Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(2): 617-620
Received: 26-01-2020
Accepted: 28-02-2020

Saurabh Singh
Research scholar, Department of Horticulture, Institute of Agriculture Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

SP Singh
Professor, Department of Horticulture, Institute of Agriculture Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Vaibhav Singh
Research scholar, Department of Horticulture, Institute of Agriculture Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Kumari Shikha
Research scholar, Department of Genetics and Plant Breeding, Institute of Agriculture Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Corresponding Author:
Saurabh Singh
Research scholar, Department of Horticulture, Institute of Agriculture Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Assessment of variability for fruit quality attributes and physico-chemical characters of different genotypes of Jamun (*Syzygium cumini* Skeels)

Saurabh Singh, SP Singh, Vaibhav Singh and Kumari Shikha

Abstract
The present study provides an assessment of genetic variability in 9 collections of jamun genotypes. The experiment was conducted at the Banaras Hindu University, Varanasi, (U.P.) during 2016 in a randomized block design with 3 replications. The mean value of fruit weight was ranged between 5.96 and 9.80 g, length from 3.91 to 4.67, breadth of fruit from 1.76 to 3.06 cm, seed weight from 0.78 to 1.93g, seed length from 1.46 to 2.39 cm, seed breadth from 0.97 to 1.41, pulp percentage from 74.27 to 93.48 and seed percentage from 7.85 to 19.67. The maximum (10.18) pulp: seed ratio was recorded in 'selection 8'. Also, there was existence of wide variability in chemical features. The TSS per cent of fruit varied from 10.22 to 18.45, moisture percentage 81.68 to 85.47 while acidity per cent was in the range of 2.04 to 2.49. These characters can be considered as component traits for its profound importance in selection of improved genotypes for further breeding programme. On the basis of overall fruit qualities and chemical properties selection 8 was promising among all the genotypes. Assessment of genetic variation in existing genotypes would be useful in maintaining their genetic diversity and preserving them from genetic erosion.

Keywords: Physico-chemical, jamun, growth, *Syzygium cumini*

Introduction

Jamun [*Syzygium cumini* Skeels syn. *Eugenia cumini* (L) Druce] (2n = 40) is a most important indigenous minor fruit of India which belongs to the family Myrtaceae. It is commonly known as jamun, black plum, Malabar plum, Indian black berry, Java plum and Portuguese plum in English (Sharma *et al*., 2012) [12]. It is thought to be a native to India or West Indies and is being cultivated for commercial purpose in many tropical and subtropical countries. In India, it is grown in Indo-Gangetic plains, lower ranges of Himalayas and Kumaon hills in North to Tamil Nadu in South. Chundawat (1990) [2] reported the presence of 400-500 species, of which few are only source of edible fruits.

It has gained tremendous importance and recognition in recent past years not only because of its hardy nature but also for its un-comparable medicinal and nutritional properties. Anonymous (1976) [1] reported that Jamun fruit is a rich source of glucose and fructose and its seed also found to be a rich source of protein, carbohydrates, vitamin C (40mg), folate, vitamin B, carotene, calcium, iron (1-2 mg/100g), phytochemical (purple pigment anthocyanin), magnesium, potassium and fibre. The seeds contain a type of glucose called jamboline, which checks the conversion of starch into sugar in cases of increased production of glucose that is responsible for high sugar levels in human body. It possess several medicinal properties (Warrier *et al*., 1996) [16] and found helpful in treating diabetes, pharyngitis, spleenopathy, urethrorrhea and ringworm infection.

Jamun is commonly propagated through seed. A wide range of variability recorded with regard to fruit morphology (such as fruit shape, size etc.), quality (pulp colour, TSS, acidity etc.), maturity period and productivity (Priya *et al*., 2002) [10]. Despite of presence of such variability, there is lack of availability of standard in *Syzyium cumini*. However, several farmers have utilized area-specific selection methods for ameliorating jamun yield and quality. These types of selections are generally made on the basis of visual phenotypic traits such as fruit size, shape, taste, fruiting period and maturity of fruits.

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.

Considering the importance of this crop, there is great need for improvement and to develop varieties suitable for cultivation under different agro-climatic areas. Survey and selection are the best procedures to evolve suitable genotypes for a particular area of its natural existence. Attempts were also made to collect locally available germplasm in Goa (Priya *et al*., 2002) [10], Karnataka and West Bengal (Kundu *et al*., 2001) [5].

As we know the success of any breeding programme depends mostly on the identification and selection of superior parents for hybridization. Therefore, the objective of this study was to assess genetic variability for fruit quality and physico-chemical traits of different genotypes of jamun. This study would help in improving jamun crop in order to encourage commercial orcharding in India.

Materials and Methods

Experimental material and location

The experiment material consisted of 9 jamun (*Syzygium cuminii* skeels) genotypes which was carried out in the campus of Banaras Hindu University, Varanasi during 2016 to identify elite types of germplasm among its population. The observations on the fruiting and fruit quality attributes and chemical analysis of fruits were recorded. The ripe fruits differing in shape, size and appearance of various genotypes of five fruits each were collected to study the variability in physico chemical attributes from each tree. Fruits at full maturity were harvested and physico chemical parameters *viz*, fruit weight (g), Length of fruit (cm), breadth of fruit (cm), seed weight (g), seed length (cm), seed breadth(cm), pulp (%), seed (%), pulp: seed ratio, fruit shape, fruit base, fruit apex, fruit colour, pulp colour and chemical properties *viz*, moisture (%), total soluble solid (%), acidity (%) content were assessed from randomly selected fruits from genotypes.

The weight of a selected fruits was determined with the help of a balance and mean weight per fruit was computed and expressed in gram (g). The size of fruit (length and breadth) was measured with the help of Vernier calliper by taking polar diameter and transfer diameter of fruits and expressed in centimetres. The weight of a selected twenty seeds was recorded with the help of a balance and mean weight per seed was computed and expressed in gram (g). The percent consumable part of the fruit *i.e.*, pulp was measured using the following formula:

$$\text{Pulp weight (g)} = \text{weight of fruit (g)} - \text{seed weight (g)}$$

Pulp (%) was computed on the basis of pulp percentage and seed percentage in fruits using formula:

$$\text{Pulp\%} = \frac{\text{weight of pulp (g)}}{\text{weight of fruit (g)}} \times 100$$

The percent non-edible part of the fruit i.e. seed was measured using the following formula:

$$\text{seed \%} = \frac{\text{weight of seed (g)}}{\text{weight of fruit (g)}} \times 100$$

Pulp seed ratio was computed using following formula:

$$\text{Pulp to seed ratio} = \frac{\text{Pulp weight (g)}}{\text{seed weight (g)}}$$

Fruit shape, fruit base, fruit apex, fruit colour and pulp colour were determined by visual scoring.

Moisture was estimated by drying fresh fruit sample of known weight in hot air oven to its constant weight at 65ºC.

$$\text{Moisture} = \frac{\text{Dry Weight}}{\text{Fresh Weight}} \times 100$$

Total soluble solids, in the juice of representative sample was recorded for each sample by using "Hand refractometer" of 0-32 per cent range. Acidity was assessed by mixing five mille litres aliquot with one to two drops of phenolphthalein and mixture was titrated against 0.1N, NaOH.

Data analysis

The data was analysed statistically as per method given by Panse and Sukhatme (1989) [7] and results were evaluated at 5 per cent level of significance. Critical difference (CD) was calculated by using following formula:

$$\text{C. D} = \frac{\sqrt{2\text{MSE}}}{\text{r}} \times \text{t value at the error degree of freedom at 5\% level of significance}$$

Results and Discussion

The data pertaining to physical and chemical characteristics of jamun fruits showed significant differences and high degree of variability among the studied selections (Table 1 and 2).

Table 1: Variability in fruit size, fruit weight, seed size, seed weight and physical composition of fruits in jamun genotypes - 2016

Name of Genotypes	Fruit Weight (g)	Length of Fruit (cm)	Breadth of Fruit (cm)	Seed Weight (g)	Seed Length (cm)	Seed Breadth (cm)	Pulp (%)	Seed (%)	Pulp: Seed Ratio
Selection1	8.63	4.67	2.32	1.77	1.46	1.01	82.94	17.50	4.90
Selection2	7.53	4.45	2.25	1.46	1.91	1.13	83.16	17.14	4.75
Selection3	8.56	4.55	2.27	1.55	1.75	1.21	80.74	18.28	4.12
Selection4	9.80	4.80	2.89	1.93	2.39	1.27	82.43	18.84	3.39
Selection5	8.59	4.32	3.06	1.76	2.18	1.41	80.60	19.60	4.23
Selection6	5.46	3.91	1.89	1.34	1.91	1.07	76.24	24.49	3.47
Selection7	5.96	4.62	1.76	1.39	2.35	1.33	74.27	24.80	2.99
Selection8	11.65	5.53	2.69	0.78	1.53	0.97	93.48	7.85	10.18
Selection9	7.77	4.34	2.35	1.42	1.68	1.63	80.47	19.67	4.08
Mean	8.21	4.53	2.38	1.48	1.90	1.22	81.59	18.62	4.74
CD (5%)	1.19	0.75	0.40	0.26	0.33	0.28	2.09	1.49	0.63

Table 2: Variability in morphological characters of fruit in jamun genotypes - 2016

Name of Genotypes	Fruit shape	Fruit base	Fruit Apex	Fruit Colour	Pulp Colour
Selection1	Oblong	Flat	Pointed	Deep purple	Purple pink
Selection2	Pyriform	Flat	Pointed	Deep purple	Purple
Selection3	Round	Necked	Flat	Deep purple	Purple
Selection4	Oblong	Necked	Flat	Bluish black	Purple pink
Selection5	Oblong	Flat	Flat	Deep purple	Purple
Selection6	Round	Flat	Pointed	Purple pink	Purple
Selection7	Oblong	Flat	Flat	Deep purple	Purple
Selection8	Oblong	Necked	Pointed	Purple pink	Pink
Selection9	Round	Flat	Flat	Black	White

Physical characters

The maximum fruit weight was recorded in the genotype selection 8 (11.65 g) while, the minimum fruit weight was recorded in the genotype selection 7 (5.96 g). Similar findings were observed by Priya *et al*. (2002) [10]. The maximum fruit length was recorded in the genotype selection 8 (5.53cm) and the minimum fruit length was recorded in the selection 5 (4.32 cm). Priya *et al*. (2002) [10]; Singh *et al.* (2007) [13]; Sharma *et al.* (2009) [11] and Ghojage *et al*. (2011) [3] also recorded the similar finding for fruit length. On the other hand, maximum fruit breadth was recorded in the genotype selection 5 (3.60 cm). However, minimum fruit breadth was recorded in the genotype selection 7 (1.76 cm). A similar observation was noticed by Vartika *et al.* (2010) [15]. A considerable variability was recorded in seed weight and seed size (length and breadth). The lowest seed weight was noted in selection 8 whereas, highest seed weight was recorded in selection 4 (1.93g) against the mean value of seed weight (1.48g) of nine genotypes. The minimum seed length was observed in selection 1 (1.46), whereas, maximum seed length was recorded in selection 7 against the mean value of seed length (1.90cm) of nine genotypes. The lowest seed breadth was remarked in selection 8 whereas, highest seed breadth was percieved in selection 7 against the mean value of seed breadth (1.22cm) of nine genotypes. These finding were also observed by Singh *et al.* (2007) [13]; Prakash *et al.* (2010) [9]; Inamdar *et al.* (2002) [4] for seed weight and seed size.

A wide range of variability was noticed among various genotypes for pulp%, seed% and pulp stone ratio. The maximum pulp% (93.48%) was observed in Selection 8 while, minimum value (74.27%) in selection 6. Although, average pulp% was 81.59%. The Selection 8 had minimum seed% (7.85) while maximum seed% was recorded in selection 7 against the mean value of 18.62%. The highest pulp: seed ratio (10.18) was computed in Selection 8. However, least pulp: seed ratio (2.99) was noticed in Selection 7 against the mean value of 4.74. This finding was in agreement with Priya *et al.* (2002) [10]; Sharma *et al.* (2009) [11] and Prakash *et al.* (2010) [9], Singh and Singh (2012) [14].

Fruit shape varies depending on genotype. Oblong fruit shape was recorded in Selection 1, selection 4, selection 5, selection 7 and selection 8 whereas, round shape fruit was recorded in selection 3, selection 6, and selection 9 while pyriform fruit was noticed in selection 2. The same result revealed by Sharma *et al.* (2009) [11]. Only two type of fruit base was observed among genotypes. Flat fruit base was found in selection 1, selection 2, selection 5, selection 6, selection 7 and selection 9. Necked fruit base was recorded in Selection 3, selection 4, selection 8. The genotypes selection 1, selection 2, selection 6 and selection 8 had pointed fruit apex while flat fruit apex was noticed in selection 3, selection 4, selection 5, selection 7 and selection 9. Visual observation showed that different genotypes exhibited different pulp colour (deep purple, bluish black, purple pink and black). Deep purple colour was recorded in 'selection 1, selection 2, selection 3, selection 5 and selection 7, whereas purple pink colour was noticed in selection 6 and selection 9. The bluish black and black colour of fruit was found in selection 4 and selection 9 respectively. These findings are in conformity with the results of Prakash *et al.* (2010) [9].

Chemical characters

There was non-significant variation among genotypes for moisture content. As pertaining to table: 3, the maximum moisture content was recorded in selection 7 while, minimum moisture content in selection 3. Similar results were also reported by Priya *et al*. (2002) [10] in jamun. The TSS content of different jamun genotypes was varied from 18.45 to 10.22. The maximum TSS value was perceived in selection 8 followed by selection 1. The minimum TSS content was recorded in selection 3 against the mean value 14.29. Similar observation was also reported by Priya *et al*. (2002) [10] in jamun. Acidity also varied among genotypes but non-significant variation was noticed. The acid content was varied from 2.49 to 2.04. The maximum acid content observed in selection 3 followed by selection 4. The minimum acid content was recorded in selection 8 (2.04) against the mean value 2.23. Similar observations was reported by Vartika *et al.* (2010) [15].

Table 3: Variability in moisture, total soluble solids (T.S.S) and acidity contents of fruits in jamun genotypes – 2016

Name of Genotypes	Moisture (%)	T.S.S (%)	Acidity (%)
Selection1	81.68	16.31	2.32
Selection2	81.23	12.67	2.23
Selection3	79.53	10.22	2.49
Selection4	81.63	11.42	2.47
Selection5	81.52	12.78	2.13
Selection6	83.42	15.33	2.10
Selection7	81.47	15.13	2.22
Selection8	85.47	18.45	2.04
Selection9	81.61	13.32	2.14
Mean	81.83	13.96	2.23
CD (5%)	1.46	1.07	0.28

Conclusion

From the physico-chemical evaluation of jamun fruits collected from different locations it is concluded that the genotypes exhibited tremendous variability for either one or more characteristics. The presence of variability opens scope for further breeding applications and selection. On the basis of the characters studied selection 8 was found to be superior among all the genotypes. The selected superior genotype based on physico-chemical characteristics of jamun can be utilized for commercial plantation in India.

References

1. Anonymous. The wealth of India, Raw material, CSIR, New Delhi. 1976; 10:207-216.
2. Chundawat BS. Arid fruit culture. Pub. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1990, 165-171.
3. Ghojage AH, Swamy GSK, Kanamadi VC, Jagdeesh RC, Kumar P, Patil CP *et al*. Studies on variability among best selected genotypes of Jamun *(Syzygium cumini* Skeels.). Acta Horticulturae. 2011; 890(2):255-260.
4. Inamdar S, Swamy GSK, Patil PB, Athani SI. Correlation and path analysis studies in jamun (*Syzygium cumini* Skeels) for fruit characters. Journal of Maharashtra Agricultural Universities. 2002; 27(2):212-213.
5. Kundu S, Ghosh DK, Maiti SC. Evaluation of some local types of jamun (*Syzygium cuminii* Skeels) of west Bengal. Environment and Ecology. 2001; 19(4):872-874.
6. Noomrio MH, Dahot MU. Nutritive value of Eugenia jambosa fruit. Medical Journal of Islamic Academy of Sciences. 1996; 9(1):9-12.
7. Panse, Sukhatme PV. Statistical methods for Agricultural workers. Indian council of Agricultural Research, New Delhi, 1989, 205-214.
8. Patel VB, Pandey SN, Singh SK, Das B. Variability in jamun (*Syzygium cuminii* Skeels) accessions from Uttar Pradesh and Jharkhand. Indian Journal of Horticulture. 2005; 62(3):244-247.
9. Prakash J, Maurya AN, Singh SP. Studies on variability in fruit characters of jamun. Indian Journal of Horticulture. 2010; 67(2):63-66.
10. Priya Devi S, Thangam M, Desai AR, Adsule PG. Studies on variability in physico-chemical characters of different jamun (*Syzygium cumini)* accessions from Goa. Indian Journal of Horticulture. 2002; 59(2):153-156.
11. Sharma M, Gehlot R, Singh R, Siddiqui S. Studies on physico-chemical composition fresh guava and jamun fruits. Haryana Journal of Horticultural Sciences. 2009; 38(2):68-69.
12. Sharma S, Mehta BK, Mehta D, Nagar H, Mishra A. A review on pharmacological activity of *Syzygium cumini* extracts using different solvent and their effective doses. International Research Journal of Pharmacology. 2012; 3(1):54-58.
13. Singh AK, Bajpai A, Singh A, Singh A, Reddy BMC. Evaluation of variability in jamun (*Syzygium cuminii* L.) using morphological and physico-chemical characterization. Indian Journal of Agricultural Science. 2007; 77(12):845-848.
14. Singh S, Singh AK. Studies on variability in jamun (*Syzygium cuminii* Skeels) from Gujarat. Asian Journal of Horticulture. 2012; **7**(1):186-189.
15. Vartika S, Rai PN, Prabhat K. Studies on variability in physico-chemical characters of different accessions of Jamun (*Syzygium cumini* Skeels). Pantnagar Journal of Research. 2010; 8(1):139-142.
16. Warrier PK, Nambiar VPK, Ramankutty C. Indian Medicinal Plants, Orient Longman Ltd. Hyderabad, India, 1996, 225-228.