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# Morphological characterization of elite Jamun (*Syzigium cuminii* Skeels) genotypes

**G.S.K Swamy, P.L. Anushma and R.C. Jagadeesha**

*University of Horticultural Sciences, Bagalkot, Karnataka*

*Email: swamykumar2@rediffmail.com*

**ABSTRACT**

*An investigation on morphological and physico-chemical characters of 15 elite jamun genotypes was undertaken at University of Horticultural Sciences, Bagalkot. Among 15 genotypes observed, five were found to be of old age (more than 40 years); one of medium age (20-40 years) and nine were of young age (less than 20 years). Genotype KJS-48 recorded significantly higher fruit weight (10.76 g), fruit length (3.48 cm), fruit breadth (2.27 cm), fruit volume (11.03 ml), pulp weight (9.02 g), pulp per cent (83.50%) and pulp to seed ratio (5.128) and lower seed weight and seed content (16.50%). KJS-89a recorded lowest fruit weight (3.60 g), fruit length (2.30 cm), fruit breadth (1.46 cm), fruit volume (3.66 ml) and minimum pulp weight (2.60 g). Lowest pulp content (68.08%) and pulp to seed ratio (2.332) was recorded in KJS-58. High TSS was recorded in KJS-48 (16.95 °Brix) while lowest in KJS-89a (9.66 °Brix). Significant differences were observed for total, reducing and non-reducing sugar content among the genotypes. Highest acidity was recorded in KJS-65 (1.03%) and lowest in KJS-20 (0.51%). Highest TSS: acid ratio was recorded in KJS-89 (26.39) and the lowest in KJS-58 (10.85). Highest phenol content was recorded in KJS-44 (1.65 mg per gram) and lowest in KJS-65 (0.281 mg per gram).Significantly high score for overall acceptability was recorded for the genotype KJS-48 (4.17) out of five points.*

***Key words :*** Jamun, Variability, genotypes

## INTRODUCTION

The jamun (*Syzigium cuminii* Skeels), a member of family Myrtaceae,is one of the most important potential fruits widely distributed throughout the tropics and subtropics. It is native to India or East indies. In India, the maximum number of jamun trees is found scattered throughout the tropical and subtropical regions. It has gained tremendous importance and recognition in recent past not only because of its hardy nature but also for its incomparable medicinal and nutritional properties. Jamun has been attributed in the Indian folklore medicine system to possess several medicinal properties (Inamdar, 2000).

The fruits are good source of iron, minerals, sugars and proteins. Besides its use as dessert fruit, jamun is used for preparation of delicious beverages, jellies, jam, squash, wine, vinegar etc. Jamun is highly cross pollinated crop; hence wide variability is common in the species. Relatively long pre-bearing period and lack of standard varieties are the main hurdles in the area expansion programme. Looking at the importance of the fruits and high price value, the demand for its planting material is also increasing. However, except one or two, no specific recommended variety is available, although a wide variability exists in India. Due to lack of any suitable or recommended variety, the farmers have been planting trees of either seedling origin or grafted plants of unknown yield potential and fruit quality. In nature, lot of variation with respect to fruit shape and size, TSS, acidity and earliness in bearing of this crop is evident. Advantages of these variations can be taken to evolve selections of superior quality. Survey and selection are the best procedures to evolve suitable genotypes for a particular area of its natural existence. Hence, the present study aimed to characterize the elite jamun genotypes to know the variability existing among them.

## MATERIALS AND METHODS

The investigation on morphological and physico-chemical characters of 15 elite jamun genotypes was undertaken at KRC College of Horticulture, UHS, Bagalkot. The 15 jamun genotypes used in the study were sampled from Gokak taluk (Arabhavi, Dhupdhal, Kaitnal etc.) of Belgaum district, Karnataka. The genotypes were characterized for their tree morphological characters like age, shape of the canopy, tree height, canopy spread and yield. The fruits from these trees were collected in the first fortnight of June (all fruits were harvested). Further, these fruits (10 fruits were used for analysis) were analysed for physical parameters like fruit weight, fruit length, fruit breadth, fruit volume, seed weight, pulp weight, pulp per cent, seed per cent and pulp to seed ratio. Chemical parameters like total soluble solids, titrable acidity (as prescribed by Anon., 1976) and TSS: Acid ratios were estimated. Total sugars, reducing sugars and non reducing sugar contents were analysed by the Dinitro salicylic acid method (Sadasivam and Manickam, 2005). The total phenol contents were estimated by catechol method (Sadasivam and Manickam, 2005). Organoleptic evaluation of fruits was done by 10 semi trained judges(Staff members) based on colour, taste and appearance on a five point hedonic scale score card as following; Extremely good: 4.1-5.0,Very good: 3.1-4.0, Good: 2.1-3.0, Bad: 1.1-2.0 and Very bad: 0.0-1. The data on various characters were subjected to Fisher's method of analysis of variance and the interpretation of data as given by Panse and Sukhatme (1967). The level of significance used for 'F' and 't' tests was p= 0.05. Critical difference (CD) values were calculated whenever the 'F' test was significant.

## RESULTS AND DISCUSSION

The morphological characteristics of trees are one of the important aspects for a fruit breeder. The variability in tree height, canopy shape, age, canopy spread and yield depict the enormity of variation present in the collection under study (Table 1). Among 15 genotypes observed, five were found to be old age of more than 40 years, one genotype of medium age (20-40 years) and nine genotypes of young age having less than 20 years. Among 15 genotypes, three genotypes were found to have oval canopy while twelve were found to have round canopy. The spread of the trees varied with genotype and age. The highest spread of 9.50 m was recorded in KJS-45 and KJS-48, which were old trees and lower height was recorded in KJS-45a, KJS-45b and KJS-20 (2.00-2.65 m) which were young trees. Out of the 15 genotypes studied,

**Table 1. Tree morphological characters of different jamun genotypes**

| Genotype | Age | Shape of canopy | Spread (m) | Height | Fruit yield (kg/tree) |
|---|---|---|---|---|---|
| KJS-30 | Old | Oval | 8.60 | Large | 100 |
| KJS-44 | Old | Round | 7.50 | Large | 100 |
| KJS-45 | Old | Round | 9.50 | Large | 200 |
| KJS-48 | Old | Round | 9.50 | Large | 200 |
| KJS-89 | Old | Round | 8.00 | Large | 200 |
| KJS-20 | Medium | Round | 7.50 | Small | 100 |
| KJS-5 | Young | Oval | 5.60 | Small | 50 |
| KJS-20a | Young | Round | 2.65 | Small | 20 |
| KJS-45a | Young | Round | 2.00 | Small | 1.0 |
| KJS-45b | Young | Round | 2.50 | Small | 1.5 |
| KJS-58 | Young | Oval | 3.50 | Small | 1.0 |
| KJS-65 | Young | Round | 5.00 | Small | 1.5 |
| KJS-84 | Young | Round | 4.00 | Small | 1.5 |
| KJS-89a | Young | Round | 4.50 | Small | 2.5 |
| KJS-95 | Young | Round | 4.50 | Small | 1.0 |

i)Approximate age: (a) Old(>40years) (b) Medium (20-40years) (c) Young (<20 years)
ii) Tree height:(a) Large (>15 m) (b) Medium (10-15 m) (c) Small (<10 m)

five were of large size and 10 were of small stature. Among the old trees, KJS-45, KJS-48 and KJS-89 recorded higher yield of 200 kg per tree and KJS-30 and KJS-44 recorded yield of 100 kg. Among the young trees, KJS-5 recorded higher yield (50kg) while other genotypes which started bearing in this year recorded yield varying from one to twenty kg per tree (Table 1). The variation between the genotypes for different morphological characters may be attributed to the differences in the genetic makeup of these genotypes. The existence of variation in morphological characters has been reported by many workers in jamun (Inamdar *et al.*, 2002, Prabhuraj, 2002a, Laxmikanth, 2004 and Patil *et al.*, 2009).

Apart from estimating yield of a tree, weight of a fruit is considered to be an important factor in judging its compactness, maturity, juice content and levels of chemical constituents. In the present investigation, significantly maximum fruit weight was recorded in the genotype KJS-95 (12.00 g) which was on par with KJS-45 (10.76 g) and KJS-20a (10.61g). Significantly minimum fruit weight of 3.60 g was recorded in the genotype KJS-89a (Table 2). This variation in fruit weight indicates better chances for selection on this character. Significantly maximum fruit length was recorded in the genotype KJS-48 (3.48 cm) which was on par with KJS-65 (3.42 cm), KJS-95 (3.37 cm), KJS-20a (3.34 cm) and KJS-45a (3.20 cm). Significantly minimum fruit length was recorded in the genotype KJS-89a (2.30 cm). Significantly maximum fruit breadth was recorded in the genotype KJS-65 (2.32 cm) which was on par with KJS-30 (2.27 cm), KJS-45 (2.27 cm) and KJS-48 (2.25 cm). Significantly minimum fruit breadth was recorded in the genotype KJS-89a (1.46 cm). Significantly maximum fruit volume was recorded in the genotype KJS-65 (12.97 ml) which was on par with KJS-48 (11.03 ml). Significantly minimum fruit volume was recorded in the genotype KJS-89a(3.66 ml).The results showed significant differences among the genotypes. Significantly maximum pulp weight was recorded in the genotype KJS-65 (9.80 g) which was on par with KJS-48 (9.02 g) and KJS-95 (8.90 g). Significantly minimum pulp weight was recorded in the genotype KJS-89a (2.60 g). There was no significant differences among the genotypes for pulp per cent. Higher pulp content was recorded in the genotypes KJS-48 (83.50%), KJS-5 (82.76%) and KJS-20 (82.73%). Higher seed content was recorded in the genotypes KJS-58 (31.917%) and lower seed weight in the genotype KJS-45 (16.50%). Significant pulp to seed ratio difference among genotype was also obtained (Table 2). Experimental evidence provides proof to the fact that the seedless Jamun fruits tend to be less sweet than the seeded fruits. Hence, Jamun seeds can be used for many purposes i.e. medicinal, nutritional and food by products etc. (Shahnawas and Sheikh, 2011).

Taste is a complex character which is contributed by TSS, acidity, TSS: acid ratio and other biochemical constituents. Total soluble solids are measure of the amount of material dissolved in water. This material can include carbonate, bicarbonate, chloride, sulfate, phosphate, nitrate, calcium, magnesium, sodium, organic ions, and other ions. Significantly high TSS was recorded in the genotype KJS-45 (16.95 °Brix) and low TSS of 9.66 °Brix in the genotype KJS-89a. In the present study, total sugar, reducing and non reducing sugar content recorded significant differences among the 15 genotypes. This may be due to the variability in the genetic makeup of the genotypes (Shahnawas and Sheikh, 2011). Highest total sugar and reducing sugar was recorded in the genotype KJS-48. This may be due to its high TSS content and genetic makeup of the genotype. The highest non reducing sugar content of 10.14 per cent was recorded in the genotype KJS-95 (Table 3). Shahnawas and Sheikh (2011) reported that fresh extract of Jamun fruit is highly acidic and may be responsible for astringency in taste. Noomrio and Dahot (1996) authenticated the same view point on acidity of Jamun fruit. Acidity recorded significant differences among the 15 genotypes. Significantly higher acidity was recorded in the genotype KJS-65 (1.03%) and minimum in the genotype KJS-20-D (0.51%). There was significant difference among the genotypes for TSS: acid ratio also. The other researchers reported that the pH value and acidity of jamun fruit pulp is higher than other fruits like *Carisacarindas* (Hasnain and Ali, 1990). They further reported that lower pH (high acidity) of

**Table 2. Physical characters of jamun genotypes**

| Genotype | Fruit weight (g) | Fruit length (cm) | Fruit breadth (cm) | Fruit volume (ml) | Seed weight (g) | Pulp weight (g) | Pulp per cent (%) | Seed per cent (%) | Pulp to seed ratio |
|---|---|---|---|---|---|---|---|---|---|
| KJS-5 | 8.73 | 2.86 | 1.88 | 8.72 | 1.82 | 6.91 | 79.10 | 18.47 | 3.79 |
| KJS-20a | 10.61 | 3.34 | 2.09 | 10.10 | 2.55 | 8 | 75.30 | 24.70 | 3.06 |
| KJS-20 | 7.75 | 3.06 | 1.93 | 7.35 | 1.33 | 6.41 | 82.73 | 25.20 | 4.80 |
| KJS-30 | 8.13 | 2.92 | 2.27 | 7.85 | 1.62 | 6.50 | 79.90 | 16.50 | 3.97 |
| KJS-44 | 7.30 | 3.02 | 1.85 | 7.03 | 1.56 | 5.72 | 78.09 | 24.40 | 3.56 |
| KJS-45 | 9.95 | 3.30 | 2.27 | 10.13 | 1.81 | 8.15 | 81.53 | 22.87 | 4.49 |
| KJS-45a | 7.86 | 3.10 | 1.80 | 7.53 | 2.10 | 5.60 | 72.46 | 31.92 | 2.64 |
| KJS-45b | 7.33 | 3.20 | 1.75 | 6.77 | 2.10 | 5.30 | 72.31 | 28.43 | 2.69 |
| KJS-48 | 10.76 | 3.48 | 2.25 | 11.03 | 1.75 | 9.02 | 83.50 | 17.23 | 5.12 |
| KJS-58 | 7.24 | 2.96 | 1.86 | 6.77 | 2.19 | 5.03 | 68.08 | 27.69 | 2.33 |
| KJS-65 | 9.20 | 3.42 | 2.32 | 12.97 | 3.36 | 9.80 | 74.80 | 20.10 | 2.96 |
| KJS-84 | 9.33 | 3.07 | 1.92 | 7.99 | 2.29 | 7.18 | 77.13 | 21.91 | 3.41 |
| KJS-89 | 8.63 | 2.98 | 1.93 | 8.47 | 2.11 | 6.54 | 75.60 | 17.27 | 3.10 |
| KJS-89a | 3.60 | 2.30 | 1.46 | 3.66 | 1.00 | 2.60 | 71.56 | 20.90 | 3.46 |
| KJS-95 | 12.00 | 3.37 | 2.06 | 10.14 | 1.84 | 8.90 | 82.76 | 27.54 | 4.84 |
| S.Em ± | 0.57 | 0.11 | 0.11 | 0.68 | 0.13 | 0.53 | 3.49 | 3.49 | 0.45 |
| CD at 5% | 1.63 | 0.32 | 0.32 | 1.96 | 0.38 | 1.55 | NS | NS | 1.29 |

**Table 3. Chemical parameters of jamun genotypes**

| Genotype | TSS (° Brix) | Total sugars (%) | Reducing sugars (%) | Non reducing sugar (%) | Titrable acidity (%) | TSS: Acid ratio | Total phenols (mg/g) |
|---|---|---|---|---|---|---|---|
| KJS-5 | 14.36 | 12.85 | 4.06 | 8.79 | 0.69 | 20.65 | 0.51 |
| KJS-20a | 12.00 | 10.47 | 5.21 | 5.25 | 0.59 | 20.12 | 0.91 |
| KJS-20 | 12.83 | 11.59 | 5.92 | 5.66 | 0.51 | 25.14 | 0.82 |
| KJS-30 | 16.40 | 12.56 | 3.73 | 8.83 | 0.88 | 18.69 | 0.92 |
| KJS-44 | 16.43 | 12.56 | 3.66 | 8.90 | 0.67 | 24.85 | 1.65 |
| KJS-45b | 10.76 | 10.18 | 2.62 | 7.56 | 0.92 | 13.37 | 0.74 |
| KJS-45a | 12.33 | 10.32 | 2.71 | 7.61 | 0.90 | 11.92 | 0.71 |
| KJS-45 | 16.93 | 13.47 | 6.55 | 6.93 | 0.85 | 19.90 | 0.73 |
| KJS-48 | 16.95 | 13.87 | 6.70 | 7.17 | 0.74 | 22.85 | 0.65 |
| KJS-58 | 10.53 | 10.80 | 5.27 | 5.54 | 0.97 | 10.85 | 0.86 |
| KJS-65 | 11.50 | 11.52 | 5.09 | 6.43 | 1.03 | 11.21 | 0.28 |
| KJS-84 | 11.40 | 10.67 | 5.10 | 5.56 | 0.65 | 17.67 | 0.78 |
| KJS-89a | 9.66 | 9.67 | 2.49 | 7.18 | 0.61 | 15.76 | 0.31 |
| KJS-89 | 16.86 | 13.07 | 4.06 | 9.01 | 0.64 | 26.39 | 0.85 |
| KJS-95 | 12.63 | 13.11 | 2.98 | 10.14 | 0.64 | 19.79 | 0.85 |
| S.Em± | 0.54 | 0.13 | 0.12 | 0.10 | 0.02 | 1.24 | 0.01 |
| CD AT 5% | 1.56 | 0.39 | 0.34 | 0.29 | 0.07 | 3.59 | 0.03 |

**Table 4. Organoleptic evaluation of jamun genotypes**

| Genotype | Colour | Taste | Overall acceptability |
|---|---|---|---|
| KJS-5 | 4.07 | 3.50 | 3.42 |
| KJS-20a | 3.80 | 3.00 | 2.97 |
| KJS-20 | 4.10 | 3.62 | 3.60 |
| KJS-30 | 4.20 | 3.95 | 3.70 |
| KJS-44 | 4.03 | 3.87 | 3.70 |
| KJS-45 | 4.03 | 4.05 | 3.78 |
| KJS-45a | 3.47 | 3.40 | 3.17 |
| KJS-45b | 3.50 | 3.40 | 3.25 |
| KJS-48 | 4.07 | 4.25 | 4.17 |
| KJS-58 | 3.60 | 3.33 | 3.17 |
| KJS-65 | 4.07 | 4.10 | 3.85 |
| KJS-84 | 3.60 | 3.00 | 2.90 |
| KJS-89 | 4.00 | 3.83 | 3.92 |
| KJS-89a | 3.32 | 3.42 | 3.65 |
| KJS-95 | 4.00 | 3.43 | 3.42 |
| S.Em± | - | - | 0.24 |
| CD at 5% | NS | NS | 0.71 |

sample is favorable for higher shelf life. Significant differences were observed for total phenol content among the studied genotypes (Table 3). Significantly highest phenol content was recorded in the genotype KJS-44 (1.65 mg per gram) and lowest in the genotype KJS-65 (0.281 mg per gram).

Results on organoleptic evaluation showed no significant differences among the genotypes studied with respect to colour and taste. The overall acceptance showed significant difference among the genotypes. Significantly high score for overall acceptability was recorded in the genotype KJS-45 (4.17) and lowest score of 2.90 was recorded in KJS-84 and KJS-20a (Table 4). This may be due to comparatively bigger size of the fruit with higher pulp content, higher TSS and moderate acidity in the genotype KJS-45 when compared to other genotypes. Similarly many workers have stressed the importance of physico-chemical characters in different fruit crops like jamun (Patel *et al.*, 2005, Singh *et al.*, 2007, Prakash *et al.*, 2010, Vartika *et al.*, 2010, Ghojage *et al.*, 2011a and Shahnawaz and Sheikh, 2011), ber (Meena *et al.*, 2009) and aonla (Rao and Subramanym, 2009 and Patel *et al.*, 2010).

Significant variability was observed among the genotypes with respect to tree characters and physico-chemical properties of the fruits. Many of the genotypes were found promising with respect to fruit characters which can be used in the selection and crop improvement programmes.

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