5 millilitres of FeCl3 (0.1 percent, w/v), and 2.5 millilitres of distilled water.

Fig 1: Shows persimmon fruit of Jammu region Fig 2: Shows persimmon fruit pulp

Statistical Analysis

The analysis of the data were done by using the statistical programme SPSS V. 25. Differences were considered significant at $p < 0.05$. All experiments and subsequent analysis results were conducted three times, and the average is used to express all obtained data.

Results and Discussion

Table 1: Proximate composition of fresh persimmon pulp

Parameters	**Fresh Pulp of persimmon (Mean)**
L*	99.6
a*	17.0
b*	73.0
Moisture (%)	76.83
Crude protein (%)	1.32
Crude fibre (%)	13.5
Crude fat (%)	0.05
Ash (%)	0.38
TSS (^{0}Brix)	15.12
Total sugars (%)	14.60
Ascorbic acid (mg/100g)	15.60
Antioxidant activity (DPPH)	77.10
Total phenolic compounds (mg GAE/g)	3.68
Carbohydrate (%)	7.92
FRAP (mmol FeSO4/g)	1.19
Solubility%	78.5

The proximate composition of fresh persimmon pulp was shown in Table 1; colour values were (L*) value of 99.6, (a*) value of 17.0, and (b*) value of 73.0, while solubility, moisture content, T.S.S, crude fibre, crude protein, crude fat, and ash content were found to be, respectively, 78.5percent, 76.83percent, 15.12ºBrix,13.5percent, 1.32 per cent. Titratable acidity for fresh persimmon pulp was 0.11 percent, and total sugar content was 14.60 percent. Fresh persimmon pulp was found to have 15.60 mg/100g of ascorbic acid. The outcomes are consistent with Gorinstein *et al*., (2011). Additionally, the following values were noted: carbohydrates 7.92%, antioxidant activity using DPPH assay 77.10%, total phenolic content 3.68 mg GAE/100g, FRAP 1.19 (mmol FeSO4/g).

In Table 1, the mean colour (L*, a*, and b*) colour values of persimmon pulp are shown. The values for the flesh colour (bottom of the skin) are 99.6, 17.0, and 73.0, respectively.

Among fresh fruit of 100 g, a persimmon contains the following nutrients: moisture (76.33%); crude protein (1.32%); total dietary fibre (13.5%); crude fat (0.05%); ash content (0.38%); total carbohydrates (79.2%); a high concentration of ascorbic acid (15.60 mg/100 gm); total sugars (14.60%); carotenoids; some minerals; polyphenols; and a particular group of polyphenols/tannins These results are in line with those of (Young and How, 1986).

Chemical features of the persimmon fruit in table 1. The fruit of persimmon has a TSS (total soluble solid) content of 15.12ºB. According to Celik and Ercisli (2008), persimmon cv. Hachiya fruits had an average total soluble solids content of 17.1 ^{o}B. This study discovered a solubility percent of 78.5. Similar results were found for the (TSS) total soluble solid, sugar, and other contents in earlier studies (Celik and Ercisli, 2008 and Candir *et al*., 2009), as well as in Attia *et al*., (2013) and Denev and Yordanov (2013).

The persimmon's total sugar content (in per cent) was 14.60 g/100 g. (Table 1). The persimmon's total phenolic content was 3.68 mg GAE/g f.m. According to Chen *et al*., (2008), the total phenolic content of persimmon cv. Mopan was 32.3 mg/100 g d.w. FRAP is 1.19 mmol FeSO4/g, although total antioxidant activity (DPPH) was 77.10.The results are in line with the Chen and co. (2008). One of the most bioactive fruits, according to some studies, particularly in terms of polyphenols and tannins, is the persimmon (Chen *et al*., 2008). According to this study, persimmons have high total polyphenol levels and strong antioxidant potential.

Conclusion

In contrast to prior reports, this study's findings on total soluble solid content and other contents showed that persimmons have higher potential antioxidant activity and ascorbic acid contents than those found in other reports.

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