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RESEARCH ARTICLE

Material properties of paras variety jamun fruit (*Syzygium cumini* L.)

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ABSTRACT

Jamun (*Syzygium cumini* L.) is a popular indigenous fruit. Characterizing fruits is an important process that explains the individual characteristics of the different cultivars, as well as the features that influence the handling and development of the product. Improving the Jamun stock benchmark can increase their attention and prepare them to be more productive and profitable. The material properties values of jamun fruit of paras variety for weight, length, width and thickness obtained were found tobe 9.08 ±1.14 g, 29.58 ±1.23mm, 17.07 ±1.29 mm, 16.30 ±1.85, Value for bulk density and true density were found to be 1049±0.03 Kg/m^3 and 1054±0.03 Kg/m^3 respectively. The pulp yield and pulp to seed ratio were estimated as 72.17±1.46 and 2.82**:** 1, respectively. These properties were important to commercial aspects for storage, packaging, processing and transportations.

Keywords: Jamun, paras, properties, pulp, seed properties

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INTRODUCTION

The popular Indian fruit jamun, (*Syzygium cumini* L) is also referred to as the "blackberry." When ripe, the green, fresh fruit of the jamun turns pink or purple. In terms of global fruit production, India is ranked second. India supplies 15.4% of the 13.5 million tonnes of jamun that are produced globally. 25% seed-based and 75% fresh pulp with skin, both of which are rich in phytochemicals and are very nutrient-dense (Patil et al., 2012). Jamun fruit has many forms of antioxidant, hepatoprotective, hypoglycemic, antidiabetic, antiulcerogenic, cardioprotective, antiallergic, cancer-preventive, chemopreventive, and radioprotective effects. It has been traditionally used by medical practitioners to treat many ailments over the years due to its therapeutic effects (Garrido et al., 2013). It goes without saying that the ripe fruits should be preserved and processed into various value-added products in order to reduce the post-harvest losses of jamun fruits and preserve their flavor and vitamins. By creating and standardizing different processing methods, jamun fruits are transformed into value-added products with highly preserved nutritional and sensory properties, thereby extending the season of availability.

It is important to understand the meaning and location of changes in the physical packaging of apple fruit in conjunction with preharvest conditions, efficient methods, sorting, and the design of processing equipment are dependent on mechanical or home-made packaging. It is important to consider the physical packaging of apple fruit, including color, size, weight, viscosity

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and other properties, as well as the pre-harvest influence of certain factors. Fruit type, age, and location within the pericarp in the sample plot of the study. While we found a special donation in the box, our growing and post-harvest handling procedures have been improved to ensure a high quality fresh harvest when receiving customer requests and processing facilities. Rebuilt and redesigned and transformed into a processing unit. Pre-harvest conditions are particularly important as the physical packaging of apple fruit may also change. Degradation and other properties of fresh fruit and its recycled products are subject to unknown variables. Pre-harvest physical fruit characteristics and operational tree aspects should be considered. Moreover, future reports should describe in more detail the growth effects or interactions of pre-harvest factors on post-harvest apple orchard plots. (Kashaninejad et al., 2006; Bart-Plange and Baryeh, 2003).

There may be several physicochemical components in jamun worth testing in this study. With a view to determining the physical characteristics of jamun fruits and considering appropriate techniques for further processing, several studies have been conducted on their greater applicability in assessing quality, nutritional value and consumer acceptability. Several important properties were evaluated.

MATERIALS AND METHODS

Jamun fruits of cultivar Paras were purchased from the village of Vadod in the district of Anand. To remove microbial burden, dust, dirt, and other pollutants, jamun fruits were sorted, graded, and then washed with 40 ppm chlorinated water. They were then rinsed with tap water and utilised for subsequent studies.

Fruit size and shape

A Vernier calliper with an accuracy of 0.01 mm was used to measure the length, width, and thickness of jamun fruit at random from the bulk sample.

Arithmetic Mean (AM) and Geometric Mean (GM) was calculated by the below given formula. (Ghosh, et al., 2017; Bakane et al., 2016)

$$AM = \frac{l+w+t}{3}$$

$$GM = (l * w * t)\frac{1}{3}$$

Where,

AM= Arithmetic mean diameter (mm)

GM= Geometric mean diameter (mm)

l= length

w= width

t= thickness

Fruit weight

Randomly selected jamuns (individuals) were weighed using an electronic scale (Mettler Toledo) with an accuracy of 0.01 g, and the mean value was calculated and reported. (Ghosh et al., 2017; Mohsenin, 1986).

Volume

The water displacement method based on Archimedes' principle was used to measure the volume of jamun fruit. Jamun fruits were immersed in a 10000 cc Eureka tank, and the amount of water displaced was measured with a graduated cylinder at a water temperature of 25°C during the measurement. (Ghosh, et al., 2017; Mohsenin, 1986).

$$\text{Volume (v)} = \frac{\text{B}-\text{A}}{\text{N}}$$

Where,

V= Volume (cm^3)

A= Initial volume of water (cm^3)

B= Final volume of water (cm^3)

N= Total numbers of fruits

Bulk density

A dry, empty cylinder with a capacity of 50 cc was used to measure the bulk density of jamun fruit. After filling the sample to a known volume and weighing the filled graduated cylinder, a known weight of jamun fruit was added and the bottom of the graduated cylinder was tapped. Bulk density was calculated by dividing the mass of fruit filling the cylinder by its volume. Bulk density was determined as indicated. (Ghosh, et al., 2017; Carmen, 1996).

$$\text{Bulk density } (\rho\text{b}) = \frac{\text{Mx}}{\text{Vc}}$$

Where,

ρb=Bulk density (g/cm^3),

Mx=Weight of sample (g)

Vc=Volume of the container (cm^3)

True density

Toluene displacement method was used to measure the true density of jamun fruit. A 500 mL graduated cylinder was filled to 100 mL with toluene and a known weight of fruit was slowly placed into the toluene. Afterwards, an increase in the amount of toluene was observed. We repeated this process three times and took the mean of the observations. (Ghosh, et al., 2017; Mohsenin, 1986).

$$\text{True density } (\rho_t) = \frac{Mx}{\Delta Vt}$$

Where,

ρ_t = True density (g/cm^3),

Mx = Weight of sample (g)

ΔVt = Increase in the volume of toluene (cm^3)

Porosity

The porosity of fruits is calculated as the ratio of their total volume to their empty space. Using the aforementioned relationship, this was computed from the measured values of the bulk and actual densities.

$$\text{Porosity } (\epsilon) = \left(\frac{\rho_t - \rho_b}{\rho_b}\right) X\ 100$$

Where,

ρ_t = True density (g/cm^3)

ρ_b =Bulk density (g/cm^3)

Pulp yield (%) and pulp to seed ratio

Ripe jamun fruits (50) were randomly selected and weighed. The fruits were pierced by hand to preserve the pulp and seeds. The masses of both sections were determined separately. Equation given below was used to calculate the yield of jamun fruit (Ghosh et al., 2017). The pulp-to-seed ratio was calculated using the approach of Kolekar and Tagad (2012). A sharp stainless steel knife was used to separate the jamun fruit pulp and seeds. The weight of pulp and seed in each individual fruit was measured with an electronic balance.

$$\text{Pulp Yield recovery } (\%) = \frac{\text{Weight of jamun pulp (g)}}{\text{Weight of whole fruit (g)}} \times 100$$

$$\text{Pulp to Seed ratio} = \frac{\text{Pulp percent of fruit (\%)}}{\text{Seed percent of fruit (\%)}}$$

Color value

Jamun fruit color analysis was performed using a CIELAB scale L*, a*, b* scale colorimeter (manufacturer: Lovibond). A low L* value (0-50) indicates dark and a high value (51-100) indicates light. Positive a* values indicate red, negative values indicate green. A positive b* value indicates a yellow color and a negative value indicates a blue color. Therefore, the L* value of each scale indicates the degree of lightness or darkness, the a* value indicates red or green, and the b* value indicates yellow or blue (Arjeh et al., 2015). All three values are required to determine the color. The instrument was first calibrated and L*, a*, and b* values were recorded for three replicates of each jamun fruit sample for analysis.

RESULTS AND DISCUSSION

The material properties of jamun fruit (*Syzygium cumini* L.) for paras variety were determined as per standard methods describe in Section 2. All the values shown on Table 1.

Table 1: Properties of jamun fruit

Parameters	Mean values ± SD
Fruit weight (g)	9.08 ±1.14
Size (mm)	Length: 29.58 ±1.23
	Width: 17.07 ±1.29
	Thickness : 16.30 ±1.85
Shape	Oblong to ovoid
Arithmetic mean diameter (mm)	20.98 ±7.45
Geometric mean diameter (mm)	20.19 ±7.45
Volume (cm^3)	8.33±0.28
Porosity	0.476±0.18
Bulk density (Kg/m^3)	1049 ±0.03
True density (Kg/m^3)	1054 ±0.03
Pulp yield (%)	72.17±1.46
Pulp to seed ratio	2.82 **:** 1
Colour value	
L*	23.48±2.21
a*	0.95±0.25
b*	0.44±0.14

The mean values of weight, length, width and thickness of jamun fruit obtained were found to be 9.08±1.14 g, 29.58 ±1.23 mm, 17.07 ±1.29 mm, and 16.30 ±1.85 mm, respectively at moisture content of 80.75 % (w.b). The average arithmetic and geometric mean diameter obtained were found tobe 20.98 ±7.45 mm and 20.19 ±7.45 mm, respectively. The shape was found oblong to ovoid and color was observed purple and blueish. The volume and porosity were determined as 8.33±0.28 cm^3 and 0.476±0.18 respectively.

The mean values obtained for bulk density and true density of jamun fruits were found to be 1049 ±0.03 Kg/m^3 1054 ±0.03 Kg/m^3, respectively. The pulp yield and pulp to seed ratio were estimated 72.17±1.46 % and 2.82 : 1, respectively.

The colour in terms of L*, a*, b* values was found as per the procedure explained in Section 3.3.4.8. Low L* values (0-50) indicates dark and a high value (51-100) indicates light. Positive a* values indicate red and a negative value indicates green. Positive b* values indicate yellow and a negative value indicates blue. The colour value (L*a*b) were observed 23.48±2.21, 0.95±0.25, 0.44±0.14. The Physical properties observed are similar to the observation made by Ghosh et al., (2017) Bakane et al., (2016), Jaiswal et al., (2015) and Shahnawaz and Sheikh, (2011) and the minor variation could be due to various factors such as varieties and other environmental factors.

CONCLUSION

The goal of this study was to look at the hylic of jamun fruit. There are many varieties of jamun fruit its having Medical and pharmaceutical benefits. The paras variety jamun fruit physical properties were determined for its weight, size, shape, diameter volume, porosity, colour, pulp to seed ratio, as well as various parameters were investigated. Jamun fruits were evaluated in order to improve the design of jamun physical properties tools, equipment, and machinery, as well as to simplify the overall mechanism of processing, preserving, and marketing.

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