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Chemical and mineral composition of jamun fruit pulp (*Syzygium cumini* L.)

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Abstract
Jamun fruit (*Syzygium cumini* L.) has an important medicinal properties used for different conventional practices and treatment. There are different varieties cultivated and its harvested in all over India. Jamun fruit paras variety is bountiful in mineral content like calcium, magnesium, phosphorus, iron, potassium, zinc, sodium and copper as well as crude fiber, crude fat, protein content and carbohydrates also different anatomical parts are popular due to its taste. Pulp contains moisture and total soluble solids (°Brix) were found to be 80.75±2.15, and 14.20±1.87 respectively. Similar calcium (mg/100 g), magnesium (mg/100 g) were found to be 54.55±4.78, 166.7±7.10 respectively. Jamun fruit pulp have a great potential, because of their distinctive value and because of the nutritional advantages. Therefore, it is essential to develop, optimize, and advertise fruit products with value addition.

Keywords: Jamun fruit, paras, pulp, chemical, mineral

Introduction
Jamun fruit (*Syzygium cumini* L.) has been widely used by the traditional practitioner over many centuries for the treatment of number of disease due to its various morphological actions like free radical scavenging antioxidant hepatorotective, anti-diarrhoeal, hypoglycaemic, anti-diabetic, anti-ulcer genic, cardio protective, antiallgeric anticancer, chemo preventive and radio protective effects (Baliga *et al*., 2011) [4].
The healing and rejuvenating properties of the tropical fruit jamun are highly valued. The jamun is one of the more nutrient-dense, smaller, and perishable fruits. It is most frequently used by the pharmaceutical industry and diabetes patients. An excellent source of it is anthocyanin, which effectively negates the effects of analgesics. There is no absolute knowledge of the Indian Jamun. Jagetia, G. C. 2017 [8] and Aqil *et al*., 2022 [2] Jamun fruit are rich source of glucose and fructose which are the major in the ripe fruit besides minerals which provide more calories compared to other fruits. Chaudhary and Mukhopadhyay, (2012) [6] reported that *Syzygium cumini* L. is a potential source of nutraceuticals. Jamun fruits are used as an alternative medicine to treat various diseases and used in well-known traditional medicines to control the blood sugar level in the patients suffering from diabetes and rich in phytochemicals like glycoside jambolin, anthocyanin tannins, terpenoids, and various minerals. It was also reported that jamun fruit pulp contains vitamin C, vitamin A, riboflavin, nicotinic acid, choline, folic acid maleic acid, sugar, and amino acids and stated that fruits are purplish black in colour when ripe and have high anthocyanin content.
To make functional fruit based beverages, it is usual practice to blend fruit juice, pulp and Fruit pulp that has been frozen is shipped to different places, where it is employed as the main added-value product for the cosmetics, pharmaceutical, and culinary sectors. It is commonly used in the food industry to increase the amount of vitamin C in cocktails and mocktail like drinks (Marcus, 2013 and Castro *et al.*, 2018) [10, 5].

Materials and Methods
Jamun Fruit
The jamun fruit of Paras variety were procured from Village-Vadod, Dist. Anand. Jamun fruits were randomly selected for determination of various chemical and mineral compositions.

Chemical analysis
Moisture content
The Gravimetric method was used (AOAC, 2012) [1] was used to measure moisture content. Moisture content was determined by drying the weighed sample (5g) to a constant weight in

Bio craft make laboratory Hot Air Oven at 105° C. The dried sample was then cooled to room temperature in desiccators prior to weighing. The moisture percent was calculated by below.

$$\text{Moisture content } (\% \text{ w.b.}) = \frac{w_1 - w_2}{w_1} \times 100$$

Where,
w_1= initial weight of sample (g)
w_2= weight of sample after drying (g)

Ash content
Ash content of sample was determined as per AOAC, (2012) [1].
In order to achieve a steady state temperature condition, the muffle furnace was set at a temperature of 550°C around 30 minutes before the experiment.
The weight of an empty silica crucible is first measured and recorded. Then, 5 g of the sample is put into the crucible, which is then heated to 550 °C in the muffle furnace for 5 to 6 hours, until the sample is completely charred. The crucible is then removed from the muffle furnace, put in a desiccator to cool, and then it is immediately weighed. The percent ash content is calculated using the initial and final weights.

$$\text{Ash } (\%) = \frac{w_2 - w_1}{w_3} \times 100$$

Where,
W1 = Weight of empty crucible (g),
W2 = Weight of crucible + Ash (g) and
W3 = Weight of sample (g)

Crude fat
Crude fat content of sample was determined using a Soxhlet apparatus (*Make: Pelican Equipment's, Chennai*) (A.O.A.C. 2012) [1]. Weighed, transferred, and cotton plugged into a thimble was around 2 g of sample material.
The soxhlet extraction device's fat extraction tube was fitted with the blocked thimble. 250 ml of n-Hexane was added to the soxhlet flask attached to the bottom of the extraction tube after the sample.
The extraction tube's top was where the condenser was fastened. 5 hours were spent extracting the sample. At the conclusion of the extraction, the thimble was taken out, and the solvent was largely distilled out by letting it build up in the soxhlet tube.
At low temperatures, the remaining solvent evaporated. It was then dried for 1 hour at 60 °C in a hot air oven and chilled before the measurement of weight. The process replicated three times and the fat content in the sample was calculated by the following equation 3.11.

$$\text{Crude fiber } (\%) = \frac{w_2 - w_3}{w_1} \times 100$$

Where,
w_1= weight of sample (g)
w_2= weight of crucible + sample after washing and drying (g)
w_3= weight of crucible + ash (g)

Crude fiber
For estimation of crude fiber content, the Fibra plus instrument (Make: *Pelican Equipment, Chennai*) was used (A.O.A.C 2012) [1]. After each treatment, 2 g of the sample were treated with 1.25% H2SO4 and subsequently 1.25% NaOH to render the residual alkali-free. After that, distilled water was used to completely rinse the sample. The residual weight was dried, weighed, and the percentage of crude fibre was calculated using the following equation after the neutral residue in the muffle furnace was ignited.

Protein
Micro-Kjeldahl method (AOAC, 2012) [1] Protein content of the sample was determined using a method. The sample was digested at 400 °C in concentrated sulfuric acid (H2SO4) with 3 g of a K2SO4:CuSO4:2.5:0.5 catalyst mixture using 0.2 to 0.3 g of the material. A mixed indicator was used to collect the released ammonia from the digested sample in a 4% boric acid solution (methyl red: bromocresol green, 1:5). The condensate was titrated with standard 0.1 N HCl until the blue colour disappeared. The protein content was calculated by multiplying by 6.25, and the% nitrogen was calculated by using the quation below:

$$\text{Nitrogen } \% = \frac{14 \times \text{ T - N } \times \text{Normality of HCl} \times 100}{\text{W} \times 1000}$$

% Protein=% Nitrogen × 6.25
Where,
T=Titre value (ml)
N= Normality of HCL
W=Weight of the sample

Carbohydrate
The carbohydrate content of jamun fruit pulp was calculated by difference using following formula:

$$\text{Carbohydrate } \% = 100 - \% \text{ moisture + crude protein + ash + crude fibre + crude fat}$$

Total soluble solids
The total soluble solids of jamun pulp sample was estimated by using pocket hand refractometer PAL -1 (ERMA, made in Japan) and ºBrix value was recorded three times and average value reported (Makroo *et al*., 2019) [9].

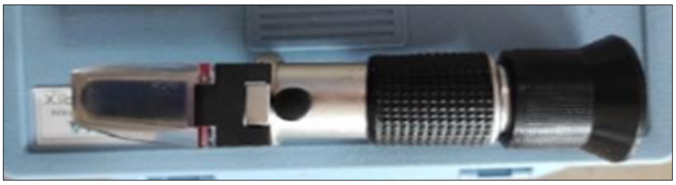

Fig 1: Refractometer

Mineral analysis
Using inductive couple plasma-optical emission spectrometry, the minerals in jamun pulp were identified. 1 g of the sample was kept for digestion the next day while 10 ml of concentrated nitric acid was added. The minerals in jamun pulp were detected by ICP-OES, or inductive couple plasma-optical emission spectrometry (Model Optima 7000 DV). 1 g of the substance was saved for digestion the next day, and 10 ml of powerful nitric acid was also added (HNO3). The sample was heated in the fume hood at 70–80 ºC until the solution became colourless after adding 15 ml of the diacid

mixture (Concentrated nitric acid: Perchloric acid, 2:1). After cooling, the fluid was filtered through cotton fabric. Ultrapure water was used to generate a solution of up to 50 ml in a volumetric flask. The presence of minerals was also estimated using a sample (Ranganna, 2017) [18].

Results and Discussion

The chemical and mineral composition were determined of Jamun fruit pulp. The results obtained in the present investigation. The trials were carried out three times, and mean values and standard deviations are presented in Table No.1 Moisture content (% wb), ash content (%), crude fiber (%), crude fat (%), protein content (%), carbohydrate (%) and total soluble solids (°Brix), of jamun pulp obtained were 80.75±2.15, 1.85±0.08, 1.05±0.6, 0.149 ±0.41, 1.12±0.05, 13.58±1.2, 14.20±1.87, respectively. The chemical constitutes observed are similar to the observations made by Swami, *et al*., (2020) [16], Suradkar, *et al*., (2017) [14] and Ghosh, *et al.*, (2017) [7]. The minor variations could be due to various varieties and other environmental factors.

The mineral analysis *viz*, calcium (mg/100g), magnesium (mg/100g), phosphorus (mg/100g), iron (mg/100g), potassium (mg/100g), zinc (mg/100g), sodium (mg/100g) and copper (mg/100g), were found to be 54.55±4.78, 166.7±7.10, 152.65 ±15.38, 33.2±1.0, 358.5±5.0, 1.215±0.1, 8.75±0.25, and 0.105±0.5, respectively. Nearby results were reported by Nawaz, *et al*., (2010) [11] for mineral elements of jamun fruit.

Table 1: Composition of jamun pulp

Parameters		Mean value ± S. D.
Chemical	Moisture (%)	80.75±2.15
	Ash (%)	1.85 ±0.08
	Crude fiber (%)	1.05 ±0.6
	Crude fat (%)	0.149 ±0.41
	Protein (%)	1.12 ±0.05
	Carbohydrate (%)	13.58 ±1.2
	TSS (°Brix)	14.20 ±1.87
Minerals	Calcium (mg/100g)	54.55±4.78
	Magnesium (mg/100g)	166.7±7.10
	Phosphorus (mg/100g)	152.65 ±15.38
	Iron (mg/100g)	33.2±1.0
	Potassium (mg/100g)	358.5±5.0
	Zinc (mg/100g)	1.215±0.1
	Sodium (mg/100g)	8.75±0.25
	Copper (mg/100g),	0.105±0.5

Conclusion

In India, jamun (*Syzgium cuminiL.*) is a fruit that is enjoyed b y all socioeconomic groups. It is easily accessible and also has some therapeutic qualities. Jamun contain many different kinds of chemical and nutritional composition these properties are important for health concerns and useful for human being. In this study Jamun fruit pulp analyzed by standard analytical methods. These studies focused and understanding the values of mineral and chemical composition of jamun fruit as it underutilized and in scattered form so that more attention should be required on such commodity for beneficial uses, effects and further research on it.

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