Research Article

Nutritional Information of Custard Apple and Strawberry Fruit Pulp

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Abstract

The aim of the present study was to evaluate the chemical and phytochemical properties of custard apple and strawberry pulp which was prepared using mixer. Proximate, minerals, and phytochemical properties were carried out on the fruit pulp. Custard apple and strawberry pulp exhibited moisture levels varying from 74.00 to 91.66%, fat 0.39 to 0.31%, crude fibre from 3.30 to 2.90%, sugars 22.77 to 6.57, crude protein from 2.80 to 2.39%, and carbohydrates from 21.50 to 5.43%, acidity from 0.63 to 5.49 and ash from1.05 to 0.40. The predominant mineral elements in the custard apple and strawberry were Ca, Fe, phosphorus, 22.00, 0.43, 25.33 and 15.33, 0.41, 26.61 mg/100g respectably. The phytochemical properties revealed that the ascorbic acid and total phenols of custard apple and strawberry pulp ranged from (52.13, 79.73) and (26.55, 37.25) mg/100g, respectively. Antioxidant activities were found in custard apple and strawberry 1815.20 and 261.94 % activity.

Keywords: chemical composition, micro nutrient, antioxidant activity, phenolic compounds of custard apple and strawberry

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Introduction

Sitaphal is a fruit from the small tree named Annona squamosa which belongs to the Family Annonaceae of the order Magnoliales [1]. It is also called custard apple. The genus name, 'Annona' is from the Latin word 'anon', which means 'yearly produce'. Custard Apple requires hot dry climate during flowering and high humidity during fruit setting. Flowering comes during hot dry climate still fruit setting takes place on onset of monsoon. Low humidity is not good for pollination and fertilization Flowering comes during hot dry climate still fruit setting takes place on onset of monsoon. Low humidity is not good for pollination and fertilization. The Custard Apple withstands drought conditions and cloudy weather [2]. The color is typically pale green through blue-green, with a deep pink blush in certain varieties, and typically has a bloom. Annona squamosa, Annona cherimola and Annona reticulate are the related species varieties. The seeds and the leaves are being used for preparation of medicine. The variety of *Annona squamosa* is also been extensively used as traditional medicine for different ailments. The leaves of the plants have been used as insecticide, antihelmintic and in the healing of bleeding wounds. Unripe and dried Fruits are used as antidysenteric. Bark act as powerful astringent, antidysenteric and vermifuge. Rootbark, leaves and stems are sources of many isoquinoline alkaloids. Powdered seeds can also used to kill head-lice and fleas [3]. Despite the medicinal property of the fruits and reasonable taste, the species has not completely come into common use like many other fruits like jack, mangoes etc.

The garden strawberry is a grown hybrid species of the genus *Fragaria* [4]. It is cultivated worldwide for its fruit. The fruit (which is not a botanical berry, but an aggregate accessory fruit) is widely appreciated for its characteristic aroma, bright red color, juicy texture, and sweetness. Artificial strawberry flavorings and aromas are also widely used in many products like lip gloss, candy, hand sanitizers, perfume, and many others. The woodland strawberry (*Fragaria vesca*), which was the first strawberry species cultivated in the early 17th century. [5]

Strawberries *(F. ananassa*) are an excellent source of vitamin C (average 40-90/100 mg), fiber, foliate, vitamin K and potassium [6]. Depending on age group, the daily requirement for vitamin C is about 60-90 mg [7, 8], thus with a supply of 100 g of strawberries daily needs of vitamin C will be covered [6, 9]. Strawberries also contain substantial amounts of ellagitannins and anthocyanins, which may help treat the hyperglycemia and high blood pressure associated with type 2 diabetes; these substances have antioxidant properties that lowered cholesterol and risk of metabolic syndrome in women [10]. Strawberries contain fisting, an antioxidant that has been studied in relation of Alzheimer's disease and to kidney failure resulting from diabetes [11]. Technical knowledge is very few for Strawberry processing [12].

Materials and Methods

Raw material

Fruits were procured from the department of Horticulture, Sam Higginbottom University of Agriculture Technology and Science (SHUATS), Allahabad. All the chemicals used in the present study were purchased from S.D. Fine Chemicals Ltd. Mumbai, India.

Proximate Composition

The methods of the Association of Official Analytical Chemists [13] were used for proximate analysis. A fruit pulp sample was used for determination of moisture content by weighing in crucible and drying in oven at 105^0C, until a constant weight was obtained. Determination of ash content was done by muffle Furness at 550^0C for 3h. The Kjeldah method was used to determine the protein content. The crude fiber content of the samples was determined by digestion method and the fat was done by HCL method. All determinations were done in triplicate.

Minerals estimations

Fruit pulp sample was weighed into a clean ceramic crucible. A blank was prepared with empty crucible. The crucible was placed in a muffle furnace at 500 ^{0}C for 4 hr. The sample was allowed to cool down in the oven after which it was removed carefully. The ashed sample was poured into already labeled 50 ml centrifuge tube. The crucible was rinsed with 5 ml of distilled water into the centrifuge tube. The crucible was rinsed again with 5 ml of aquaregia. This was repeated to make a total volume of 20 ml. The sample was mixed properly and centrifuged (IEC Centra GP8) for 10 min at 301.86 g. The supernatant was decanted into clean vials for mineral determination. The absorbance was read on atomic absorption spectrophotometer at different wavelength for each mineral element (Zn-213.9 nm, Ca-422.7nm, Fe-248.3nm, Mg-285.2nm, Na-589nm and K-766.5 nm) [14].

Bioactive compounds

Ascorbic acid

The ascorbic acid content was estimated by visual titration method using 2, 4-Dichloro-phenol-Indophenol dye method [13, 15]. Results were expressed as milligrams of ascorbic acid/100 g fresh weight.

$$\text{Ascorbic acid (mg/100gm)} = \frac{\text{Titre value} \times \text{Dye factor} \times \text{Volume made} \times 100}{\text{Aliquot taken} \times \text{sample weight}}$$

Total phenolic content

Total phenolics were estimated according to AOAC [13], by using photometric method with Folin reagent. The values were reported as mg of gallic acid equivalent (GAE) per 100 gram with reference to gallic acid standard curve.

$$\text{Total Phenols (mg/100 gm)} = \frac{\text{Conc.of phenols from graph} \times \text{Final volume} \times 100}{\text{Wt.of sample} \times \text{aliquate taken}}$$

Antioxidant activity

Antioxidant activity was determined according to the method described by [16, 17] as follows: Five grams of Moringa different parts were extracted by 100 ml. 80 % methanol. Different concentrations (0.5 to 1 ml) were used to determine the antioxidant activity using 2,2 – diphenyl – 1 – picryl hydroxyl (DPPH).

$$\text{Radical scavenging activity (\%)} = \frac{\textit{Absorbance of control (0 minute)} - \textit{Absorbance of sample (30 minute)}}{\textit{Absorbance of control (0 minute)}} \times 100$$

Statistical analysis

Statistical analysis all the experiments were conducted in triplicate and the mean and standard deviation were calculated using MS Excel software. The data were subjected to one-way analysis of variance (ANOVA).

Result and Discussion

Chemical Analysis

The proximate analyses of Fruits Pulp play a crucial role in assessing its nutritional significance (<0.05). The chemical composition of custard apple and strawberry pulp for their moisture content, Ash, crude protein, ether Fat, total carbohydrates and crude fiber, Acidity and sugars are shown in **Table 1**. The results of the proximate composition (Table 1) revealed that custard apple contained high amounts of sugar, crude protein, moisture, total carbohydrates and crude fiber, Ash and acidity (22.77%, 2.80% 74.00%, 21.50%, 3.30%,1.05 and 0.63% respectively and minimum amount of fat content (0.39%). Custard apple is considered as one of the delicious and nutritionally valuable fruit. It contains about 28-55% of edible portion consisting of 73.30% moisture, 1.60% protein, 0.30% fat, 0.70% mineral matter, 23.90% carbohydrates, 0.20% calcium, 0.40% phosphorus, 1.0% iron, 12.4-18.15% sugar, 0.26-0.65% acidity [18].

The percentages of moisture, ash, proteins, fat, carbohydrates, fiber, acidity and sugar of strawberry were 91.66, 0.40, 2.39, 0.13, 5.43, 2.90, 5.49 and 6.57 respectively. Finally, through data tabulated in Table 1, Strawberries mainly consist of water (91%) and carbohydrates (7.7%). They contain only minor amounts of fat (0.3%) and protein (0.7%). One cup of whole strawberries (150 grams) contains less than 50 calories. The table below contains information on all the main nutrients in strawberries. The carbohydrate content is less than 6 grams for every 100 grams of strawberries. Strawberries have a glycemic index score of 40, which is relatively low [19]. About 26% of the carb content of strawberries is in the form of fibers. 1 cup of strawberries provides 3 grams of fiber, both soluble and insoluble. [20, 21]

Table1 Chemical composition of custard apple (annona squamosa) and strawberry (*F. ananassa*) pulp (n=3)

Parameters	Custard Apple Pulp	Strawberry Pulp
Moisture (%)	74.00±12.16	91.66±5.94
Ash (%)	1.05±1.00	0.40±0.20
Crude Protein (%)	2.80±0.30	2.39±0.35
Fat (%)	0.39±0.35	0.13±0.21
Carbohydrates (%)	21.50±10.95	5.43±5.67
Crude fibre (%)	3.30±0.60	2.90±0.36
Acidity (%)	0.63±0.31	5.49±0.96
Sugar (%)	22.77±1.86	6.57±1.34

Mean values in the same column followed by different superscripts differ significantly ($P < 0.05$). The values in brackets are the standard deviation from the mean values.

Minerals Analysis

The minerals analysis of our samples revealed that high contents of Ca (22, 15.33mg/100g), phosphorus (25.33, 26.61 mg/100 g), iron (0.43, 0.41 mg/100 g), were found in custard apple and strawberry (Table 2).

Table 2 Measured concentration in (mg/100 g) of trace element in the custard apple and strawberry fruit pulp (n=3)

Perameters	Custard Apple Pulp	Strawberry Pulp
Calcium (mg/100g)	22.00±2.00	15.33±3.05
PhosphoruS (mg/100g)	25.33±3.05	26.61±6.1
Iron (mg/100g)	0.47±0.30	0.41±0.08

Mean values in the same column followed by different superscripts differ significantly ($P < 0.05$). The values in brackets are the standard deviation from the mean values.

Phytochemical analysis

The total phenolic content of the samples was determined according to the spectrophotometric method based on the ability of the phenolic substances to form blue molybdenum tungstic complex with the reagent Folin-Ciocalteu [22]. Concentrations of two natural antioxidants (Total phenolics and antioxidant vitamin C) and total antioxidant custard apple and strawberry are shown in **Table 3**. The results shown in Table 3 revealed that the ascorbic acid and total phenols of custard apple and strawberry ranged from (52.13 to 79.73), (26.55 to 37.25) mg/100 g, respectively. Antioxidant activities of custard apple and strawberry as determined by DPPH radical scavenging method are presented in Table 3. Radical scavenging activity of methanolic extracts of custard apple and strawberry pulp were in

the range of 1815.20 -261.93 % activity respectively. It could be observed that the custard apple and strawberry pulp are rich sources for natural antioxidants and total antioxidant activity (Table 3).

Table 3 Phytochemical analysis Custard Apple and Strawberry pulp n=3

Perameters	Custard Apple Pulp	Strawberry Pulp
Ascorbic acid (mg/100g)	52.13±28.10	79.73±38.30
Total phenols (mg/100g)	26.55±2.53	37.25±3.34
$TEAC^2$, µmol TE (% activity)	1815.20±10.71	261.93±79.97

Mean values in the same column followed by different superscripts differ significantly ($P < 0.05$).
The values in brackets are the standard deviation from the mean values.
TEAC: Trolox equivalent antioxidant capacity, an antioxidant assay using ABTS radicals; TE: trolox equivalent

Conclusion

Custard apple or the sugar apple is the fruit of Annona squamosa, which is one of the most widely grown species of Annona and a native of the tropical Americas and West Indies It has been also grown in India, china etc. The fruit pulp has shown numerous medicinal properties which include antioxidant, anti-diabetic, anti-infective and anti dyslipidemic properties. Still the pulp of the fruit is not very easy for intake. There are a variety of recipes to overcome the problem and increase intake. Strawberries are low in calories, and are both delicious and healthy. They are a good source of many vitamins, minerals and plant compounds, some of which have powerful health benefits. Furthermore, they may help prevent big spikes in both blood sugar and insulin levels. Strawberries are an excellent addition to a healthy diet.

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