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Morphological footprints of jackfruit (*Artocarpus heterophyllus* Lam) in Konkan belt of Maharashtra: A comparative study

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Abstract
The present investigation focused on the morphological evaluation of five distinct jackfruit (*Artocarpus heterophyllus* Lam.) genotypes, namely Kadrekar Kapa, Joshi Kapa, Palur-1, Konkan Prolific, and Kerala Type, with the aim of identifying their unique vegetative characteristics. Detailed observations were recorded on crown architecture, leaf dimensions, leaf blade and apex shapes, base form, orientation, posture, and surface texture. Tree crown shape varied from broadly pyramidal in Joshi Kapa and Palur-1 to elliptical in Konkan Prolific and Kerala Type, while Kadrekar Kapa showed a distinct pyramidal form. Leaf blade length ranged from short in Kadrekar Kapa (93 mm) and Joshi Kapa (97 mm) to medium in the other genotypes (105-110 mm), with widths spanning narrow (50 mm in Joshi Kapa) to broad (77 mm in Kerala Type). Leaf blade shape was predominantly obovate or oblong, except in Konkan Prolific, which exhibited an elliptical form. Apex shape was consistently acuminate across genotypes, while the base showed variation between oblique and rounded forms. Orientation differed, with horizontal positioning in Kadrekar Kapa and Joshi Kapa, and erect leaves in the remaining types. Posture was mostly flattened, except for Palur-1 (revolute) and Konkan Prolific (conduplicate). Regardless of variation in other traits, all genotypes shared a smooth upper leaf surface.

Keywords: Jackfruit, morphological characters, Kadrekar Kapa, Joshi Kapa, palur-1, Konkan prolific, Kerala type

Introduction
Jackfruit (*Artocarpus heterophyllus* Lam.), a member of the Moraceae family, is a highly productive evergreen tree native to the Western Ghats of India and widely cultivated across tropical and subtropical regions. It is renowned for producing the largest edible fruit in the plant kingdom, with individual fruits weighing up to 35 kg, and for yielding more prolifically than most other tree crops. Owing to its adaptability to diverse agro-climatic conditions and minimal input requirements, jackfruit holds great promise in traditional agroforestry systems as well as commercial cultivation. Despite its growing economic and nutritional importance, jackfruit remains largely underutilized and under-researched, particularly in terms of varietal improvement. One of the major challenges in jackfruit cultivation is its highly heterozygous and cross-pollinated nature, which results in wide morphological variability in traits such as fruit size, shape, rind texture, bulb type, color, and maturity period. This genetic diversity, though complex, offers immense potential for crop improvement and selection of superior genotypes suited for specific end-uses. Therefore, systematic morphological characterization is essential for identifying and conserving elite types, standardizing descriptors, and laying the foundation for future breeding programs.

Material and Methods
A research study titled "Morphological footprints of Jackfruit (*Artocarpus heterophyllus* Lam) in twin terrains of the Konkan belt of Maharashtra: A Comparative Study" was undertaken during the academic year 2024-2025 at two prominent research centres of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth (DBSKKV), namely the College of Horticulture, Dapoli (Ratnagiri) and the College of Horticulture, Mulde, Kudal (Sindhudurg), Maharashtra. The investigation focused on five distinct jackfruit genotypes namely Kadrekar

Kapa, Joshi Kapa, Palur-1, Konkan Prolific and Kerala type, meticulously evaluating a wide range of morphometric parameters. This comparative assessment aimed to explore the inherent genetic diversity and identify promising genotypes based on their physical and qualitative attributes.

The research was carried out at two research centres under Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth (DBSKKV), in the Konkan region of Maharashtra. The first location, the College of Horticulture, Dapoli (17.76° N latitude, 73.18° E longitude; 244 m above mean sea level), is situated in a moderately elevated zone and receives an average annual rainfall of approximately 2,700 mm, predominantly during the monsoon months from June to October, spanning nearly 100 rainy days. The relative humidity in this region averages around 80%, contributing to a moist subtropical climate.

The second site, the College of Horticulture, Mulde, located in Kudal, Sindhudurg district (16.02° N, 73.42° E; elevation 18 m AMSL), falls within the coastal lowland zone of southern Konkan. This location is characterized by higher rainfall, with annual precipitation ranging from 3,000 mm to 3,200 mm, and maintains a consistently high relative humidity of about 86% to 90% during the southwest monsoon period. The genotypes were selected and tagged at both experimental sites. Trees aged between 10 to 20 years were chosen to maintain consistency in growth and fruiting stage. Morphological observations were recorded systematically to evaluate variation among the genotypes.

Table 1: List of jackfruit genotypes and their geographical originals

Sr. no.	Genotypes	Source	State
1	Kadrekar Kapa	Ratnagiri	Maharashtra
2	Joshi Kapa	Ratnagiri	Maharashtra
3	Palur-1	Ratnagiri	Maharashtra
4	Konkan Prolific	Ratnagiri	Maharashtra
5	Kerala Type	Ratnagiri	Maharashtra

Result and discussion

In the present investigation, an attempt was made to identify superior genotypes of jackfruit collected from the Konkan region of Maharashtra. The evaluation was based on key morphological features and fruit quality parameters. The results obtained from the study are analysed and discussed in this section under relevant subheadings.

Table 2: Morphological evaluation of jackfruit genotypes

Varieties \ Character	Kadrekar Kapa	Joshi Kapa	Palur-1	Konkan Prolific	Kerala Type
Tree crown shape	Elliptical	Broadly pyramidal	Broadly pyramidal	Elliptical	Elliptical
Leaf blade: length	Short (93mm)	Short (97mm)	Medium (110 mm)	Medium (110 mm)	Medium (105 mm)
Leaf blade: width	Medium (60 mm)	Narrow (50 mm)	Medium (70 mm)	Medium (55 mm)	Broad (77 mm)
Leaf blade shape	Obovate	Oblong	Obovate	Elliptical	Obovate
Leaf apex shape	Acuminate	Acuminate	Acuminate	Acuminate	Acuminate
Leaf base shape	Oblique	Oblique	Oblique	Oblique	Rounded
Leaf orientation	Horizontal	Horizontal	Erect	Erect	Erect
Leaf posture	Flattened	Flattened	Revolute	Conduplicate	Flattened
Upper leaf surface	Smooth	Smooth	Smooth	Smooth	Smooth
Fruit clustering habit	Clusters	Clusters	Clusters	Clusters	Clusters
Stalk attachment to fruit	flattened	Inflated	Flattened	Flattened	Flattened

Tree crown shape

The observations revealed that the Joshi Kapa and Palur-1 genotypes exhibited a broadly pyramidal crown shape, indicating a more spreading growth habit. In contrast, the Kadrekar Kapa, Konkan Prolific and Kerala Type varieties were characterized by an elliptical tree shape, suggesting a relatively upright and compact canopy structure. Similar variation was observed by Gwokyalya *et al*. (2024) [2] and Singh *et al*. (2023) [4].

Leaf blade length

Variation in leaf blade length was observed across the five jackfruit genotypes. Kadrekar Kapa and Joshi Kapa recorded short leaf blades, measuring 93 mm and 97 mm respectively. In contrast, Palur-1, Konkan Prolific, and Kerala Type showed medium-length leaf blades, ranging from 105 mm to 110 mm, indicating noticeable morphological differences among the genotypes.

Leaf blade width

The genotypes exhibited noticeable variation in leaf blade width. Joshi kapa recorded the narrowest leaf blade at 50 mm, whereas Kerala type showed the broadest blade measuring 77 mm. Kadrekar kapa (60 mm), Palur-1 (70 mm), and Konkan Prolific (55 mm) were categorized as having medium width leaves, indicating moderate variation among the genotypes in terms of leaf breadth.

Leaf blade shape

Distinct differences in leaf blade shape were recorded among the evaluated jackfruit genotypes. Obovate leaf shapes were observed in Kadrekar Kapa, Palur-1, and Kerala Type, characterized by a wider tip than base. whereas, Joshi Kapa exhibited an oblong leaf form, and Konkan Prolific showed an elliptical blade shape, highlighting the morphological diversity among the varieties. Similar variation was seen by Kisepa *et al*. (2024) [3]

Leaf apex shape
All five jackfruit genotypes exhibited an acuminate leaf apex shape, characterized by a gradually tapering tip. This uniformity in apex form suggests a common morphological trait across the selected varieties.

Leaf base shape
Variation in leaf base shape was evident among the genotypes. Kadrekar Kapa, Joshi Kapa, Palur-1, and Konkan Prolific exhibited an oblique leaf base, indicating an asymmetrical attachment to the petiole. In contrast, the Kerala Type genotype was characterized by a rounded leaf base, reflecting genotypic diversity in leaf morphology.

Leaf orientation
Differences in leaf orientation were observed among the jackfruit genotypes. Kadrekar Kapa and Joshi Kapa exhibited a horizontal leaf orientation, while Palur-1, Konkan Prolific, and Kerala Type found an erect leaf orientation. This variation indicated structural diversity among the genotypes that may influence light interception and canopy structure.

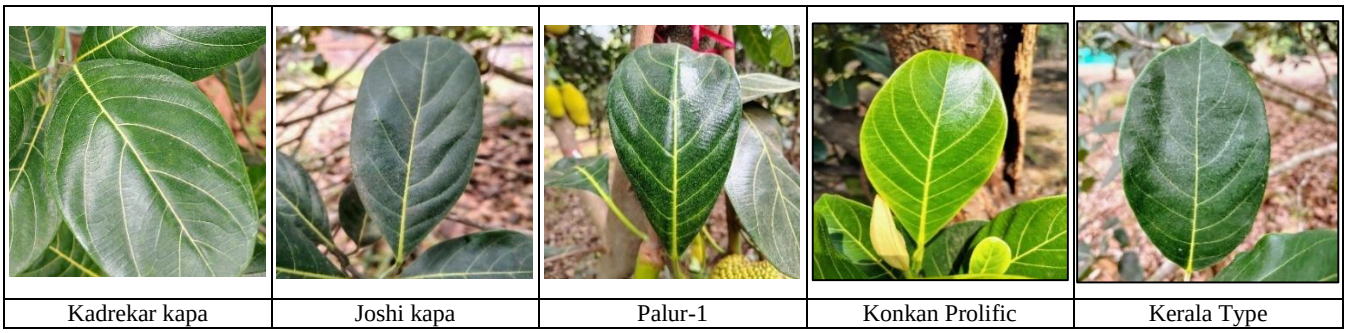
Leaf posture
The study revealed noticeable variation in leaf posture among the jackfruit genotypes. Kadrekar Kapa, Joshi Kapa, and Kerala Type exhibited a flattened leaf posture, indicating a smooth and open leaf surface. In contrast, Palur-1 showed a revolute posture, with leaf margins rolled backward, while Konkan Prolific displayed a conduplicate posture, where the leaf was folded lengthwise along the midrib, reflecting distinct genotypic differences in leaf architecture.

Upper leaf surface
All five jackfruit genotypes exhibited a smooth upper leaf surface, showing no noticeable roughness or pubescence. This uniform trait suggests a common feature across the studied genotypes in terms of leaf surface texture.
Cluster bearing habit
All five jackfruit genotypes exhibited a cluster bearing habit, with multiple fruits developing in close proximity on the same node or branch. This uniform trait suggests a shared reproductive characteristic among the selected varieties, which may contribute to higher fruit density per bearing point.

Stalk attachment to fruit
Differences were observed in the stalk attachment among the jackfruit genotypes. Joshi Kapa exhibited an inflated stalk attachment, forming a swollen base where the stalk connects to the fruit. In contrast, the remaining four genotypes — Kadrekar Kapa, Palur-1, Konkan Prolific, and Kerala Type — showed a flattened stalk attachment, indicating variation in fruit-peduncle structure among the varieties.

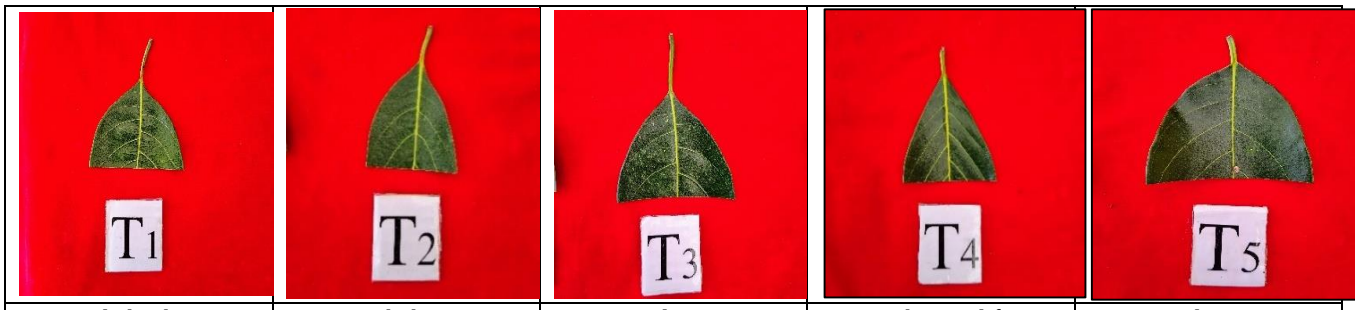
Kadrekar kapa	Joshi kapa	Palur-1	Konkan Prolific	Kerala Type

Fig 1: Crown shape



Kadrekar kapa	Joshi kapa	Palur-1	Konkan Prolific	Kerala Type

Fig 2: Leaf blade shape and upper leaf surface



Kadrekar kapa	Joshi kapa	Palur-1	Konkan Prolific	Kerala Type

Fig 3: Leaf apex shape

Kadrekar kapa	Joshi kapa	Palur-1	Konkan Prolific	Kerala Type

Fig 4: Leaf base shape

Kadrekar kapa	Joshi kapa	Palur-1	Konkan Prolific	Kerala Type

Fig 5: Leaf blade length

Kadrekar kapa	Joshi kapa	Palur-1	Konkan Prolific	Kerala Type

Fig 6: Leaf Blade width

Kadrekar kapa	Joshi kapa	Palur-1	Konkan Prolific	Kerala Type

Fig 7: Cluster bearing habit and stalk attachment to fruit

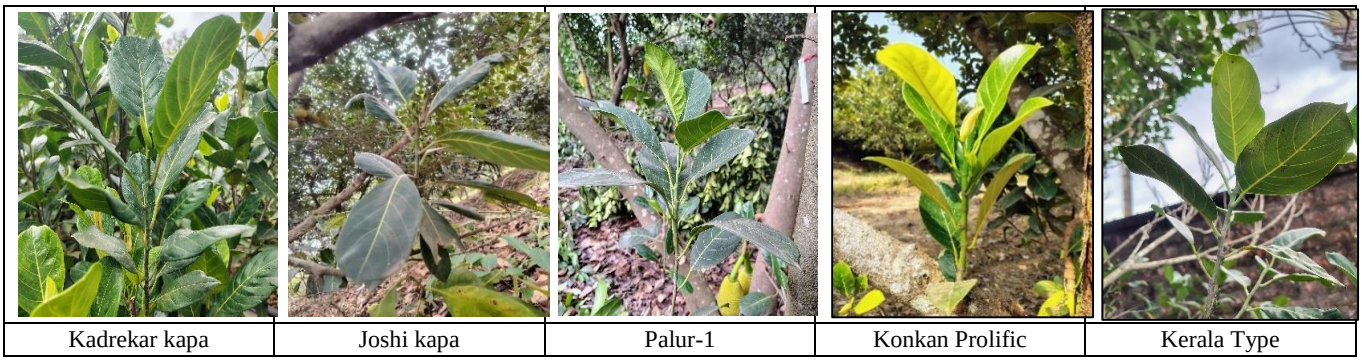


Fig 8: Leaf orientation and leaf posture

Conclusion

The present study on morphological characterization of five jackfruit genotypes revealed substantial variability in both vegetative and reproductive traits. Tree crown shapes ranged from broadly pyramidal in Joshi Kapa and Palur-1 to elliptical in Kadrekar kapa, Konkan Prolific and Kerala Type, which indicated difference in canopy structure and growth habits. Leaf traits such as blade length, width, shape, and posture also varied widely, with Kadrekar Kapa and Joshi Kapa showing shorter and narrower blades, while Kerala Type exhibited broader leaves. Leaf orientation and posture differed among genotypes, and variations in apex and base shapes further emphasized the genetic diversity. While all varieties shared common traits like acuminate apex and smooth upper leaf surface, differences in fruiting position, leaf architecture, and crown shape reflect adaptive strategies and potential for selection based on structural characteristics.

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