

## Studies on Flowering Characteristics and Floral Morphology of Some Jamun Genotypes (*Syzygiumcumini* Skeels) under Semi-arid Lateritic Belt of West Bengal

### ABSTRACT

A study was conducted to ~~find out~~ determine the variability of flowering behaviour and floral morphology of randomly selected 10 jamun genotypes (*Syzygiumcumini* Skeels) from 3 different districts namely Bankura, Purulia and Paschim Bardhaman under semi-arid lateritic belt of West Bengal during the year 2022. Significant variation ~~was has been~~ observed among the genotypes for the flowering behaviour as well as morphological characters of flowers. Month of panicle emergence among the selected genotypes ranged from 1<sup>st</sup> week of March to last week of March. Time taken for bud development was observed 21 (days from panicle emergence) from three accessions like JA 9 was shortest among 10 jamun accessions studied. Longest time for bud development was observed in JA 4 (38 days). ~~The d~~Duration of flowering was highest, ~~about -of~~ 39 days in genotype JA 6 followed by 35 days in JA 10 and 34 days in JA 4. The length of panicle was ~~recorded~~ longest ~~in from~~ JA 1 (13.08 cm) and shortest in JA 2 (6.73 cm). ~~The h~~Highest flower length was measured ~~on from~~ JA 2 (26.39 mm) and lowest ~~on from~~ JA 8 (8.31 mm). ~~The m~~Maximum number of branchlets per panicle was recorded ~~in from accessions like~~ JA 1 (15.02) and it was least in JA 8 (7.39). ~~The m~~Maximum number of flowers per branchlets was observed from JA 7 (12.07) followed by JA 4 (11.09). ~~The n~~Number of stamens per flower varied between 58.04 and 67.07. The total number of sepals was 5 in all the accessions. The flower colour of all accessions was light yellow except JA 3 ~~which was (pale green).~~

Comment [D1]: Briefly outline the methodology used to collect data

**Keywords:** Jamun, *Syzygiumcumini*, flowering, genotypes

Comment [D2]: Provide conclusion for the abstract

### INTRODUCTION:

Among the lesser known important fruit crops Jamun (*Syzygium cumini* Skeels) is one of the evergreen, multipurpose tree. This is one tall growing, hardy tree among the minor fruit crops under the family Myrtaceae. Jamun is considered to be native of India and its diversity can be found in India, Bangladesh, Sri Lanka, Thailand, Malaysia, Indonesia, Vietnam, Pakistan etc.

Comment [D3]: Reference (s)

Due to the presence of various nutraceutical components like anthocyanins, phenolic compounds and antioxidants in abundance, jamun is known for possessing immense nutritional importance.

Comment [D4]: References (s)

It has high medicinal value particularly the presence of anticancerous property and anti-diabetic property present in jamun. It is also a major concern due to which the crop has been recognized a medicinally important fruit rather a table fruit. The fruits are good source of iron, minerals, sugars and proteins. The fermented or fresh jamun juice is reported to have various medicinal values such as stomachic, carminative and diuretic, apart from having cooling and digestive properties (Thaper, 1958). The pulp and juice of the fruit is commonly used in controlling diarrhoea. The seeds contain jambosin (an alkaloid) and a glycoside, jambolin or antimellin. These secondary metabolites of the seeds can reduce or stop conversion of starch into sugars in human body.

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A considerable wide navigation in the diversity of jamun genotypes with respect to their growing habits, flowering behavior, fruiting and fruit quality parameters can be observed in Western dry tract of West Bengal as a huge population of this crop can be found as wild plants. The crop improvement programme of this crop is also lacking behind due to the long pre-bearing period and very few superior genotypes as identified by the scientists. Some studies have been done made by various group of scientists to identify superior germplasm of jamun in different parts of India (Misra and Bajpai, 1984; Devi et al., 2002; Bajpai and Ravishankar, 2012; Devi et al., 2002; Misra and Bajpai, 1984). Studies on variation in flowering behaviour, floral morphology and fruit set etc. are very indispensable part to start any crop improvement programme. Jamun exhibits a wide variation in 3 different districts namely Bankura, Purulia and Paschim Burdwan under semi-arid lateritic belt of West Bengal with respect to flowering behaviour, morphology of flowers, fruit set and fruit drop. The, the present study was has been undertaken to evaluate some jamun genotypes of the three localities mentioned locality with respect to their flowering and bearing habits under semi-arid lateritic belt of West Bengal.

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## MATERIAL AND METHODS:

### Study Area

The study was conducted using 10 jamun genotypes (germplasm) from three (3) different districts namely; Bankura, Purulia and Paschim Bardhaman under semi-arid lateritic belt of West Bengal during the year 2022 to determine find out the degree of variation in flowering behavior, and floral morphology present study has been carried out after selecting 10 jamun genotypes (germplasm) randomly from different parts of 3 different districts namely Bankura, Purulia and Paschim Bardhaman under semi arid lateritic belt of West Bengal during the year 2022. The GPS locations of all the jamun plants were recorded using handheld GPS (Garmin GPS 12H). The plants were visited frequently starting from January'2022 to April' 2022 to observe different flowering parameters, panicle characters along with the flower morphology of selected jamun genotypes. Observations on time of panicle emergence, time taken in bud development (days), flushing time, duration of flowering (days), length of panicle (cm), length of flowers (mm), number of branchlets/panicle, number of flowers /branchlets, number of stamens, number of sepals and flower colour were recorded have been taken during flowering season of all the jamun genotypes.

### Data Analysis

All the numerical observations were subjected to simple mean analysis to compare all the jamun genotypes with respect to their flowering behavior and floral morphology using SPSS (George, 2011).

## RESULTS AND DISCUSSION

**Table 1: Locations of Randomly Selected 10 Jamun Accessions from Various Blocks of Purulia, West Bardhaman and Bankura, West Bengal:**

| Sl. No. | Jamun Accessions | Location  |         |              | GPS location |               |
|---------|------------------|-----------|---------|--------------|--------------|---------------|
|         |                  | Village   | Block   | District     | Latitude (°) | Longitude (°) |
| 1       | JA 1             | Bishnupur | Kanksha | W. Bardhaman | 23.616       | 87.409        |

**Comment [D10]:** Briefly describe the location for the study

**Comment [D11]:** How many plants of each genotype was used for the study; how were they selected; how old were the plants/; were the record plants tagged?

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**Comment [D12]:** The function of the Discussion is to interpret your results in light of what is already known about the subject of the investigation. Also to explain your new understanding of the problem after taking your results into consideration. In the discussion you should EXPLAIN the results and the scientific principles that have been established or reinforced. Compare the results with those reported in the literature. (Show how your results agree or contrast with previous work). Use the literature to support a claim, hypothesis or deduction you make from the results. Make a claim for how the results can be applied more generally (deduction) and conclude based on reasoning from the results. What generalizations can be drawn? Are there any theoretical/practical implications of your work? The discussion must rest firmly on the evidence presented in the results section. Continually refer to your results (but do not repeat them). **Do not waste entire sentences restating your results; if you need to remind the reader of the result to be discussed, use "bridge sentences" that relate the result to the interpretation:**  
"The slow response of the lead-exposed neurons relative to controls suggests that...[interpretation]".

Organize the Discussion to address each of the experiments or studies or objectives for which you presented the results. Discuss each in the same sequence as presented in the Results, providing your interpretation of what the results mean in the context of the problem. The discussion must also place emphasis on the implications of the key findings, the way forward for their practical utilization and their limitations.

|    |       |             |                   |              |        |        |
|----|-------|-------------|-------------------|--------------|--------|--------|
| 2  | JA 2  | Jamdaha     | Kanksha           | W. Bardhaman | 23.648 | 87.402 |
| 3  | JA 3  | Kataberia   | Faridpur-Durgapur | W. Bardhaman | 23.609 | 87.372 |
| 4  | JA 4  | Panchgachia | Barabani          | W. Bardhaman | 23.732 | 86.957 |
| 5  | JA 5  | Lagam       | Jhalda II         | Purulia      | 23.358 | 86.021 |
| 6  | JA 6  | Burda       | Bagmundi          | Purulia      | 23.236 | 85.983 |
| 7  | JA 7  | Puryara     | Barabazar         | Purulia      | 23.156 | 86.984 |
| 8  | JA 8  | Dhulai      | Sonamukhi         | Bankura      | 23.356 | 87.415 |
| 9  | JA 9  | Kakatia     | Patrasayer        | Bankura      | 23.204 | 87.455 |
| 10 | JA 10 | Bankisole   | Patrasayer        | Bankura      | 23.201 | 87.453 |

## RESULTS AND DISCUSSION

The location of the various genotypes are shown on Table 1. The results regarding flowering parameters recorded, showed significant difference among different genotypes studied (Table 2). The findings of present investigation summarized in table number 2.

Month of panicle emergence among the selected genotypes ranged from 1st week of March to last week of March (Table 2). It was recorded earliest from genotypes like JA 1, JA 2 and JA 4 much late in JA 10 (March ending). Similar observations on flower initiation was reported by Mishra and Bajpai (1984); Bajpai et al. (2012) and Solomon et al. (2014).

Time taken for bud development was observed 21 (days from panicle emergence) from three accessions like accession JA 9 was shortest among 10 jamun accessions studied. Longest time for bud development was observed in JA 4 (38 days). Tarai and Kundu (2008) studied the flowering behavior of jamun and other minor fruits in the new alluvial zone of West Bengal and got similar results.

It is evident from the Table 2 that peak period of flowering was earliest in genotype JA 1 (April 1<sup>st</sup> week) and in maximum genotypes it was in April mid (2<sup>nd</sup> and 3<sup>rd</sup> week). Tarai et al. (2006) reported that the flowering of jamun commenced ~~was started~~ at the last week of March and ends at the last week of April which takes four week duration of flowering.

Duration of flowering was highest, ~~about of~~ 39 days in genotype JA 6 followed by 35 days in JA 10 and 34 days in JA 4. ~~The it was recorded shortest duration was from~~ JA 7 (24 days). The corresponding observation was recorded for 43 days in jamun by Misra and Bajpai (1984); Bajpai *et al.* (2012); Devi *et al.* (2016).

The longest length of panicle was recorded ~~longest from on~~ JA 1 (13.08 cm) followed by JA 5 (11.27 cm) and the shortest ~~was on from~~ JA 2 (6.73 cm). The highest flower length was measured ~~on from~~ JA 2 (26.39 mm) and lowest ~~on from~~ JA 8 (8.31). The maximum number of branchlets per panicle was recorded ~~on from~~ accessions like JA 1 (15.02) and it was least on JA 8 (7.39). ~~Whereas~~, Singh *et al.* (2012) reported the highest panicle length (15.5 cm) and minimum panicle length (15.12 cm) among sixteen genotypes ~~were~~ studied.

The maximum number of flowers per branchlets was observed ~~on from~~ JA 7 (12.07) followed by JA 4 (11.09) and it was lowest ~~in~~ JA 5 (7.08) and JA 8 (7.89). The number of stamens per flower varied between 58.04-67.07. The flowers with highest numbers of stamens ~~were as~~ observed ~~on from~~ JA 8 and minimum from JA 2. The total number of sepals were 5 in all the accessions. The flower colour of all accessions was light yellow except JA 3 which was (pale green). Similar results ~~were as~~ observed by Alam *et al.* (2020) ~~on studied~~ 12 jamungemplasm from Nadia district of West Bengal.

## **CONCLUSION**

From the findings of the present experiment, the following conclusion can be made:

Month of panicle emergence among the selected genotypes ranged from 1<sup>st</sup> week of March (JA 1, JA 2 and JA 4) to last week of March (JA 10). Time taken for bud development was observed 21 days (JA 9) to 38 days (JA 4) from panicle emergence. The duration of flowering was highest, ~~of~~ 39 days on genotype JA 6 shortest in JA 7 (24 days). The length of panicle was recorded longest from JA 1 (13.08 cm) and shortest ~~on from~~ JA 2 (6.73 cm). The highest flower length was measured from JA 2 (26.39 mm) and lowest from JA 8 (8.31). The maximum number of flowers per branchlets was observed from JA 7 (12.07). The number of stamens per flower varied between 58.04 and 67.07. The total numbers of sepals were 5 in all the accessions. The flower colour of most of all the accessions was light yellow.

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**Comment [D13]:** Conclusion is not just the list of the key findings. The conclusion must be re-written. It should be noted that Conclusion is not a summary of the research by just stating the main findings. NO!!! The conclusion is the last thing that your reader will see, so it should be memorable. A good conclusion will review the key points of the research and explain to the reader why the information is relevant, applicable, or related to the scientific world as a whole. The best way to start a conclusion is simply by restating the problem statement in different words. The next step is to review or reiterate the key points of the research as a whole. Explain why your findings are relevant to your field of research and how your research intervenes within, or substantially revises, existing scholarly knowledge or debates. What is the take-home message for the reader?

## REFERENCES

**Comment [D14]:** Follow the style and format of the journal in the compilation of references

- Alam, M., Mani, A., Mitra, S., & Bauri, F. K. (2020). Flowering, Fruiting and Physio-chemical properties of Jamun (*Syzygiumcumini*Skeels) grown in Nadia district of West Bengal. *Advances in BioResearch*, 11(5): 1-5.
- Bajpai, A. and Ravishankar, H. (2012) Studies on reproductive phenology, flower biology and pollination in jamun (*Syzygiumcumini*Skeels), *Indian J. Hort.*; 69 (3): 416-419
- Devi CA, Swamy GSK, Naik N. (2016) Studies on Flowering and Fruit Characters of Jamun Genotypes (*Syzygiumcumini*Skeels). *Biosciences Biotechnology Research Asia.*,13(4): 2085-2088.
- Devi P. S., Thangam, S. M., Desai, A.R. and Adsule, P. G. (2002) Studies on variability in physico-chemical characters of different jamun (*Syzygiumcumini* Skeels) accessions from Goa. *Indian J. Hort.*; 59(2): 153-156.
- George, D. (2011). *In:SPSS for windows step by step: A simple study guide and reference*, 17.0 update, 10/e. Pearson Education India.: 2-119
- Inamdar, R. (2000) Survey, evaluation of seedling progenies and standardization of clonal propagation of jamun. *M. Sc. (Hort.) Thesis*, Univ. Agric. Sci, Dharwad.
- Misra, R.S. and P.N. Bajpai(1984).Studies on pollination, fruit set, and fruit development in Jamun (*Syzygiumcumini*Skeels). *Progressive Hort.*;16: 1-5.
- Prakash, J., & Singh, S. P. (2007). Mode of Pollination, Fruit Set and Fruit Drop in Jamun (*Syzygiumcumini*Skeels). *Environment and Ecology*, 25(4), 1151.
- Sanjay, S., & Singh, A. K. (2012). Studies on variability in jamun (*Syzygiumcumini*Skeels) from Gujarat. *Asian J. Hort.*, 7(1): 186-189.
- Singh, E.S. and Srivastava, A.K., (2000). Genetic diversity - Jamun (*Syzygiumcumini*Skeels). *Indian J. Hort.*; 45(3): 2-7.
- Singh, Y.S., Shira, V.D. and Swamy, G.S.K. (2016). Genetic variation for morphological and physico-chemical traits in jamun (*Syzygiumcumini*Skeels). *Asian J. Hort.*, 11(1): 163-167.
- Solomon, R., Radhakrishna, J. and Hareesh, C. (2014) Reproductive ecology of *Syzygiumalternifolium*(Myrtaceae), an endemic and endangered tropical tree species in the southern Eastern Ghats of India.*J.Threatened Taxa.*, 6 (9): 6153-6171.
- Tarai, R. K. and Kundu, S. (2008). Flowering behaviour of eight minor fruit crops in the newalluvial zone of West Bengal. *J. of Interacademia*. 12(3): 292-296.

Tarai, R. K., Kundu, S., Ghosh, B., and Mitra, S. (2006). Performance of some minor fruits in west Bengal. In: Ghosh, S. N., Mitra, S. K., Banik, B. C., Hasan, M. A., Sarkar, S. K., Dhua, R. S., Kabir, J., and Hore, J. K.(eds), *Proceedings of national symposium on production , utilization and export of underutilized fruits with commercial potentialities*, 22-24 November 2006, Bibhan Chandra KrishiViswavidyalaya, West Bengal.: 79-82.

Thaper, A. R. (1958) Farm Bulletin, No. 42, ICAR, New Delhi.

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**Table 2: Flowering behaviour of Randomly Selected 102 Jamuna Accessions From Various Blocks of Bankura**

| Sl. No. | Jamun Genotypes | Time of Panicle Emergence  | Time taken in bud development (Days) | Flushing Time              | Duration of Flowering (Days) | Length of panicle (cm) | Length of flowers (mm) | No. of Branchlets/ panicle | No. of Flowers /Branchlets | No. of stamens | No. of sepals | Flower Colour |
|---------|-----------------|----------------------------|--------------------------------------|----------------------------|------------------------------|------------------------|------------------------|----------------------------|----------------------------|----------------|---------------|---------------|
| 1       | JA1             | March 1 <sup>st</sup> week | 31                                   | April 1 <sup>st</sup> week | 28                           | 13.08                  | 22.17                  | 15.02                      | 10.05                      | 62.37          | 5             | Light yellow  |
| 2       | JA2             | March 1 <sup>st</sup> week | 37                                   | April mid                  | 31                           | 6.74                   | 26.39                  | 11.46                      | 9.32                       | 58.04          | 5             | Light yellow  |
| 3       | JA3             | March 3 <sup>rd</sup> week | 27                                   | April 4 <sup>th</sup> week | 25                           | 9.12                   | 15.34                  | 7.94                       | 8.47                       | 65.21          | 5             | Pale green    |
| 4       | JA4             | March 1 <sup>st</sup> week | 38                                   | April mid                  | 34                           | 11.27                  | 21.48                  | 14.34                      | 11.09                      | 59.47          | 5             | Light yellow  |
| 5       | JA5             | March 3 <sup>rd</sup> week | 32                                   | April 4 <sup>th</sup> week | 27                           | 12.91                  | 19.36                  | 9.73                       | 9.81                       | 66.91          | 5             | Light yellow  |
| 6       | JA6             | March 2 <sup>nd</sup> week | 29                                   | April 3 <sup>rd</sup> week | 39                           | 8.09                   | 14.87                  | 14.28                      | 7.08                       | 63.07          | 5             | Light yellow  |
| 7       | JA7             | March 3 <sup>rd</sup> week | 23                                   | April 2 <sup>nd</sup> week | 24                           | 7.51                   | 25.48                  | 10.49                      | 12.07                      | 59.17          | 5             | Light yellow  |
| 8       | JA8             | March 3 <sup>rd</sup> week | 30                                   | April 4 <sup>th</sup> week | 29                           | 9.61                   | 8.31                   | 7.39                       | 7.89                       | 67.07          | 5             | Light yellow  |
| 9       | JA9             | March 3 <sup>rd</sup> week | 21                                   | April 2 <sup>nd</sup> week | 31                           | 10.73                  | 14.27                  | 8.07                       | 8.01                       | 62.74          | 5             | Light yellow  |
| 10      | JA10            | March last week            | 35                                   | May 1 <sup>st</sup> week   | 35                           | 7.16                   | 11.49                  | 11.48                      | 9.47                       | 64.47          | 5             | Light yellow  |
|         | Mean            |                            | 30.3                                 |                            | 30.3                         | 9.62                   | 17.91                  | 11.02                      | 9.32                       | 62.85          | 5             |               |