



Impact of systematic improvement in jamun (*Syzygium cuminii* Skeels) cultivars on yield and quality of fruits

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ABSTRACT

Jamun (*Syzygium cumini*) is a promising fruit crop for cultivation in central Gujarat due to its high adaptability to diverse environmental conditions and appreciable fruit yield. The genetic diversity and climate factors can influence tree growth, yield and quality attributes of jamun. This study aimed to assess the effects of genotype and year effect on the performance of four cultivars of jamun under rainfed conditions in central Gujarat (India). Experiments were carried out during 2020–2021 and 2021–2022. The experimental design was a randomized block design with three replications. Results revealed that the tree growth, fruit yield and fruit quality parameters were significantly affected by genotype while the year had a significant effect on plant growth characters only. In general, CISHJ-37 recorded the higher tree height, spread and stem girth over the years in comparison to other cultivars. However, fruit weight and pulp content were found stable over the years as not significantly affected by the year's effect. Goma Priyanka and CISHJ-37 recorded the higher fruit and pulp weight while higher pulp (%) was recorded in CISHJ-42 during both the years. However, Goma Priyanka recorded significantly higher yield/tree during both the years followed by CISHJ-37 while least was observed in CISHJ-42. Similarly, higher TSS and acidity were recorded in Goma Priyanka and CISHJ-37 compared to Konkan Bahadoli. The "genotype" factor significantly affected fruit yield and quality attributes. The results indicate that, under rainfed conditions, high yielding improved cultivars like Goma Priyanka and CISHJ-37 can be profitable in central Gujarat.

Introduction

Jamun (*Syzygium cumini* Skeels; Myrtaceae) is highly adapted to diverse environmental conditions and widely

distributed in India up to an altitude of 1600 m. The presences of anthocyanins, fibers and ellagitannins in the pulp of jamun fruits play an important role in reducing the oxidative stress in human being (Mishra *et al.*, 2020). Jamun

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berries contain carbohydrates, iron, sugars, minerals, protein and the pharmacologically active phytochemicals like flavonoids, terpenes, and anthocyanins (Mishra *et al.*, 2020 Singh *et al.*, 2019). The powdered seeds have also reputation of being useful in the treatment of diabetes. These seeds are claimed to contain alkaloids such as jambosine, and glycoside jambolin or antimellin, which halts the diastatic conversion of starch into sugar and seed extract had lowered blood pressure (Singh *et al.*, 2018). The ripe jamun fruits are consumed fresh and can also be processed into many value added products like jam, jellies, squash, cider, nectar, wine, vinegar, RTS, *etc.* (Mishra, 2018). Because of its hardy nature and various uses, it has great potential for commercial exploitation in wastelands and dry-land horticulture (Singh *et al.*, 2019). As a result, it is gaining popularity among farmers all over the country particularly in rain-fed areas (Singh *et al.*, 2018a). Several old nondescript varieties are under cultivation throughout the country, therefore, evaluation and recommendation with regard to high performing cultivars in terms of yield and quality was felt essential. This study aimed to assess the effects of genotype and year's effect on the productive performance of four cultivars of jamun under rainfed conditions in central Gujarat located in the western part of India.

Materials and Methods

In the present investigation, three newly developed genotypes *viz.*, Goma Priyanka from CHES, Godhra and CISHJ-37, CISHJ-42 from CISH, Lucknow were compared with Konkan Bahadoli, which is current popular cultivar for growth, yield and fruit quality attributes at the ICAR-CAH, Bikaner regional station CHES, Godhra (22.41°N latitude, 73.33°E longitude and altitude 115 m). These cultivars were planted earlier during July, 2013 with a spacing of 5 m x 5 m in randomized block design with five replications. These nine-year-old plants were chosen to record time to flowering and fruiting as well as fruit yield and quality attributes. Three uniform trees of each genotype/cultivar was selected for recording observations on growth in terms of plant height (cm), stem girth (cm) and plant spread (cm). The yield (kg/tree) was obtained by the weighing the fruits harvested at ripening stage. Fruit weight and fruit size were recorded as per standard procedures with the help of an electronic balance and vernier caliper respectively. The total soluble solids (TSS) were determined using an Erma Hand Refractometer (0-32°Brix). The titratable acidity (%) was determined by method of AOAC (1980). The data were subjected to statistical analysis as per the method by using open source

R software. The Duncan Multiple Range Test was carried out at 95% confidence level for testing the significant differences among the genotypes and across the years.

Results and Discussion

Conventionally the canopy spread, plant height and stem girth are considered for assessing the growth of tree species (*Syzygium cumini*) while yield attributes including fruit yield per plant, weight of each fruit, pulp weight and it's percent in whole fruit are commonly recorded to assess the response of jamun to any of the treatment. The TSS and acidity are the key quality parameters often used for judging the quality of fruit. Hence, in this study these parameters were considered to assess the effect of the year, genotype and year x genotype interaction.

Growth attributes

As evident from the data presented in Fig. 1 (i-iv), the year had a significant effect on tree height, stem girth and canopy spread both in east-west and north-south direction. These parameters together indicated that the growth in the year 2022 was significantly better than the same during 2021. The effect of genotype on the growth of plants was also evident from significant difference among the cultivars of jamun irrespective of year of evaluation. The cultivars exhibited high variability for tree growth characters, during the two years evaluation, CISHJ-37 recorded the highest tree height and stem girth compared to other cultivars. However, higher tree spread in both the directions were recorded in CISHJ-37, which was closely followed by Goma Priyanka. Genetic makeup of the plants and variations in climatic conditions could be the possible reason for the wide variation with respect to growth and plant spread. Goma Priyanka is a medium tall growing cultivar, therefore reported to be useful for high density planting (Singh *et al.*, 2018a.). The results of present findings are in agreement with Kaur and Bal (2015) in jamun, Mishra *et al.* (2019) in guava and Mishra *et al.* (2020) in pomegranate. G x E interaction effect was significant for all the growth parameters assessed in this study. While growth attributes such as plant height and stem girth of CISH J-37 were found to be relatively stable, these attributes of Goma Priyanka and Konkan Bardoli were different more in the second year relative to the first year indicating that there was significant growth over the years in these cultivars. The spread of canopy was maintained in Konkan Bahadoli over the years as the canopy spread was relatively less compared to other cultivars.

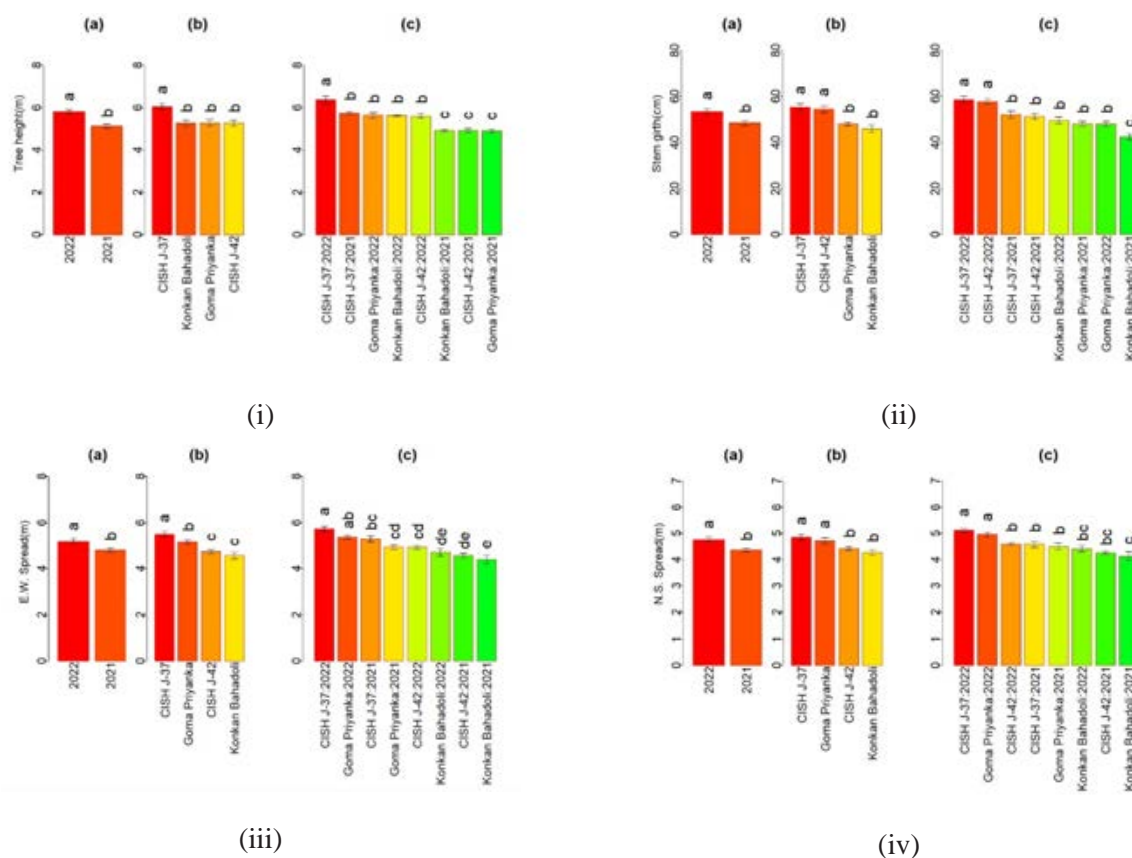


Fig. 1: Effect of year (a), genotype (b) and E X G (c) interactions on tree height (i), stem girth (ii) and spread (E-W) (iii) and spread (N-S) (iv) of jamun cultivars

Yield attributes

Fruit yield per plant as well as fruit weight were found to be stable over the years during the evaluation (Fig. 2). However, higher fruit yield/plant and pulp weight were recorded in Goma Priyanka followed by CISHJ-37 compared to other two cultivars during both the years. The diversity in these characters were attributed to highly heterozygous and diverse genetic background of parents (Kaur and Bal, 2015 and Singh *et al.*, 2019a). Similar trend was observed with respect to fruit weight except that Goma Priyanka and CISH-37 were at par for this attribute across the year. Pulp is considered as an important attribute for value added products and hence the cultivars chosen in this study were evaluated for pulp weight per fruit as well as pulp % in the fruit. This trait was found to be stable over the years while Goma Priyanka and CISH J-37 were found to have higher pulp weight relative to other cultivars. The proportion of pulp in the seed expressed as pulp (%) was also remained unaffected by the year of testing, however, CISH J-42 found to be superior (>92% pulp) to other cultivars during both the years. Goma Priyanka had more than 85% pulp in the fruit which was higher than that was found in the Konkan Bahadoli (80%). Variations in fruit and pulp weight were

earlier reported by Kaur and Bal (2015) and Singh *et al.* (2019) in jamun and Singh *et al.* (2019b) in phalsa.

Biochemical properties

There was a significant difference among the cultivars with regard to chemical quality attributes of jamun (Fig. 3). In general, both TSS content and acidity of fruit were stable across the two years. Improved varieties of Jamun developed at CHES, Godhra and CISH, Lucknow had significantly higher TSS and acidity relative to Konkan Bahadoli. Year and variety interaction was also significant indicating that TSS and acidity of at least some cultivars such as Konkan Bahadoli were vulnerable to significant change. However, both the TSS and the acidity were stable across the years in improved varieties. These findings are in accordance with the findings of Singh *et al.* (2019a) in jamun and Mishra *et al.* (2022) in guava. The highest TSS was recorded in Goma Priyanka followed by CISHJ-37 while the minimum TSS was observed in Konkan Bahadoli during both the years. CISHJ-37 recorded the maximum acidity (0.44 %) while the lowest acidity (0.39%) was recorded in Konkan Bahadoli (Singh *et al.*, 2019).

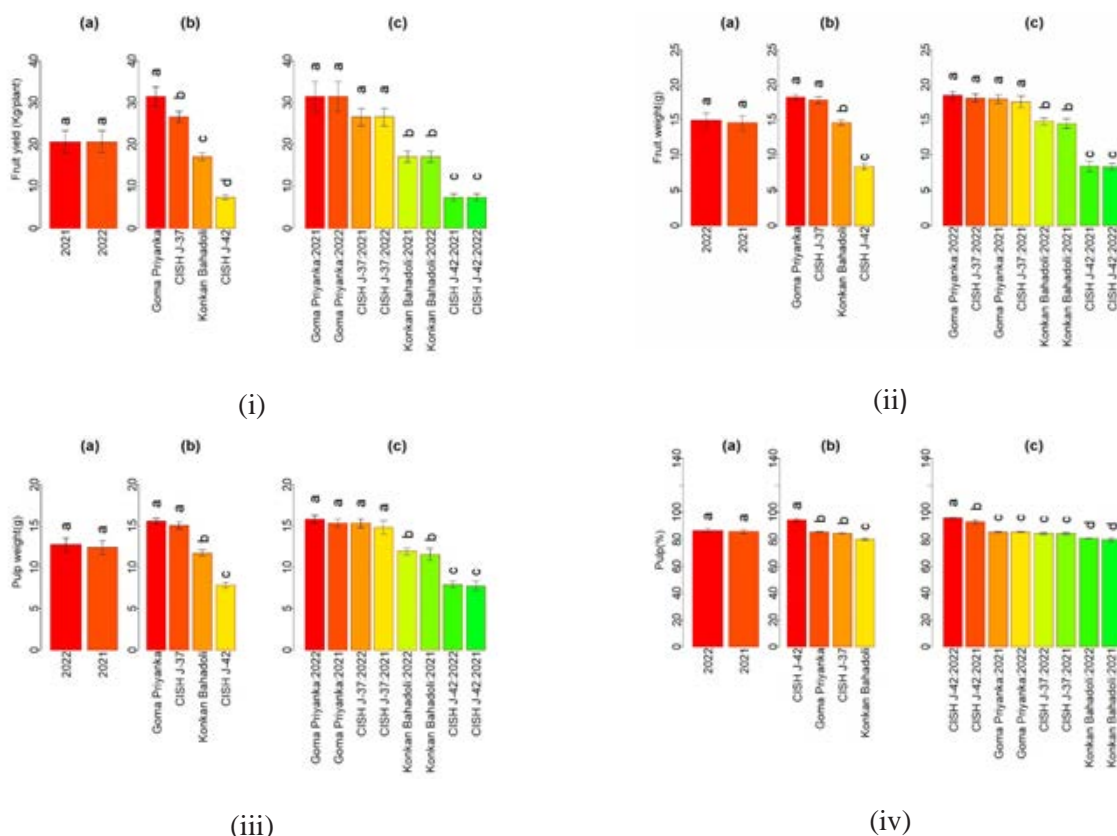


Fig. 2: Effect of year (a), genotype (b) and E x G interaction (c) on fruit yield (i), fruit weight (ii), pulp weight (iii) and pulp percentage (iv) of jamun cultivars

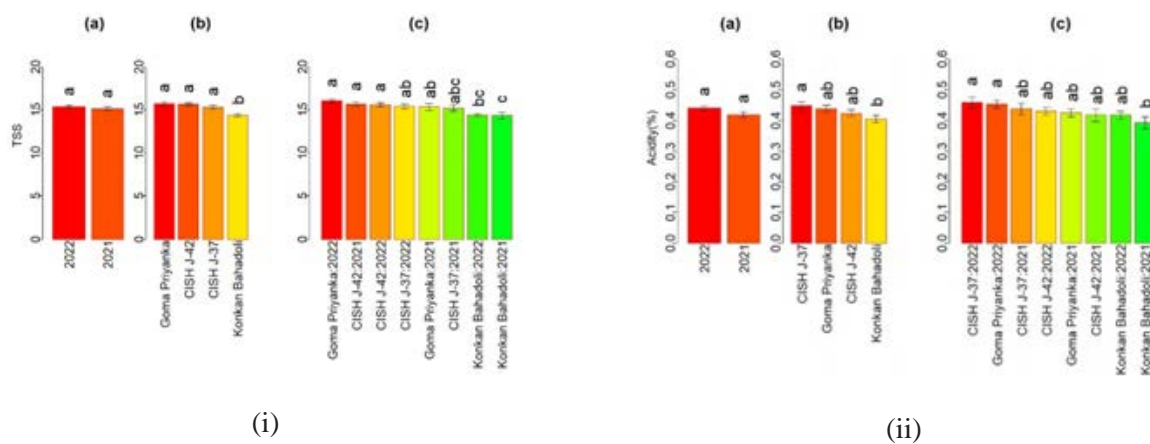


Fig. 3: Effect of year (a), genotype (b) and G x E interactions (c) on TSS (i) and acidity (ii) of jamun cultivars

Conclusion

Systematic evaluation of 4 different cultivars of jamun over two years at CHES, Godhra which represents a typically semi-arid environment of central Gujarat revealed that cultivars viz., Goma Priyanka and CISHJ-37 promise to provide more number of high quality fruits. This could be attributed to the relatively better adaptability to the local environments and genetic makeup of these two varieties.

Hence, these genotypes are recommended for cultivation in semi-arid ecosystems of Central Gujarat.

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