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## *Full Length Research Article*

# CHARACTERIZATION OF JAMUN GENOTYPES IN CENTRAL AND SUBMONTANEOUS ZONE OF PUNJAB

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**ABSTRACT**

Jamun (*Syzygium cumini* Skeels.) is an under exploited indigenous fruit tree of India.The variations act as an important source and are a prerequisite for a tree breeder in breeding methods to improve a species. To collect the variability with the aim of selecting some superior types/strains a survey was carried out in Amritsar, Gurdaspur and Pathankot Districts, in which 25 seedlings of jamun were evaluated for their physical characteristics and biochemical composition during 2015-2016 respectively. The data revealed that the maximum tree height (24.38m) and canopy volume(3897.56 $m^3$) was measured in GD-19 genotype Maximum fruit length(3.58 cm),breadth (2.75 cm) and fruit weight (14.88 g) was registered in GD-6 genotype. Among bio-chemical characters it was estimated that maximum total sugars ( 21.34 %) was recorded in PS-1 genotype and reducing sugars (14.64 %) was recorded in AJWR-14 genotype.



## INTRODUCTION

Jamun (*Syzygium cumini* Skeels.) is an under exploited indigenous fruit tree of India belonging to family Myrtaceae. It is also known by other common names as jambul, black plum, java plum, indian black berry etc. In India, the Jamun tree and its fruit are known variously as Jamun, Jambul, Jaamoon. (Swami *et al.,* 2012; Ali *et al.*,2013). It is a huge evergreen hardy tree of Indian sub-continent and can tolerate drought as well as heavy rainfall conditions. The tree grows equally well in both the tropical and the sub-tropical regions. The tree fruits once in a year and berries are sweetish sour to taste. The flavor of the fruit is astringent and it looks like blueberry in shape and colour (Baliga *et al.,* 2011). The jambolan or jamun is native to India and its bordering countries like Burma, Ceylon, Nepal, Pakistan, Bangladesh, Srilanka, Indonesia and Andaman islands (Dhillon, 2013). Jamun fruit is a drupe with dicotyledonous seed. It is oblong, ovoid and green in the initial days, but turns into crimson black as it arrives maturity. Jamun fruit is generally acknowledged to be of very high quality for its curative function chiefly against diabetes because of its effect on Pancreas. Jamun seeds also contain albumen, fat, glucosides, an alkaloid, jambosine which reduces or stop diastatic conversion of starch into sugars.

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It also contains resin, ellagic acid, quercetin, gallic acid as well as elements of zinc, vanadium, chromium, sodium and potassium. $-Sitoterol is present in unsaponifiable material of seed fat (Raza *et al.*,2015). In recent years, jamun fruits are becoming popular among people due to its rich medicinal value particularly for its antidiabetic properties. A large quantity of food syrup is much useful for curing diarrhoea. This berry fruit consumption also provides benefits during chemotherapy and radiation. However, since no elite line has been recognized and very meagre information is available on improvement of jamun fruit crop the exploitation of existing variability for improvement of jamun in order to encourage commercial orcharding in India is to be required. The evaluation and breeding of superior cultivars, duly suited for Punjab conditions need to be intensified as the recommended cultivars. For launching a planned Jamun improvement work, there is strong need to collect the existing variability (Singh and Singh 2012). Hence, the present study was planned to collect the variability with the aim of selecting some superior types/strains is an endeavour in this direction.

## MATERIALS AND METHODS

An extensive survey was carried out in Amritsar, Gurdaspur and Pathankot Districts, during 2015-2016 respectively. The superior genotypes of Jamun to peculiar characters were selected on the basis of information provided by tree owners,

local inhabitants and officials from Department of Horticulture, Punjab. The selected genotypes were evaluated for various vegetative, fruit physical and quality characters. The fruit samples were analyzed for physico-chemical attributes in the laboratory of Department of Horticulture, Khalsa College, Amritsar.In the present studies, 25 seedlings of jamun were selected and coded as AA-1, ALK-1, GD-1, PS-1 etc. The trees were free from pests and diseases.TSS and titratable acidity were determined by standard methods. Vitamin C and sugars were analyzed by the method advocated by AOAC, 1990.

## RESULTS AND DISCUSSION

A glance over the data clearly indicated a wide range of variability/diversity with respect of tree height among the various jamun germplasm which were evaluated throughout the whole research the tree height ranged from 6.70 m to 24.38 m. The identified jamun morphotype GD-19 registered the maximum tree height of 24.38 m followed by GD-10 and AA-32 both with 23.46 m and GD-3 and AA-27 with 22.25 m respectively whereas the morphotype GTB-24 recorded the minimum tree height of 6.70 m. These results are in accordance with the findings of Kaur and Bal (2015) in jamun germplasm. Chase and Reveal, (2009) also conducted a research trial on jamun germplasm and concluded the jamun tree height as medium to large size. Ghojage *et al.* (2009) resulted the same variation in tree height in jamun genotypes in the districts of Karnatka and Maharashtra.The trunk circumference was measured to be the maximum (264.16 cm) in the genotype AJWR-7. Whereas the minimum trunk circumference of (48.26 cm) was recorded in the genotype GTB-24 respectively. The canopy volume was maximum in the genotype GD-19 to the tune of 3897.56 m3. The canopy volume was recorded to be the least 42.13 m3 in genotype GTB-24.

**Table 1. Vegetative attributes of evaluated jamun genotypes**

| Selection Number | Collector code | Tree Characters | | | |
|---|---|---|---|---|---|
| | | Tree height (m) | Trunk circumference (cm) | Canopy volume ($m^3$) | Tree Growth Habit |
| 1. | GD-3 | 22.25 | 254.00 | 3015.32 | Spreading |
| 2. | GD-6 | 21.33 | 254.00 | 2577.98 | Spreading |
| 3. | GD-10 | 23.46 | 248.92 | 2534.02 | Spreading |
| 4. | GD-13 | 16.76 | 167.64 | 1529.66 | Spreading |
| 5. | GD-17 | 21.94 | 251.46 | 2317.32 | Spreading |
| 6. | GD-19 | 24.38 | 238.76 | 3897.56 | Spreading |
| 7. | GTB-24 | 6.70 | 48.26 | 42.13 | Erect |
| 8. | GQ-30 | 19.20 | 203.20 | 1766.98 | Spreading |
| 9. | GQ-32 | 12.19 | 76.20 | 444.82 | Spreading |
| 10. | GT-34 | 16.45 | 238.76 | 1245.21 | Spreading |
| 11. | GT-35 | 16.45 | 243.84 | 1235.91 | Spreading |
| 12. | GT-37 | 16.15 | 241.30 | 1040.71 | Spreading |
| 13. | GP-42 | 11.58 | 154.94 | 492.41 | Spreading |
| 14. | GG-43 | 12.19 | 152.40 | 521.38 | Erect |
| 15. | AJWR-7 | 16.30 | 264.16 | 925.25 | Spreading |
| 16. | AJWR-8 | 19.05 | 215.9 | 1135.45 | Spreading |
| 17. | AJWR-10 | 16.15 | 180.34 | 864.98 | Spreading |
| 18. | AJWR-14 | 15.84 | 170.18 | 1021.37 | Spreading |
| 19. | ALK-18 | 10.66 | 147.32 | 402.95 | Spreading |
| 20. | ALK-20 | 13.25 | 129.54 | 881.60 | Spreading |
| 21. | ALK-23 | 14.32 | 127.00 | 1081.03 | Spreading |
| 22. | AA-27 | 22.25 | 243.84 | 1540.64 | Spreading |
| 23. | AA-32 | 23.46 | 233.68 | 1863.67 | Spreading |
| 24. | PS-1 | 12.49 | 144.78 | 705.01 | Spreading |
| 25. | PS-2 | 12.95 | 106.68 | 607.22 | Spreading |

These findings are also in line with the research evaluation of Kaur and Bal (2015) in jamun. The differences were recorded clearly by visualizing the tree growth habit from the four directions. In genotypes GD-3, GD-6, GD-10, GD-13, GD-17, GD-19, GQ-30, GQ-32, GT-34, GT-35, GT-37, GP-42, AJWR-7, AJWR-8, AJWR-10, AJWR-14, ALK-18, ALK-20, ALK-23, AA-27, AA-32, PS-1 and PS-2 spreading type of tree growth habit was noticed while in the genotypes GTB-24 and GG-43 erect type of tree growth habit was found. This might be due to the genetic behaviour of different genotypes. Khatun *et al.,* (2014) also registered the spreading type of tree growth habit in jamun while evaluating jamun germplasm at Gazipur.

The perusal of the data regarding fruit length showed high genetic diversity in different evaluated seedling jamun plants. The maximum fruit length (3.58 cm) was in the genotypes GD-6 and GD-10. Minimum fruit length (2.10 cm) was noted in the genotype GD-17. Khatun *et al.* (2014) while conducting an experiment to evaluate jamun germplasm at Gazipur revealed the fruit length within the range of 2.91 cm. Like the fruit length a great variation was noticed in the breadth of jamun fruits which was under evaluation throughout the whole research. The maximum fruit breadth (2.75 cm) was in the genotypes GD-6 and GD-10. Minimum fruit breadth (1.52 cm) was recorded in the genotype GD-17. The maximum fruit weight (14.88 g) was recorded in the genotype GD-6 while the minimum fruit weight (3.94 g) was recorded in the genotype PS-1. Jai *et al.* (2010) and Waliullah *et al.* (2013) who worked on jamun strains observed that the Selection 1 proved to be the most promising for fruit weight (14.55 g). The data on fruit biochemical characters revealed a marked variability in the level of total soluble solids in various genotypes of jamun which was within the range of 17.13 to 26.11 per cent. The maximum TSS (26.11%) were registered in jamun fruits harvested from AJWR-8 strain, closely followed by AJWR-10 and ALK-23 genotypes with 26.08 and 26.02 per cent. Minimum TSS (17.13%) was recorded in the genotype GQ-30. Bal *et al.* (2006) and Ghojage *et al.* (2009) reported TSS in the range of 15.05 - 26.74 per cent in various jamun genotypes which are in agreement with the present studies.

These results are also in line with the findings of Jai *et al.* (2010) and Prakash *et al.* (2010) who also reported the TSS of 21.33 per cent in jamun genotypes. Srivastava *et al.* (2010)

also reported the same variation in jamun strains. Khatun *et al.* (2014) stated the TSS of 12.30 per cent and 13.16 per cent in exotic Jamun germplasm (SC-Ex 001) which was less than the present findings. The level of acidity in fruit pulp varied from 0.45 to 0.87 per cent in different evaluated jamun genotypes with the highest content (0.87%) recorded in the genotype ALK-18 closely followed by AA-27 with (0.86%).Lowest acidity (0.45%) was in the genotype GD-3 respectively. The present studies are partially in agreement with the previous work of Srivastava *et al.* (2010) who observed the highest acidity (1.41 %) in VJ-20 genotype and lowest acidity (0.37 %) in VJ-5 genotype and Keskar *et al.* (1989) who resulted a wide variation in acidity (0.16 to 0.55 %). TSS: acid ratio is the most ideal index of fruit quality as it is the response of sweet/sour blend.

A glance over the data divulged highest TSS: acid ratio (43.73) which was recorded in the genotype GD-10 followed by GD-6, GD-3, GD-13, AJWR-10, AJWR-8 and GT-35 genotypes having TSS: acid ratio of 43.00, 40.57, 38.58, 34.31, 33.47 and 33.32 respectively. Minimum TSS: acid ratio (26.47) was recorded in genotype GTB-24.Srivastava *et al.* (2010) also showed variation in TSS: acid ratio ranged from 14.50 in PJ-25 genotype to 43.78 in VJ-5 genotype. These results are also in accordance with the findings of Kaur and Bal (2015) who also reported the same variation in jamun germplasm. The results of the study showed that reducing sugars in the evaluated genotypes of jamun varied from 8.14 to 14.64 per cent with maximum of 14.64 per cent in the genotype AJWR-14. Minimum reducing sugars (8.14%) were recorded in genotype GD-10.

**Table 2. Fruit physical attributes of evaluated jamun genotypes**

| Selection Number | Fruit Characters | | | |
|---|---|---|---|---|
| | Collector code | Fruit length (cm) | Fruit breadth (cm) | Fruit Weight (g) |
| 1. | GD-3 | 3.50 | 2.66 | 14.54 |
| 2. | GD-6 | 3.58 | 2.75 | 14.88 |
| 3. | GD-10 | 3.58 | 2.75 | 14.75 |
| 4. | GD-13 | 3.50 | 2.63 | 14.37 |
| 5. | GD-17 | 2.10 | 1.52 | 4.02 |
| 6. | GD-19 | 2.37 | 1.68 | 4.25 |
| 7. | GTB-24 | 2.25 | 1.75 | 6.09 |
| 8. | GQ-30 | 2.62 | 1.93 | 6.11 |
| 9. | GQ-32 | 3.20 | 2.10 | 10.97 |
| 10. | GT-34 | 3.08 | 2.08 | 9.33 |
| 11. | GT-35 | 3.05 | 2.03 | 10.31 |
| 12. | GT-37 | 3.08 | 2.08 | 10.40 |
| 13. | GP-42 | 2.62 | 1.93 | 6.07 |
| 14. | GG-43 | 2.68 | 2.00 | 6.55 |
| 15. | AJWR-7 | 2.37 | 1.77 | 5.34 |
| 16. | AJWR-8 | 2.27 | 1.65 | 5.64 |
| 17. | AJWR-10 | 2.57 | 1.92 | 5.50 |
| 18. | AJWR-14 | 2.73 | 2.02 | 5.17 |
| 19. | ALK-18 | 2.65 | 1.92 | 6.59 |
| 20. | ALK-20 | 2.43 | 1.90 | 5.57 |
| 21. | ALK-23 | 2.68 | 2.00 | 6.65 |
| 22. | AA-27 | 3.00 | 2.18 | 8.81 |
| 23. | AA-32 | 3.00 | 2.25 | 8.92 |
| 24. | PS-1 | 2.75 | 1.75 | 3.94 |
| 25. | PS-2 | 2.37 | 1.93 | 5.18 |

**Table 3. Bio-chemical attributes of evaluated jamun genotypes**

| Selection Number | Collector code | Total soluble solids (%) | Acidity (%) | TSS : acid ratio | Reducing sugars (%) | Total sugars (%) | Ascorbic acid (mg/100g of pulp) |
|---|---|---|---|---|---|---|---|
| 1. | GD-3 | 18.26 | 0.45 | 40.57 | 8.47 | 16.64 | 32.53 |
| 2. | GD-6 | 20.64 | 0.48 | 43.00 | 13.64 | 17.21 | 33.58 |
| 3. | GD-10 | 20.12 | 0.46 | 43.73 | 8.14 | 16.97 | 33.42 |
| 4. | GD-13 | 19.68 | 0.51 | 38.58 | 14.34 | 18.21 | 34.58 |
| 5. | GD-17 | 20.60 | 0.64 | 32.18 | 13.42 | 20.28 | 35.52 |
| 6. | GD-19 | 21.24 | 0.72 | 29.50 | 12.18 | 19.92 | 35.92 |
| 7. | GTB-24 | 21.18 | 0.80 | 26.47 | 14.07 | 20.77 | 37.91 |
| 8. | GQ-30 | 17.13 | 0.57 | 30.05 | 14.63 | 18.60 | 34.84 |
| 9. | GQ-32 | 17.29 | 0.53 | 32.62 | 13.11 | 17.87 | 34.42 |
| 10. | GT-34 | 20.14 | 0.63 | 31.96 | 9.44 | 16.64 | 35.25 |
| 11. | GT-35 | 21.66 | 0.65 | 33.32 | 8.96 | 16.72 | 35.93 |
| 12. | GT-37 | 20.25 | 0.74 | 27.36 | 11.42 | 17.02 | 37.18 |
| 13. | GP-42 | 25.14 | 0.83 | 30.28 | 13.08 | 19.91 | 38.68 |
| 14. | GG-43 | 24.18 | 0.81 | 29.85 | 12.72 | 19.63 | 38.14 |
| 15. | AJWR-7 | 25.82 | 0.82 | 31.48 | 12.63 | 20.66 | 38.09 |
| 16. | AJWR-8 | 26.11 | 0.78 | 33.47 | 12.92 | 20.44 | 36.42 |
| 17. | AJWR-10 | 26.08 | 0.76 | 34.31 | 14.46 | 21.07 | 36.78 |
| 18. | AJWR-14 | 24.12 | 0.84 | 28.71 | 14.64 | 21.14 | 40.37 |
| 19. | ALK-18 | 24.33 | 0.87 | 27.96 | 12.47 | 20.28 | 42.87 |
| 20. | ALK-20 | 25.42 | 0.85 | 29.90 | 13.72 | 21.19 | 41.12 |
| 21. | ALK-23 | 26.02 | 0.80 | 32.52 | 12.13 | 19.73 | 37.47 |
| 22. | AA-27 | 25.89 | 0.86 | 30.10 | 13.23 | 20.13 | 41.46 |
| 23. | AA-32 | 25.13 | 0.79 | 31.81 | 13.42 | 20.71 | 37.18 |
| 24. | PS-1 | 21.02 | 0.66 | 31.84 | 14.12 | 21.34 | 36.77 |
| 25. | PS-2 | 20.96 | 0.69 | 30.37 | 13.44 | 20.42 | 36.28 |

These findings are confirmed by Jai *et al.* (2010) while evaluating various selection of jamun in which they demonstrated the variation in reducing sugars among the selection with the maximum sugars in Selection-I. Srivastava *et al.* (2010) also recorded highest reducing sugars in VJ-14 (20.54%) and lowest reducing sugars in VJ-12 (8.14%) germplasm of jamun respectively. The findings of Singh and Singh (2012) in jamun strains are also in agreement with the present studies. The data regarding total sugars in the evaluated jamun germplasm clearly indicated that the genotype PS-1 contained highest level of total sugars (21.34%). The genotype GT-34 registered the minimum (16.64%) total sugars respectively. Srivastava *et al.* (2010) who also recorded highest total sugars in VJ-14 (25.46 %) and lowest total sugars (9.94 %) in jamun strain VJ-12. Prakash *et al.* (2010) found highest total sugars content of (20.24 %) in Selection-1 of jamun germplasm. Singh and Singh (2012) recorded the variability for total sugars to the tune of 7.40 to 9.14 per cent, which is less than the present study. According to them this might be due to the climatic and varietal difference among the various strains of jamun. These results are also in agreement with the findings of Ghojage *et al.* (2011) who also reported highest total sugars (18.43%) in KJS-3 genotype of jamun. The findings of Kaur and Bal (2015) in jamun are also in support with the present study. A wide range of variability was found among all the evaluated jamun genotypes which showed a range from 32.53 to 42.87 mg/100g fruit pulp respectively. The maximum ascorbic acid 42.87 mg/100g pulp was found in the ALK-18 genotype. The genotype GD-3 registered the minimum (32.53 mg/100g pulp) ascorbic acid respectively. Results of these findings are confirmed by Singh and Singh (2012) who reported ascorbic acid content of 30.0 to 43.0 mg/100g pulp respectively. Srivastava *et al.* (2010) also supported the present findings.

**Conclusion**

The different genetic resources having desirable horticultural traits had been isolated during the studies. The genotype GD-19 recorded the highest tree height and canopy volume, while AJWR-7 had maximum trunk circumference. Genotype GD-6 was excellent in terms of fruit length, fruit breadth and fruit weight. Genotype AJWR-8 had highest TSS and were excellent in flavor and hence can be used for increasing flavor in hybridization programme. The present investigations are quite useful for future conservation and mass plantation of seedling jamun in common lands of villages, unutilized lands, road sides, canal banks and gardens so as to provide fruit to the poor people. If these germplasm are mass planted in waste lands, rural schools, unutilized land etc, it will give a chance to the people living below poverty line to consume low cost and nutritional fruits that would be helpful in curing many diseases. These studies showed that there exists a great variability among different jamun seedling progenies and this can be exploited for the selection of elite genotypes in future after evaluating their performance and provide livelihood to local population.

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