RESEARCH ARTICLE

ASSESSING VARIABILITY IN MORPHOLOGICAL TRAITS OF JAMUN (*SYZYGIUM CUMINI* (L.) SKEELS) GENOTYPES

Anushma. P.L.* and Anuradha Sane

Division of Fruit Crops, ICAR-Indian Institute of Horticultural Research, Bengaluru-560089
Email: anushma.p.l@gmail.com

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Abstract: The indigenous future fruit 'Jamun' is grown throughout the tropical and subtropical regions of the country. Since vast genetic variability exists among the seedling populations, characterizing the germplasm to identify superior genotypes is essential for jamun crop improvement. In this background, morphological characterization of 14 jamun genotypes to know the variability was studied in randomized block design with three replications. Significant variability was observed for tree morphological traits such as plant height, canopy spread and leaf petiole length and fruit characters fruit length, fruit width and seed length. Variations were also observed on date of flower initiation, number of flowers and fruits set per panicle. Among the genotypes, a few with bold fruits with comparable TSS and pulp content, lesser plant height and canopy spread and early initiation of flowering such as IIHRJ-3, IIHRJ-14 and IIHRJ-12 were found as superior clones for utilizing the jamun crop improvement programs.

Keywords: Jamun, Morphological traits, Genotypes, *Syzygium cumini*

INTRODUCTION

Syzygium cumini (L.) Skeels, commonly called as 'jamun' or 'Indian black berry' is one of the most potential underutilized fruit crops, native to the Indian subcontinent. Though the species has been found growing throughout the tropical and subtropical regions of the country (Singh et al., 2016), the same has been a neglected crop until the recent past. Over the past two decades, jamun has gained the consumer attention because of its exceptional health benefits. The drupaceous fruits of jamun are either consumed as fresh or processed into many products such as juice, squash, jam etc. With the growing awareness on medicinal and nutritional properties, various jamun seed based formulations are gaining popularity among the common people.

Being highly cross pollinated by nature, huge variability exists among the seedling populations grown across the country. Variations are available in terms of fruit size, shape, pulp content, TSS and acidity which need documentation for identifying elite clones. In light of its potentiality, commercial jamun orchards are being established in the recent years. But farmers have been growing either seedlings or grafted plants of unknown yield potential due to non-availability of standard recommended varieties (Swamy *et al*., 2017). Hence, characterizing the available germplasm to identify the elite genotypes of higher yield, better fruit quality and adaptability is of utmost importance in jamun crop improvement programs. In addition to these fruit quality related traits, genotypes with dwarf tree stature, less vigorous types and off season bearing needs to be explored in view of area expansion and productivity in jamun. Keeping this in mind, the present study was taken up to know the extent of variability existing among the genotypes available in the field gene bank.

MATERIALS AND METHODS

The present research work was undertaken for morphological characterizing of 14 jamun *(Syzygium cumini* (L.) Skeels) germplasm maintained at the field gene bank of ICAR-Indian Institute of Horticultural Research, Bengaluru during 2016-17. The 15 years old jamun plants were characterized as per the minimal descriptors for fruit crops (Mahajan et al., 2000) for the tree morphological characters such as height, trunk girth, canopy spread, leaf length, width and petiole length in completely randomized block design with three replications. To know the variations in flowering related traits, date of flower initiation was visually observed; number of flowers per panicle, number of fruits per panicle and per cent fruit set were also recorded. To understand the extent of variability with respect to fruit morphological traits, ripe fruits were harvested during May-June and ten fruits from each tree were analysed for fruit weight, size, pulp content, seed size and total soluble solids (TSS). The TSS was measured using ERMA (0-32%) hand refractometer.

RESULTS

The data referring to the tree morphological characters of 14 jamun genotypes showed significant difference with respect to tree height, canopy spread and leaf petiole length (Table 1). Height of the trees ranged from 6.59 to 12.35 m. Among the accessions, IIHR9 recorded maximum tree height (12.35m) which was on par with IIHRJ-10 (11.19m), while minimum height was observed in genotypes IIHRJ-1 and IIHRJ-2(6.59 and 6.76m respectively), followed

*Corresponding Author

by IIHRJ-3 (7.06m). Though there was no significant difference for tree girth at 30 cm from ground level, the circumference ranged from 140.67m (IIHRJ-13) to 170.67m (IIHRJ10).

The tree canopy spread varied significantly in both the directions(East-west and North-south)highest tree spread in the east-west direction was noted in IIHRJ-9(10.91m) which was at par with IIHRJ-10 (9.92 m), followed by IIHRJ-8 (9.76 m), IIHRJ-5 (9.56 m) and IIHRJ-6 (9.39 m). The genotype IIHRJ-13 had significantly lower canopy spread (7.20 m) in the E-W direction followed by IIHRJ-2, IIHRJ-3 and IIHRJ-1. The maximum tree canopy in the north south (N-S) direction was recorded in the genotype IIHRJ-14 (11.31 m) which was at par with IIHRJ-2 (11.31 m). The lowest spread was recorded in IIHRJ-7 (7.05m) which was similar to IIHRJ-3 (7.89 m) and IIHRJ-9(8.03 m).

No significant difference was noted for leaf length and leaf width among the accessions. Mean leaf lamina length ranged from 11.63 cm (IIHRJ-14) to 15.53 cm (IIHRJ-10) while lamina width ranged between 5.04 cm (IIHRJ-4) and 7.53 cm (IIHRJ-9). Longest leaf petioles were present in IIHRJ-2 (2.63 cm) while leaves with shortest petioles were observed in IIHRJ-4(1.52 cm).

Table 1. Tree morphological characters of different jamun genotypes

Genotype	Tree height (m)	Tree girth (cm)	Tree canopy spread E-W (m)	Tree canopy spread N-S (m)	Leaf length (cm)	Leaf width (cm)	Leaf petiole length (cm)
IIHRJ1	6.59^{F}	148.67	7.95^{BC}	8.68^{ABCD}	15.29	6.43	2.31^{A}
IIHRJ2	6.76^{F}	144.33	7.27^{BC}	11.31^{A}	14.92	6.92	2.63^{A}
IIHRJ3	7.06^{EF}	142.33	7.78^{BC}	7.65^{D}	13.02	5.13	2.17^{A}
IIHRJ4	7.90^{CDEF}	148.00	9.05^{ABC}	7.89^{CD}	14.28	5.04	1.52^{A}
IIHRJ5	9.75^{BC}	161.00	9.56^{ABC}	7.37^{D}	13.12	6.58	2.40^{A}
IIHRJ6	9.42^{BCD}	169.00	9.39^{ABC}	8.44^{ABCD}	14.16	6.99	2.18^{A}
IIHRJ7	9.21^{BCDE}	162.33	7.88^{BC}	7.05^{D}	14.08	5.52	1.99^{A}
IIHRJ8	10.09^{BC}	146.00	9.76^{ABC}	8.08^{BCD}	14.34	5.74	1.66^{A}
IIHRJ9	12.35^{A}	158.10	10.91^{A}	8.03^{CD}	13.99	7.53	2.42^{A}
IIHRJ10	11.19^{AB}	170.67	9.92^{AB}	8.42^{ABCD}	15.53	6.95	2.03^{A}
IIHRJ11	7.33^{DEF}	144.33	8.17^{BC}	9.42^{ABCD}	12.24	6.89	2.32^{A}
IIHRJ12	8.73^{CDEF}	146.67	8.32^{ABC}	11.25^{AB}	12.92	6.06	2.18^{A}
IIHRJ13	8.24^{CDEF}	140.67	7.20^{C}	11.07^{ABC}	12.62	5.73	2.14^{A}
IIHRJ14	8.76^{CDEF}	151.67	8.76^{ABC}	11.52^{A}	11.63	5.88	1.92^{A}
p-Value	<.0001	0.2454	<.0001	<.0001	0.1590	0.0709	0.0225
CV(%)	7.15	9.73	8.69	9.91	11.70	15.19	15.31
SE(d)	0.514	12.103	0.618	0.729	1.311	0.774	0.267
Tukey HSD at 1%	2.2508	NS	2.7045	3.1908	NS	NS	1.1672

Among the 14 genotypes, variability was noticed on flowering and fruit set parameters (Table 2). Earliest initiation of flowering, in the second week of February was recorded in genotypes IIHRJ-5, IIHRJ-8, IIHRJ-3, IIHRJ-4 and IIHRJ-6 while comparatively delayed flowering was noticed in genotypes viz., IIHRJ-1 and IIHRJ-2 (second week of March). The accessions IIHRJ-7 and IIHRJ-10 did not flower and set fruits during the year of study, indicating their irregularity in bearing. The number of flowers per panicle varied from 29 (IIHRJ-2) to 96.33 (IIHRJ-14). Genotypes such as IIHRJ-6, IIHRJ-12 and IIHRJ-4 also produced more flowers per panicle (89.67, 83.00 and 81.33 respectively) while IIHRJ-8 and IIHRJ-9 had fewer flowers (35 and 33 respectively). Variations were noticed in the number of fruits produced in a panicle, ranging from 13.57 to 46.80. Number of fruits per panicle was higher in IIHRJ-14 (46.80), IIHRJ-6 (45.73) and IIHRJ-12 (43.99). The per cent fruit set ranged from 44.00 to 55.00 percent with higher fruit set in IIHRJ-

9 (55%) followed by IIHRJ-11 (54.34%) and IIHRJ-12 (53.00%).

Table 2. Flowering characters in jamun genotypes

Genotype	Date of start of flowering	Number of flowers per panicle	Number of fruits per panicle	Fruit set (%)
IIHRJ1	13.03.2016	48.33	23.68	48.99
IIHRJ2	13.03.2016	29.00	13.57	46.79
IIHRJ3	14.02.2016	41.00	19.06	46.49
IIHRJ4	14.02.2016	81.33	39.28	48.29
IIHRJ5	13.02.2016	44.00	19.36	44.00
IIHRJ6	16.02.2016	89.67	45.73	50.99
IIHRJ7	-	-	-	-
IIHRJ8	13.02.2016	35.00	14.78	42.23
IIHRJ9	08.03.2016	33.00	18.15	55.00
IIHRJ10	-	-	-	-
IIHRJ11	14.02.2016	55.67	30.25	54.34
IIHRJ12	21.02.2016	83.00	43.99	53.00
IIHRJ13	21.02.2016	68.67	32.24	46.95
IIHRJ14	21.02.2016	96.33	46.80	48.58

The data pertaining to the fruit physical traits of the genotypes are presented in (Table 3). Among the characters studied, significant variability was observed only for fruit length and fruit diameter. The accessions IIHRJ-14, IIHRJ-3 and IIHRJ-13 had maximum fruit length (3.87, 3.85 and 3.85 cm respectively) while genotype IIHRJ-8 had minimum fruit length (2.25 cm) which was on par with IIHRJ-1 (2.88 cm) and IIHRJ-4 (2.32 cm). There was no significant difference for other fruit traits such as fruit weight, seed weight, seed length, per cent pulp content and TSS. The fruit weight ranged from 5.58g (IIHRJ-6) to 11.18g (IIHRJ-2). The seed weight ranged from 1.26g (IIHRJ-8) to 2.58g (IIHRJ-2) while the seed length varied between 1.31 cm (IIHRJ-8) and 3.10 cm (IIHRJ-3). The pulp content of the genotypes ranged from 70.84 per cent (IIHRJ-11) with varying TSS from 11.25 (IIHRJ-9) to 13.62° Brix (IIHRJ-1).

Table 3. Fruit parameters of jamun genotypes

Genotype	Fruit length (cm)	Fruit diameter (cm)	Fruit weight	Seed weight (g)	Seed length (cm)	Pulp content (%)	TSS (° Brix)
IIHRJ1	2.88^{AB}	1.88^{BC}	9.95	2.51	1.99	74.65 (59.77)	13.62
IIHRJ2	3.46^{AB}	2.52^{ABC}	11.18	2.58	2.44	76.61 (61.09)	12.42
IIHRJ3	3.85^{A}	2.97^{ABC}	10.04	1.85	3.10	78.93 (62.91)	11.33
IIHRJ4	2.32^{B}	1.77^{C}	7.02	1.72	1.40	74.96 (60.05)	12.65
IIHRJ5	3.06^{AB}	2.27^{ABC}	7.37	1.95	2.43	72.95 (58.69)	12.25
IIHRJ6	3.53^{AB}	2.60^{ABC}	5.58	1.43	3.02	74.27 (59.54)	11.50
IIHRJ8	2.25^{B}	1.68^{C}	6.10	1.26	1.31	79.24 (62.89)	11.50

IIHRJ9	2.70^{AB}	1.63^{C}	9.47	2.56	1.74	72.32 (58.26)	11.25
IIHRJ11	3.66^{AB}	3.01^{ABC}	8.49	2.33	3.08	70.84 (57.43)	11.45
IIHRJ12	3.72^{AB}	3.31^{AB}	8.26	2.39	2.76	71.38 (57.69)	11.65
IIHRJ13	3.85^{A}	3.28^{AB}	9.60	2.31	2.70	76.00 (60.68)	11.75
IIHRJ14	3.87^{A}	3.42^{A}	8.66	2.36	2.50	72.79 (58.56)	11.40
p-Value	0.0046	0.0021	0.3011	0.0471	0.0369	0.0451	0.7694
CV(%)	11.14	14.74	24.11	17.92	21.36	5.238	10.56
SE(d)	0.363	0.372	2.043	0.377	0.506	-	1.256
Tukey HSD at 1%	1.467	1.5037	NS	NS	NS	NS	NS

DISCUSSION

In perennial fruit crops like jamun, elite clonal selection is majorly adopted for conventional crop improvement. While identifying the elite ones with better yield and fruit quality, emphasis needs to be given for dwarf types with compact canopy for effective utilization of limited land available. The genotype IIHRJ-3 having bolder fruits of higher TSS and pulp content could be a promising clone owing to its smaller tree stature (with lesser plant height and canopy spread) and early onset of flower initiation. With higher number of fruits per panicle, genotypes IIHRJ-14 and IIHRJ-12 are also found superior due to comparable fruit quality and less vigorous plants and early flowering. Even though the other genotypes included in the study possessed fruits of similar size and quality, the robust or highly vigorous growth habit make them unappealing for selection programs. Several other studies have been reported on physico-chemical characterization of jamun collections across the country by various researchers viz., Singh and Kaur (2016), Devi *et al*. (2016), Swamy *et al*. (2017) and Ningot *et al*. (2017).

CONCLUSIONS

Among the fourteen genotypes characterized, variability was observed for tree characters like tree height, plant canopy spread in E-W and N-S directions, and leaf petiole length. Variations were also observed among the fruit characters such as fruit weight, seed weight, pulp content and TSS, though not significant. Among the genotypes, a few with bold fruits, comparable TSS and pulp content, lesser plant height, low canopy spread and early initiation of flowering such as IIHRJ-3, IIHRJ-14 and IIHRJ-12 were found as superior clones for utilizing the jamun crop improvement programs.

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