

Morphological Characterization of Jackfruit (*Artocarpus heterophyllus* L.) Accessions

A. Aswini*, K. Lila Mathew**, T. Radha***, A.K. Babylatha****, P.S. Abida*****, S. Krishnan*****

ABSTRACT: Jackfruit, one of the important tropical fruit tree produces largest fruits and has got unique characteristics. It exhibits wide heterogeneity due to its cross pollination nature and seedling perpetuation. A preliminary survey was conducted in Central Kerala to explore the variability in jackfruit and 20 promising accessions conserved in the orchard of the College of Horticulture, Kerala Agricultural University, Vellanikkara, Thrissur, Kerala. Characterizations of the accessions were carried out and wide variability was observed in morphological characters. The morphological observations viz., tree characters, inflorescences characters and fruit characters were recorded to assess the proximity of accessions. These accessions were grouped into clusters based on the similarity coefficient. It is concluded that, a tree with oblong shaped fruits with prolific inflorescences on the trunk and primary branches are preferred.

Key words: Jackfruit, *Artocarpus heterophyllus* L., characterization

INTRODUCTION

Jackfruit (*Artocarpus heterophyllus* L.) belongs to the family Moraceae, indigenous to the rainforests of Western Ghats of India (Purseglove, 1968). It is very popular in Eastern and Southern parts of India and it is known as the poor man's food. Flakes of ripe fruits are high in nutritive value, every 100g of ripe flakes contain 287-323 mg potassium, 30.0-73.2 mg calcium and 11-19 g carbohydrates (Samaddar *et al.*, 1985). Jackfruit being an important component of homestead gardens in Kerala, there exists a lot of variability since most are raised from seedlings (Krishnan *et al.*, 2015). Several studies have reported diversity in jackfruit, based on morphological characteristics (Hossain, 1996; Saha *et al.*, 1996; Jagadeesh *et al.*, 2007). A comprehensive understanding on variability of jackfruits in the existing germplasm is needed for conservation which would help in popularising these types as a commercial variety. Hence, the present study was

conducted with the objective to characterize 20 accessions based on its morphological traits.

MATERIALS AND METHODS

In the present study, 20 jackfruit accessions serially numbered as Acc 1 to Acc 20 were obtained from the germplasm collection maintained at the orchard of Department of Pomology and Floriculture, College of Horticulture, Kerala Agricultural University, Vellanikkara, Thrissur situated at latitude of 10° 30' N, longitude of 76° 3'E and at an altitude of 22.25 m above msl. The plants were healthy, about 20 years of age and received similar cultural treatments. The morphological characteristics of each accessions were recorded based on the descriptor provided by the International Plant Genetic Resource Institute (IPGRI, 2000). Tree characters viz., age of the tree, tree height (m), trunk girth (cm), crown shape, branching pattern were recorded. Inflorescence characters viz., female inflorescence density, female and male inflorescence positions, bearing habit were recorded. Mature fruits

* PG student

** Professor (Horticulture)

*** Professor and Head

**** Professor and Head, Pineapple Research Centre, KAU

***** Associate Professor, Centre for Plant Biotechnology and Molecular Biology, KAU,

***** Professor and Head, Department of Agricultural Statistics, KAU

E-mail: aswini.ajith@gmail.com

were collected and fruit characters *viz.*, fruit clustering habit, fruit number, shape, surface, fruit weight (kg), rind thickness (cm), core length and thickness (cm), weight of flake without seed (g), bulb length, bulb diameter (cm), number of seeds were recorded. Similarity coefficient was used to generate pairwise similarity matrices using the SAHN format of NTSYS-pc version 2.02i and analysed the data.

RESULTS AND DISCUSSION

Morphological observations were recorded from 20 jackfruit accessions based on the IPGRI descriptor. Data on fruit characters, inflorescence characters and tree characters were subjected to hierarchical cluster analysis using NTSYS software.

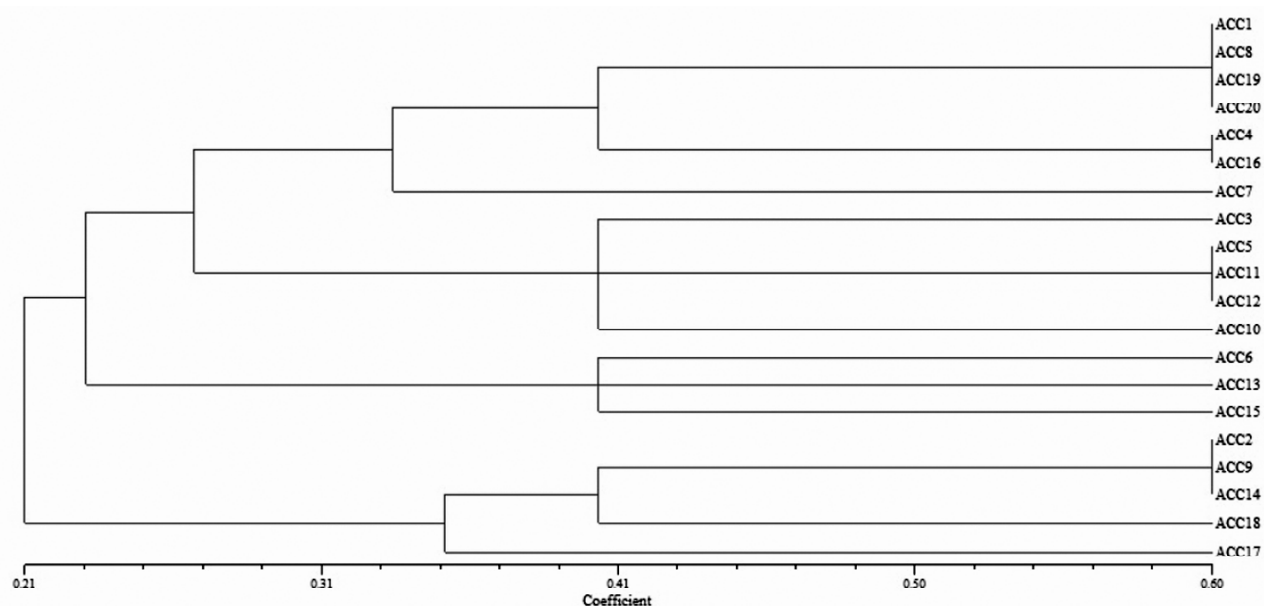


Figure 1. Dendrogram of tree characters of jack accessions

At the similarity coefficient status of 0.39, grouping of accessions was done which resulted in 6 non overlapping clusters (Fig 1). The subgroups of accessions in the non-overlapping clusters are presented in (Table 1).

Table 1
Cluster wise listing of accessions

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
ACC1	ACC7	ACC5	ACC6	ACC2	ACC17
ACC8		ACC11	ACC13	ACC9	
ACC19		ACC12	ACC15	ACC14	
ACC20		ACC10		ACC18	
ACC4		ACC3			
ACC16					

Table 2
Cluster wise summary statistics of tree characters

Characters	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Age of the tree	20	20	20	20	20	20
Tree height (m)	10.33	9.5	8.9	6.5	8.63	15.5
Trunk girth (cm)	168.83	190	132.4	195.67	169.88	190
Crown shape	Irregular and Spherical	Elliptical	Pyramidal, Spherical and Elliptical	Oblong, Pyramidal and Spherical	Broadly pyramidal and semi-circular	Irregular
Branching pattern	Irregular, Erect	Opposite	Erect	Opposite	Verticillate	Horizontal

Based on the summary statistics of tree characteristics (Table 2) it could be inferred that the tree height, crown shape and branching pattern is mainly influenced by its ability to compete with the

surrounding obstructions. If the surrounding obstructions are prolific, the tendency to have an erect pattern of growth with poor branching pattern in a disoriented manner.

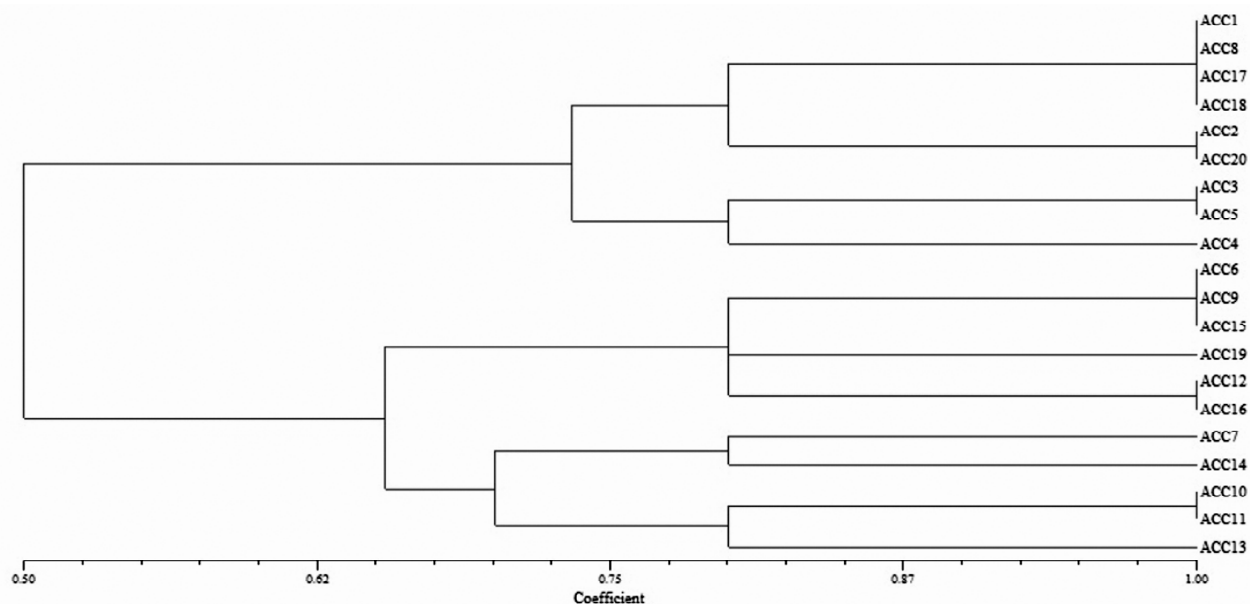


Figure 2. Dendrogram of inflorescence characters of jack accessions

At the similarity coefficient status of 0.798, grouping of accessions was done which resulted in 5 non overlapping clusters (Fig 2). The subgroups of accessions in the non-overlapping clusters are presented in Table 3.

Table 3
Cluster wise listing of accessions

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
ACC1	ACC3	ACC6	ACC7	ACC10
ACC8	ACC5	ACC9	ACC14	ACC11
ACC17	ACC4	ACC15		ACC13
ACC18		ACC19		
ACC2		ACC12		
ACC20		ACC16		

Table 4
Cluster wise summary statistics of inflorescence characters

Characters	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Female inflorescence density	Dense	Intermediate and Sparse	Intermediate, Sparse and Dense	Dense	Sparse
Female inflorescence positions	Mainly on trunk 1 ⁰ and 2 ⁰ branches	Mainly on trunk and 1 ⁰ branches	On the whole stem including 1 ⁰ , 2 ⁰ and 3 ⁰ branches	Mainly on trunk, 1 ⁰ and 2 ⁰ branches	Mainly on trunk, 1 ⁰ and 2 ⁰ branches
Male inflorescence positions	On all positions equally	Mainly on 1 ⁰ branches	All positions equally	All positions equally	All positions equally
Bearing habit	Regular	Regular	Regular	Regular	Regular
Secondary flowering	Absent	Absent	Absent	Absent	Absent

Based on the summary statistics of inflorescence characteristics (Table 4) it is inquired that the competition for sunlight and the way of infiltration will definitely speak

out the inflorescences density as well as its position. Among the trees observed the bearing habit was regular with no secondary flowering noticed.

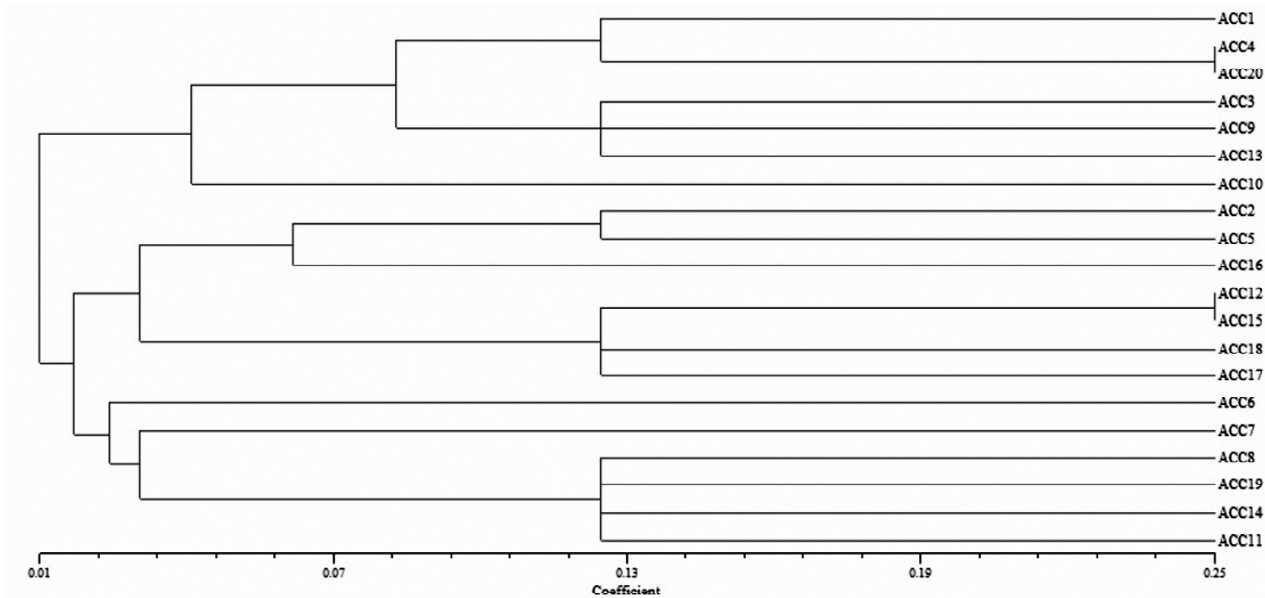


Figure 3. Dendrogram of fruit characters of jack accessions

At the similarity coefficient status of 0.118, grouping of accessions was done which resulted in nine non-overlapping groups (Fig 3). The sub groups

of accessions in the non-overlapping clusters are presented in Table 5.

Table 5
Cluster wise listing of accessions

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9
ACC1	ACC3	ACC10	ACC5	ACC16	ACC12	ACC6	ACC7	ACC 8
ACC4	ACC9		ACC2		ACC15			ACC19
ACC20	ACC13				ACC18			ACC14
					ACC17			ACC11

Table 6
Cluster wise summary statistics of fruit characters

Characters	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9
Fruit weight (Kg)	11	9.67	12	10	6	8.08	10	20	9.14
Rind thickness (cm)	2	1.5	0.5	1.1	1.8	1.33	1.4	1.2	1.05
Core length (cm)	33.34	34.34	34	47	20	22.25	43	13.9	25.75
Core thickness (cm)	6	5	10	6.75	6	32	8.5	5.5	28
Weight of the flake without seed (Kg)	24.96	26.31	26.47	25.72	23.75	23.83	2418	28.38	26.41
Bulb length (cm)	6.04	5.96	6.33	5.73	5.29	5.19	5.65	6.54	6.04
Bulb diameter (cm)	8.37	7.92	7.97	8.7	7.96	7.54	8.51	7.87	7.83
No. of seeds	195.67	210	428	330	163	183.5	328	325	209

Among the fruit characteristics the fruit weight increased with a lessened core length and thickening (Table 6). The packing of the flake increased with marginal increase in the flake associated parameters. So it is desirable that a tree with oblong shaped fruits with prolific inflorescences on the trunk and primary branches are preferred.

CONCLUSION

Based on the tree characteristics, inflorescence characteristics and fruit characteristics could be inferred that if the surrounding obstructions are prolific, the tendency to have an erect pattern of growth with low branching. Among the trees observed, the bearing habit was regular with no secondary flowering. It is also observed that the fruit weight increased with a lessened core length and thickening. The packing of the flake increased with marginal increase in the flake associated parameters. So it is desirable that a tree with oblong shaped fruits with prolific inflorescences on the trunk and primary branches are preferred.

ACKNOWLEDGMENT

The authors gratefully acknowledge Kerala Agricultural University, Thrissur, Kerala, 680656,

India and Government of India for providing funds and facilities to carry out the research works.

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