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Original article

A Comparative Study of Wild and Hybrid Varieties of *Syzygium cumini* l. Skeels: Dietary Values

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ABSTRACT:
Aim and Objectives: *Syzygium cumini* is a seasonal fruit ripening in the months of June, July and the berries are sweetish sour to taste. Though the fruits are eaten for dietary purpose, all parts of the tree are used to treat a range of ailments, the most important being diabetes mellitus. The plant is rich in compounds containing anthocyanins, glucoside, ellagic acid, isoquercetin, kaemferoL and myricetin. Two types of fruits are cultivated and available in the market, the wild variety which is smaller in size and a slightly larger fruit which is a hybrid variety. Both are commonly eaten by the people for its antidiabetic properties, but the larger fruit is preferred for it is fleshier and less astringent. In the present work the fruits were compared for their nutritional values.
Methodology and Result: The pulp of fresh fruits of both varieties was estimated for the nutritive contents. The wild fruit is found to be more rich in antioxidant and mineral content especially potassium and magnesium.
Conclusion: As per the results of the present study, it is concluded that the wild variety of Jamun fruit is more advantageous. The nutritive value of these fruits show good quality and results were statistically significant.
Significance and Impact of Study: This study could be a beneficial source to the nutritionist to consider jamun as best neutraceutical fruit with natural curing properties and food industries for manufacturing commercially viable food products.

Keywords: *Syzygium cumini,* wild variety, hybrid variety, Nutritive value, Magnesium, potassium.

1. INTRODUCTION

Syzygium cumini belongs to family Myrtaceae is a tropical fruit of great economic importance.the fruit is commonly known as jamun plum, java plum, black plum, jambul and Indian black berry. Bark, leaves and seed extracts were reported to have anti –diabetic, anti-inflammatory, hepatoprotective, antihyperlipidemic, diuretic and antibacterial effects. Jamun reported to have high amounts of antioxidants, vitamins, tannins and anthocyanins when compared to other seasonal fruits like papaya,sapota, guava and banana [1, 2]. All parts of the jambolan can be used medicinally and it has a long tradition in alternative medicine. From all over the world, the fruits have been used for a wide variety of ailments, including cough, diabetes, dysentery, inflammation and ringworm. It is also an ancient medicinal plant with an illustrious medical history and has been the subject of classical reviews for over 100 years. It is widely distributed throughout India and ayurvedic medicine (Indian folk medicine) mentions its use for the treatment of diabetes mellitus. Various traditional practitioners in India use the different parts of the plant in the treatment of diabetes, blisters in mouth, cancer, colic, diarrhea, digestive complaints, dysentery, piles, pimples and stomachache. In Unani medicine various parts of jambolan act as liver tonic, enrich blood, strengthen teeth and gums and form good lotion for removing ringworm infection of the head [3, 4]. The most effective path to eliminate and diminish the action of free radicals which cause the oxidative stress in antioxidative defense mechanisms. So in the present study the nutritive value of fresh jamun pulp was carried out for both the fruits and compared.

2. MATERIALS AND METHODS

Jamun fruits were collected from Ponneri Thiruvallur Dist. The fruits were washed in running tap water and water drops were dried using paper towels [5, 6]. The pulp of these fruits were squeezed using blender and used for nutritive analysis.

Determination of ash content: The fruit pulp (10g) was heated in a muffle furnace for about 3-5 h at 600^{o}C. It was cooled in a desiccator and weighed. Weight of ash content was calculated by the following formula (Equation 1).

$$\text{Ash\%} = \frac{\text{Weight of ashed sample}}{\text{Weight of sample taken}} \times 100 \quad \text{…(Equation 1)}$$

Determination of total solids: Total solids was estimated by deducting percent moisture from hundred as described by James (1995) (Equation 2)

% total solids = 100 - % moisture

Determination of crude fat: The fat content was determined by Mojonnier method (James, 1995) gravimetrically after extraction with diethyl ether (ethoxyethane) and petroleum ether from ammonia alcoholic solution of the sample.

$$\% \text{ fat content of sample} = \frac{W_2}{W_3}\frac{W_1}{} \times 100$$

….. Equation 2

Where W_1 = Weight of empty flask (g), W_2 = Weight of flask + fat (g) and W_3 = Weight of sample taken (g).

Determination of crude protein: Micro Kjeldahl method (2000). Fruit pulp (2 g) was taken in a Kjeldahl flask and 30 ml concentrated sulphuric acid (H_2SO_4) was added followed by the addition of 10 g potassium sulphate and 1 g copper sulphate. The mixture was heated first gently and then strongly once the frothing had ceased. When the solution became colorless or clear, it was heated for another hour, allowed to cool, diluted with distilled water (washing the digestion flask) and transferred to 800 ml Kjeldahl flask. Three or four pieces of granulated zinc and 100 ml of 40% caustic soda were added and the flask was connected with the splash heads of the distillation apparatus. Next 25 ml of 0.1 N sulphuric acid was taken in the receiving flask and distilled. When two-thirds of the liquid had been distilled, it was tested for completion of reaction. The flask was removed and titrated against 0.1 N caustic soda solution using methyl red indicator for determination of Kjeldahl nitrogen, which in turn gives the protein content [7-9]. The nitrogen percent was calculated by the following formula (Equation 3).

$$N\% = \frac{1.4(V2 - V1) \times \text{Normality of HCl}}{\text{Weight of sample}} X\ 250\ (\text{dilution})$$

.. Equation 3

Whereas, protein content was estimated by conversion of nitrogen percentage to protein (Equation 4).

Protein % = N% x Conversion factor (6.25)…. Equation 4

Where conversion factor = 100/N (N% in fruit products)

Determination of crude fibers: Two g of moisture and fat-free sample was treated with 200 ml of 1.25% H_2SO_4. After filtration with Whatman paper No. 4 and washing, the residue was treated with 1.25% NaOH. It was filtered, washed with hot water and then 1% HNO_3 and again with hot water. The residue was ignited and the ash weighed. Loss in weight gives the weight of crude fiber (Equation 5) [10].

$$\text{Crud fiber \%} = \frac{(c - b) - (d - b)}{(a)} X\ 100$$

… Equation 5

Where; a = weight of sample; b = weight of crucible; c = initial weight of crucible containing tissue sample before ignition and d = final weight of crucible containing ash after ignition.

Determination of carbohydrates: Determination of available carbohydrate in the sample was calculated by difference method as described.

% carbohydrates =Total solids - (% ash-% fat-% protein)

Determination of ascorbic acid: It was determined by titrimetric method as described by Mazumdar and Majumder (2003) and James (1995). An aliquot of 10 mg (liquid/solid or semi solid) was taken and volume made up to 100 ml with 3% HPO_3 and filtered. Pipette out 10 ml of filtrate into a conical flask and titrated with the standard dye of a pink end point. The titration reading was calculated by the following formula Equation 6;

$$\text{Ascorbic acid (mg/100 g)} = \frac{\text{Titre X Dye factor X Volume made up}}{\text{Volu of filterate taken X Wt or Volu of sample}} X\ 100$$

……. Equation 6

Dye standardization: Diluted 5 ml of standard ascorbic acid solution with 5 ml of 3% of metaphosphoric acid. Titrate with dye solution till pink color persists for 10 seconds. Dye factor was calculated (mg of ascorbic acid per ml of dye) as follow (Equation 7);

Dye Factor (D.F) = 0.5/Titration…….. Equation 7

Determination of sugars: Determination of sugars (total sugar, reducing sugar and non-educing sugar) was carried out though Lane and Eynon Method as described by James (1995).

Total sugar and reducing sugar: Five g of sample was taken in a beaker and 100 ml of warm wateradded. The solution was stirred until all the soluble matter was dissolved and filtered through Whatman paper into a 250 mL volumetric flask. Pipetted 100 ml of the preparedsolution into a conical flask added 10 ml of diluted HCl and boiled for 5 min. On cooling, neutralize the solution to phenolphthalein with 10% NaOH and make up to volume in a 250 mL volumetric flask. This solution was used for titration against Fehling's solution and reading was calculated.

3. RESULTS

The nutrient values of both varieties of *Syzygium cumini* wild and hybrid were compared in the present study and the values were presented as tables. The *S. cumini* wild variety has higher fibre content and total carbohydrate content when compared to the hybrid variety. Total protein content is similar for both the samples [11]. High fibre content of the wild variety makes it a more favorable food supplement. Jamun fruits have higher antidiabetic activity and the fruit with rich fibre content is more preferable (Table 1).

The vitamin content was also compared between the wild and hybrid variety and was found that the wild variety has higher tannin and polyphenol (Table 2) content which contributes to the higher antioxidant activity of the wild variety [12].

When the mineral content of the two varieties wild and hybrid were compared, wild shows higher potassium and magnesium content which was 145.6 mg /100g and 25.34

mg /100g respectively. Whereas sodium, zinc and iron content were in higher content in wild variety. High potassium and magnesium content makes it a favorable fruit. Since, the jamun seed and pulp powder also have good nutritive values and were quite rich in carbohydrates along with protein, ash, crude fibers but has lesser fat content (Table 3). Similar results were given by (Kshirsagar *et al*., 2019) were they reported higher potassium content.

Table 1: Nutritive value of *Syzygium cumini*wild and hybrid variety.

S.No	Parameters	Wild variety (g/100g)	Hybrid variety (g/100g)
1	Moisture	45.5%	56.35 %
2	Total carbohydrate	59.5	50.33
3	Protein	0.94	0.945%
4	Fat	0.212	0.9534%
5	Fibre	0.66	0.22 %

Table 2: Vitamin content of *S. cumini* wild and hybrid varieties.

S.No.	Vitamins / 100gms	Wild variety (mg/100g)	Hybrid variety (mg/100g)
1	Ascorbic Acid	40.33	56.4
2	polyphenols	145.6	124.5
3	Antioxidant	25.244% (DPPH)	20.11 % (DPPH)
4	Tannins	45.3	39.45
5	Anthocyanin	103.4	99.45

Table 3: Mineral content of *S. cumini* wild and hybrid varieties.

S.NO	Minerals	Wild variety (mg/100g)	Hybridvariety (mg /100g)
1	Sodium	10.35	13.5
2	Potassium	145.6	40.34
3	Calcium	83.5	84.4
4	Zinc	0.67	0.91
5	Iron	4.45	5.24
6	Magnesium	25.34	21.98

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4. DISCUSSION

Though the fruits are seasonal which is available only in the months of April to July they form rich dietary supplements. The fruits could be stored as jams and jellies and can be used year round.A number of herbal formulations were also prepared in combination with this plant available in market which showed potential antidiabetic activity and are used regularly by diabetic patients on the advice of the physicians. Different parts of the jambolan were also reported for its antioxidant, anti-inflammatory, neuropsycho-pharmacological, anti-microbial, anti-bacterial, anti-HIV, antileishmanial and antifungal, nitric oxide scavenging, free radical scavenging, anti-diarrheal, antifertility, anorexigenic, gastroprotective and anti-ulcerogenic and radioprotective activities [13, 14]. Though both the fruits have antioxidant activity, the wild variety is preferable for its high mineral content and dietary fibre content. The fruits are abundant in the months of June to August, which could be consumed fresh. The excess fruits are stored as squashes, jams and jellies. The preserved fruit especially the dried fruits also has the same nutritive value.

Jambolan is widely used by the traditional healers for the treatment of various diseases especially diabetes and related complications. The plant has many important compounds which confer the most of the characteristics of the plant. Most pharmacological works on diabetes were carried out with seeds but the pharmacological potential of the other parts of the plant is required to explore in detail. Similarly, not many works are there with pharmacological actions of phytochemical constituents of jambolan. Based on these facts, the authors hope that the fruits especially the wild variety can be consumed in large quantities when it is available as fresh fruit and when not available the dried or preserved fruits could be consumed. By consuming foods rich in antioxidants, and dietary fiber some of the disease related to oxidative stress could be avoided. Further phytochemical and clinical research should be done on this traditional medicinal plant for the discovery of safer drugs [15, 16].

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