



## Evaluation of Jamun Selections for Growth, Yield and Quality Parameters in Venkatagiri, Nellore District.

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### ABSTRACT

*Jamun* has higher nutraceutical properties and has been proved as a upcoming fruit crop in the country. To harness the genetic variability in the existing seedling population being a cross pollinated fruit crop, 29 clones of Petlur Jamun Selections were evaluated for various physico-chemicals attributes. Significant variation was observed in the tree characters *i.e.*, trunk girth, tree height, canopy volume in different genotypes. The highest tree height was measured in PJS-16 and minimum in PJS-5. Maximum fruit weight (11.0 g) was registered in PJS-11 and minimum in PJS14. Wide variability for fruit length (2.6 to 3.5 cm), fruit breadth (2.16 to 2.53 cm), pulp stone ratio(2.75- 3.18) in PJS-1 were observed. Maximum TSS/acid ratio (50.8), total sugar (17.3) and reducing sugars (14.2) was recorded in PJS-11 and minimum in PJS 16 recording 26.1, 11.0 & 7.6 respectively. PJS-11 had good eating quality because of high TSS content. Titratable acidity was found to be at the highest level of 0.60% in PJS-16 ,while it was found lowest (0.32 per cent) in PJS-11.

**Keywords :** *Jamun, nutraceutical, seedlings, underutilized, variability, windbreak.*

A large number of unexploited fruits which are still neglected or exploited to their full potential can prove a boon for the people of this country and also for enriching the germplasm collection and improvement of varieties. The soil and climate of Andhra Pradesh is much suitable for cultivation of a wide range of horticultural crops. The rich soil of the state with plenty of underground water favours the commercial production of a large variety of horticultural crops (Mehrotra *et al.*, 1996). The area and production of fruits has increased ten fold in India and Andhra Pradesh, in the recent past but the per capita consumption of fruits in our country is quite unsatisfactory, particularly in the weaker section of society. Jamun (*Syzygium cuminii*) is one of the underutilized/unexploited horticultural crop. It is liked both by poor and rich but much liked by those who cannot afford to buy costly fruits. Besides being cheap, this fruit is quite nutritive as it is rich in carbohydrates, proteins, vitamins and minerals. Jamun is indigenous to India and is favorite fruit of the common man. Apart from consumption of its fruit pulp, its seed are used in ayurvedic medicine against diabetes, heart and liver trouble. Jamun attain maturity during the month of June-July.

*Syzygium cuminii* (wild jamun) has a very long history of use for various medicinal purposes and currently has a large market for the treatment of diabetes, chronic diarrhea and other enteric disorders, including its use as an antimicrobial. *Syzygium* is a genus of flowering plants that belongs to the family, Myrtaceae. The genus comprises about 1100 species and has a native range that extends from Africa and Madagascar through southern Asia east through the Pacific. Its highest levels of diversity occur from Malaysia to north eastern Australia, where many species are very poorly known and many more have not been described taxonomically. Jambolam fruit can be eaten raw and can be made into tarts, sauces, and jams. Good quality jambolam juice is excellent for sherbet, syrup, and the Indian drink squash. The juice of the ripe fruit, a decoction of the fruit, or jambolam vinegar, may be administered in India in cases of enlargement of the spleen, chronic diarrhea, and urine retention (Joshi *et al.*, 1993). The leaves have served as fodder for livestock and as food for tassar silkworms in India. Medicinally, the fruit is described as astringent, stomachic, carminative, anti scorbutic, and diuretic. The present studies were

therefore undertaken for evaluating the variability of the jamun in the orchard so as to conserve the elite ones for multiplication and crop improvement.

### MATERIAL AND METHODS

Totally 29 clones of Petlur Jamun Selections viz. PJS-1 – PJS-29 were included in this study. The experiment was conducted at the Citrus Research Station, Petlur, Venkatagiri, Nellore district during 2011-2013. The plants are planted during the year 2001-02 planted at 6 x 6 mt spacing in the farm. The soil is red loamy type and the temperatures are very hot which reaches up to 47 degrees during summer months and dry weather persists for almost nine months in a year. Totally 29 clones were taken up, three plants in each clone were planted and-maintained. The irrigation is carried out through drip with 16 mm lateral pipes.

Statistical analysis was performed using excel data analysis tool pack annova two factor without replication. The evaluation of jamun germplasm for tree and fruit quality characters were carried out. The fruits from the identified germplasm of jamun were harvested at maturity. Tree characters were measured with usual method. Thereafter the fruit samples were analysed for physico-chemical evaluations.

#### Physical characteristics

Tree height of different Jamun varieties were measured with the help of calibrated bamboo stick and expressed in meters, whereas tree spread and trunk girth were measured with the help of measuring tape. To get a mean canopy diameter two observations, on each of east west and north south sides of selected tree was recorded. The trunk girth was recorded at a height of 15 cm above the graft union on each selected tree. The weight of fruit sample of different Jamun varieties under testing was taken with the help of simple pan balance. Ten fruits of jamun were randomly taken as sample from each tree. Average fruit weight was calculated in grams/fruit. Fruit size and length and breadth were recorded with the help of Vernier Caliper and their average was calculated in cms. The colour of fruit was assessed on the basis of Royal Colour Chart. These observations were taken at the optimum maturity of the fruit. Pulp weight was calculated by subtracting the peel and stone weight from total weight of fruit. Pulp content was expressed in percentage. To calculate the Pulp/Stone Ratio, the stone weight was subtracted from

the total weight of fruit and the value obtained was divided by stone weight.

### Chemical Characteristics

#### Total Soluble Solids and Acidity

The content of total soluble solids was determined with the help of digital refractometer and the values were corrected at 20°C with the temperature correction chart and expressed as per cent. The total titrable acidity was determined by titrating a known volume of finely blended juice with 0.1 N NaOH solution using phenolphthalein as an indicator. The end point was marked by appearance of pink color which persisted for few seconds. The results were expressed as per cent titrable acidity.

$$\% \text{ Acidity} = \frac{0.067 \times 0.1 \text{N NaOH used (ml)}}{\text{Juice taken (ml)}}$$

TSS/Acidity ratio was calculated by dividing the value of TSS with that of corresponding titrable acidity.

#### Sugars

Ten gram fruit pulp was taken in 100 ml beaker and volume made with distilled water. One gram of lead acetate was added for precipitating the extraneous matter. The solution was allowed to stand for half an hour. Then Potassium oxalate (1g) was added to remove excess of lead. The filtered solution called as aliquot was ready for estimation of reducing and total sugars.

#### Reducing sugars

5ml each of Fehling solution (A and B) was taken in a flask. The above prepared aliquot was taken in burette and four drops of methylene blue indicator were added. Then it was titrated against Fehling solution (A and B) mixed over a hot plate. The blue color of the solution started changing to red. The titration was continued till the end point was noted as appearance of permanent brick red color. The volume of aliquot used was noted as 'A'.

$$\text{Reducing Sugars \%} = \frac{\text{titrate value against Fehling Stock Solution}}{\text{weight of sample sol.used}} \times 100$$

$$= 0.05 \times \frac{100}{10 \times A} \times 100$$

### Total sugars

25 ml of above aliquot was taken in to 100 ml measuring flasks and to this 25 ml distilled water was added and there after 5 ml of HCl (60% by Vol.) was added. The solution was left over night at room temperature for acid hydrolysis. The centigrade thermometer was placed in the flask and it was heated on water bath in such a way that the temperature rose to 68°C in 10 minutes. The flask was remain kept at 68°C for another 5 minutes. Then a piece of litmus paper was put into the flask and neutralized the inverted sugars with 10% NaOH in the initial stage and with 0.1 NaOH near the neutralization point. The volume was made 100 ml by adding distilled water and titrated this against boiling Fehling solution in case of reducing sugars.

$$\text{Total Sugars (\%)} = \frac{0.05 \times \text{Stock Sol.}}{\text{Wt. of sample}} \times \frac{\text{Second stock sol.}}{\text{Sol. of Aliquot used}} \times 100 \times \text{Vol. of sol. used}$$

### Yield per tree

The yield of jamun varies with the variety, periodicity of flowering, growing conditions, influencing the size of plants and productivity varies also with locality. The yield/tree was recorded at optimum maturity in kg.

### Time of optimum maturity

The time of maturity was dependent upon various external characters like appearance of waxy coating dots on the fruits and relative size of the fruit. Some ripened fruits when start dropping, it is said that maturity of the particular variety is reached. The fruit samples for physico-chemical analysis were taken at optimum maturity and maturity period was recorded. The data recorded for various parameters were subjected to statistical analysis was performed using excel data analysis tool pack annova two factor without replication.

## RESULTS AND DISCUSSION

### Physical Characteristics

Significant variation was observed in the tree character of all genotypes of Petlur Jamun Selections PJS-1 to PJS-29 *viz.*, plant height, plant spread and trunk girth. The highest plant height was measured in PJS-16 ( 7.10) minimum tree height (2.03 m) was recorded in PJS-5. In respect of tree spread and trunk girth, the PJS -13 recorded the maximum canopy area (8.93 NS and 8.40 EW). The lowest canopy area was registered in PJS -22 (3.0 NS and 3.23 EW). In case of trunk girth PJS-

14 registered the maximum trunk girth ( 115.67, 103) closely followed by PJS-3 (104, 100 )and the lowest was recorded in PJS-5 (49.33). The present findings are support of Singh *et al.*(1963).

Significant variation was observed in the fruit weight (Table 3) of all genotypes of Petlur Jamun Selections PJS-1 to PJS-29 The fruits of PJS -11 registered the maximum fruit weight (11g) while fruits of PJS-14 recorded the minimum average fruit weight *i.e.*, (5.73 g). Fruit length also showed significant variation in different genotypes evaluated. The range of variability with regards to the fruit length was found to be (2.6-3.5 cm). Fruits breadth also showed a similar trend in which the range of variability was found to be (2.16-2.53 cm). Kumar *et al.* (1993) had also assessed variability range in fruit length from 1.1-3.5 cm in different jamun genotypes.

A very small variation in fruit colour (Table 2) was recorded in different Petlur Jamun Selections. The colour of mature fruit varied from dark purple to nearly black in different genotypes identified Daware *et al.*, (1985). The fruit colour in PJS-11 (203 B) and PJS-14 (203A) was dark purple to nearly black while it was recorded nearly black in PJS-16 (203D).

Pulp content of different jamun genotypes evaluated also showed significant variation. It ranged from 69.50-75.20 per cent in different identified types of jamun. The present study is quite nearer to the earlier findings of Keskar *et al.* (1989) who had assessed the range of variability in pulp content from 54.29 to 85.71 per cent in different jamun genotypes. The fruits of different jamun genotypes evaluated also showed significant variation in pulp/seed ratio. A high pulp/seed ratio (3.18) was recorded in PJS-14 while a low pulp/stone ratio (2.75) was found in PJS-11. Variation was also observed in organoleptic rating for different selection of jamun. PJS-16 having maximum organoleptic rating of (6.6) followed by PJS-14, PJS-11 having rating 6.6 and 6.4, respectively.

### Chemical characteristics

The TSS content in different evaluated types also varied significantly. The range of variability in the TSS content was found to be 1.725 – 20.88 per cent. The present study is in line with the earlier findings of Bal (2006) who have assessed a wide range of variability in TSS content in the different genotypes of jamun. The finding of

**Table 1 : Data on the growth and yield parameters in Jamun clonal selection**

Accessions	Plant Height mt	Girth		Spread		Yield Kg/tree
		scion	root stock	E - W mt	N - S mt	
PJS-1	5.83	102.00	103.00	7.53	7.77	0
PJS 2	4.63	68.67	78.00	5.73	4.97	0
PJS 3	6.77	100.00	104.00	5.97	6.37	0
PJS 4	4.78	75.67	72.67	5.73	5.90	0
PJS 5	2.03	49.33	62.00	3.70	3.37	0
PJS 6	5.43	77.33	83.67	6.70	7.43	0
PJS 7	5.00	78.67	82.00	6.93	7.43	0
PJS 8	4.63	60.33	58.67	4.90	4.87	0
PJS 9	5.00	78.33	72.67	6.97	6.73	0
PJS 10	5.40	75.67	80.67	8.07	7.30	0
PJS 11	5.40	86.67	83.67	7.47	8.13	2.73
PJS 12	5.50	86.00	84.67	7.20	7.40	0
PJS 13	6.03	82.33	90.33	8.40	8.93	0
PJS 14	6.50	103.00	115.67	8.37	8.43	3.9
PJS 15	6.43	85.00	90.00	8.47	8.40	0
PJS 16	7.10	66.67	75.33	5.47	5.37	0
PJS-17	5.40	77.67	78.33	5.93	6.37	3.83
PJS-18	5.27	69.00	72.00	7.10	7.40	0
PJS-19	4.07	60.33	64.67	5.00	5.43	0
PJS-20	3.07	56.00	50.67	3.07	2.97	0
PJS-21	4.03	82.00	83.00	4.77	5.03	0
PJS-22	3.07	56.00	37.00	3.23	3.00	0
PJS-23	3.40	62.00	66.33	4.00	3.27	0
PJS-24	4.40	76.33	79.67	7.07	7.43	0
PJS 25	4.43	58.67	60.33	5.23	5.40	0
PJS-26	5.23	82.33	85.67	7.93	7.70	0
PJS 27	5.77	78.33	86.00	8.40	8.50	0
PJS-28	6.77	96.00	93.33	8.50	7.77	0
PJS-29	5.67	73.67	82.33	6.33	6.90	0
<b>SE(m)</b>	<b>0.054</b>	<b>0.288</b>	<b>2.546</b>	<b>0.052</b>	<b>0.065</b>	<b>0</b>
<b>CD</b>	<b>0.154</b>	<b>0.818</b>	<b>7.233</b>	<b>0.148</b>	<b>0.184</b>	<b>0</b>
<b>Range</b>	<b>3.07- 7.10</b>	<b>56 -103</b>	<b>50 - 115</b>	<b>3.0 - 8.4</b>	<b>2.9-8.9</b>	<b>2.7 – 3.9</b>

**Table 2 : Fruit color, yield and organoleptic rating of different genetic resources of jamun.**

Clones	Fruit color	Yield (Low)	Maturity period	Organoleptic rating 10 point scale
PJS 11	Black Group 203 B	2.73	End of June	6.4
PJS 14	Black Group 203 A	3.9	I week of July	6.5
PJS 16	Black Group 203 D	3.83	Mid July	6.6

**Table 3: Physico-chemical characteristics of different genetic resources of jamun**

Clones	Fruit wt	Fruit length (cm)	Fruit breadth (cm)	Pulp/ content	Pulp/stone ratio	TSS	Acidity	TSS/ acid ratio	Reducing sugars	Total sugars
PJS 11	11.0	3.4	2.16	69.5	2.75	17.21	0.32	50.8	14.2	17.3
PJS 14	5.73	2.6	2.46	75.2	3.18	20.88	0.44	44.9	8.4	16.6
PJS 16	7.00	3.5	2.53	72.0	2.84	15.72	0.60	26.1	7.6	11.0
<b>CD</b>	<b>2.81</b>	<b>0.54</b>	<b>0.5</b>	<b>1.40</b>	<b>NS</b>	<b>0.4</b>	<b>0.32</b>	<b>0.27</b>	<b>0.5</b>	<b>0.31</b>
<b>CV</b>	<b>23.4</b>	<b>10.2</b>	<b>11.9</b>	<b>1.04</b>	<b>11</b>	<b>1.14</b>	<b>3.11</b>	<b>0.38</b>	<b>2.2</b>	<b>1.05</b>
<b>Range</b>	<b>5-11</b>	<b>2.6 -3.5</b>	<b>2.1-2.5</b>	<b>69-75</b>	<b>2.7-3.1</b>	<b>15-20</b>	<b>0.3-0.6</b>	<b>26-50</b>	<b>7.6-14</b>	<b>11-17</b>



Keskar *et al.* (1989) also support the present study who has assessed the range of variability in TSS content from 4.5 to 17.0 per cent in different evaluated types of jamun. The acidity level in different clones of jamun evaluated also showed significant variation. Titratable acidity was found to be at the highest level (0.60% percent) in PJS-16, while it was found lowest (0.32 per cent) in PJS-11. The present study also confirms the evidence provided by Bal (2006) who revealed that these are not standard varieties of jamun but common type grown in India in *Ra-jamun* which produces superior fruits. PJS-11 registered the highest TSS/acid ratio (50.8) followed by PJS-14 having TSS/acid ratio of 44.9. The TSS/acid ratio was lowest in PJS-16 which recorded 26.1.

The fruits of PJS-11 selection registered significantly highest total sugar content (17.3%) followed by PJS-14 having total sugar content of 16.6%. The lowest total sugar content was found in PJS-16 (11.0%). A significant variation was recorded in the reducing sugar content of the different genotypes identified wherein PJS-11 recorded the highest reducing sugars content of 14.2 per cent while PJS-16 recorded the lowest reducing sugar content (7.6 per cent). The time of maturity also varied in different selection evaluated. Fruits of PJS-11 matured early in last week of June. The fruits of PJS-16 matured late July. The above studies are in line of Srivastava *et al.* (2012) who reported that Jamun fruits matured in first week of July. Majority of the clones did not bear fruit except three varieties i.e. PJS-11, PJS-14, PJS-16 in the very low range of 2.7-3.9 kg and the bearing genotypes also differed significantly.

### CONCLUSION

The present evaluation of genetic resources of jamun in Citrus Research Station, Petlur, generated basic information regarding the potential of growing Jamun under prevailing conditions of Venkatagiri, Nellore dist.. On the basis of present findings the different genotypes having some useful traits have potential for their utilization in jamun improvement. The present studies are quite useful

for future conservation and planned plantation of jamun in waste lands, common lands of villages, rural schools, road sides etc. but as commercial crop this is not ideal for this region.

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