Plant Archives Vol. 26, Supplement 1, 2026 pp. 849-857 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-1.114

STUDY ON MORPHOLOGICAL DIVERSITY IN JACKFRUIT (*ARTOCARPUS HETEROPHYLLUS* LAM.) GERMPLASM FROM DIVERSE AGRO-CLIMATIC REGIONS OF INDIA

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(Date of Receiving : 20-09-2025; Date of Acceptance : 29-11-2025)

ABSTRACT

Jackfruit (*Artocarpus heterophyllus* Lam.) is widely grown across North Tripura but remains under-characterized despite its nutritional, industrial, and livelihood significance. This study assessed morphological and foliage diversity among 50 on-farm genotypes collected from eight blocks (Kadamtala, Jubarajnagar, Kalacherra, Laljuri, Panisagar, Damcherra, Dasda, and Jampui Hills) during 2019–2021 using Bioversity International jackfruit descriptors. Quantitative tree traits (height, trunk height, trunk circumference, crown diameter) and foliage traits (leaf blade length, leaf blade width, and petiole length) were recorded in situ; biochemical analyses followed standard protocols. Data were analyzed using descriptive statistics and ANOVA under a randomized block design (RBD). Substantial phenotypic variability was detected across environments characterized by tropical climate and acidic soils (pH 5.4–6.1). Tree height ranged from 4.30–17.20 m (maximum in JF-12), trunk height 0.50–3.10 m (maximum in JF-35), trunk circumference 45.00–322.00 cm (maximum in JF-35), and crown diameter 3.00–11.00 m (maximum in JF-12 and JF-35). Foliage traits also varied widely: leaf blade length 10.00–19.00 cm (maximum in JF-35), leaf blade width 5.20–12.10 cm (maximum in JF-36), and petiole length 12.00–38.00 mm (maximum in JF-36). The results highlight distinct superior candidates (notably JF-12, JF-35, JF-36) for targeted conservation, clonal selection, and use as parents in breeding programs aimed at productivity and product quality improvement in North-East India.

Keywords **:** Artocarpus heterophyllus; jackfruit descriptors; on-farm diversity; Northern Tripura; morphological characterization; foliage traits; randomized block design; phenotypic variability; clonal selection; genetic resources

Introduction

The Jackfruit (*Artocarpus heterophyllus* Lam.), also popularly known as the “poor man’s fruit”, is a species of tree in the Fig, Mulberry and Breadfruit family Moraceae and originated in the rainforests of the Western Ghats of India (Chandler, 1958;

Purseglove, 1968; Popenoe, 1974). From Nutritive value and Health benefits point of view - The Jackfruit provides a potential part of the solution for tropical countries facing problems with nutritional security. The Jackfruit is a multi-purpose tree providing food, fodder, timber, fuel, medicinal and industrial products.

Tripura being under Eastern Himalayan Agro-Climatic Region produces a major share of Jackfruit in India. In Tripura, it is one of the major fruit crop. The largest Jackfruit producing districts are West Tripura and South Tripura out of total eight districts. It is only fruit crop having production clusters in all districts.

Roy (2008) reported that till date no research study has been conducted on Jackfruit of Tripura (especially at the Northern parts of this State) despite it is being produced in bulk with rich genetic diversity.

Tripura, there is a high potential for increasing the area, production, and processing as a rainfed fruit crop, but it is grown non-scientifically or does not have a commercial or promising variety for this state. Therefore, there is an urgent need for a survey, collection, conservation, and characterization of the threatened cultivars or clones of jackfruit in Northern Tripura for improvement and to increase sustainable production and productivity now or in the future for food security in the district. So, the characterization of jackfruit types is essential before taking up any research programme for their commercial exploitation in the jackfruit industry and also for a breeding programme. For undertaking any improvement programme, the knowledge of various aspects of morphology, floral biology, and fruit characters of jackfruit is in fact of great significance.

Therefore, there is an urgent needs for survey, collection, conservation and characterization of the threatened cultivars or clones of Jackfruit in Northern Tripura for improvement and to increase the sustainable production and productivity at now or in future for food security in the district.

Keeping in mind all these already discussed facts, the present investigation entitles "Study on Morphological Diversity in Jackfruit (*Artocarpus heterophyllus* Lam.) Germplasm from Diverse Agro-Climatic Regions of India" has been conducted with following objective:

To study the morphological diversity of selected Jackfruit genotypes in Northern Tripura region.

To identify the superior among the selected genotypes.

Materials and Methods

Experimental site

The region of the Northern parts of Tripura State is covered for the study included the hilly zone. The characterization of 50 (fifty) different Jackfruit genotypes were collected from 8 (eight) blocks namely, Kadamtala, Jubrajnagar, Kalacherra, Laljuri, Panisagar, Damchera, Dasda, Jampui Hills in the state following the Bio-diversity International Jackfruit Descriptor during the years 2019-2021.

The morphological diversity and quantitative characteristics of selected Jackfruit genotypes were performed in situ. The Bio-chemical diversity and Analytical diversity for quantitative characters were done in the College of Agriculture, Lembucherra, Tripura as well as in the Department of Horticulture & Post-harvest Technology, Palli Siksha Bhavana, Visva-Bharati, Sriniketan, West Bengal.

Ecology and soil of growing sites

The sample collection sites were located in the North-eastern part of Tripura, the District covers an area of about 1422.19 sq km. Jampui hills is located along the eastern boundary of the district and Dharmanagar-Panisagar valley located at the north-western part. More than 70% area is hilly and forest covered. The terrain is mostly undulating & hilly with small water streams (cherras), rivers and fertile valleys intervening.

The climate of the district is tropical in nature and is generally warm and humid. The hilly regions enjoy higher temperature in summer and lower temperature in winter in comparison with the plain lands. The climatic temperature generally ranges in between 100C and 350C.

Soil is acidic in nature (pH 5.4 – 6.1).

Table 1: Location details of various Jackfruit germplasm samples chosen for the present study

Sl. No.	Genotypes	Place of collection	Geographical location	
			Latitude (North)	Longitude (East)
1	JF-1	Krishi Vigyan Kendra Office, Panisagar, Tripura, India	24°15'17.2"	92°9'14.5"
2	JF-2	House of Prasenjit Das, Roa, Tripura, India	24°15'42.9"	92°10'14.6"
3	JF-3	House of Anup Nath, Laxmipur, Dasda, Tripura, India	23°57'40.1"	92°12'7.9"
4	JF-4	House of Md. Khalil Uddin, Pekucherra, Tripura India	24°15'19.5"	92°10'21.1"

5	JF-5	House of Himadri Sekhar Das, Bilthoi, Tripura, India	24°16'43.5"	92°8'59.1"
6	JF-6	House of Lalnunpuia, Purba Hmunpui, Jampui, Tripura, India	24°3'8.2"	92°16'36.8"
7	JF-7	House of Lalhriatpuia, Vanghmun, Jampui, Tripura, India	$24^0$0'15.9"	$92^0$16' 43.1"
8	JF-8	House of Narayan Bhowmik, Pratyekroy, Tripura, India	$24^0$24'41.8"	$92^0$11'58.4"
9	JF-9	House of Bikash Chandra Reang, Satnala, Kanchanpur, Tripura, India	$23^0$59'38.1"	$92^0$12'48.1"
10	JF-10	House of Aisharai Reang, Laljuri, Tripura, India	$24^0$9'5.0"	$92^0$12'39.8"
11	JF-11	House of Biswadeep Chakraborty Kameswar, Tripura, India	$24^0$22'54.2"	$92^0$11'18.5"
12	JF-12	House of Sujit Pal, Baruakandi, Ragna, Tripura, India	$24^0$24'25.1"	$92^0$8'44.8"
13	JF-13	House of Jamal Hachaini, Rajnagar, Tripura, India	$24^0$19'31.9"	$92^0$7'56.2"
14	JF-14	House of Barun Rupini, Rahumchhara, Tripura, India	$24^0$14'39.7"	$92^0$15'56.1"
15	JF-15	House of Subhash Bhowmik, Damcherra, Tripura, India	$24^0$14'38.7"	$92^0$16'40.6"
16	JF-16	Office of the Superintendent of Agriculture, Kadamtala, Tripura, India	$24^0$27'9.5"	$92^0$13'7.5"
17	JF-17	House of Utpal Nath, Mantala, Dharmanagar Jail Road, Tripura, India	$24^0$22'9.2"	$92^0$8'46.5"
18	JF-18	House of Sarat Kumar Halam, Purba Halam Para, Ujan Machmara, Tripura, India	$24^0$8'2.7"	$92^0$13'12.6"
19	JF-19	House of Bikash Debnath, Purba Tilthoi, Tripura, India	$24^0$18'6.7"	$92^0$8'48.1"
20	JF-20	House of Buddhimantra Singha Sanicherra, Tripura, India	$24^0$22'44.7"	$92^0$14'6.4"
21	JF-21	House of Dhirendra Das, Algapur, Dharmanagar, Tripura, India	$24^0$22'49.9"	$92^0$8'31.0"
22	JF-22	House of Kutub Ali, Bishnupur, Tripura, India	$24^0$26'1.0"	$92^0$11'8.3"
23	JF-23	House of Taj Uddin, Jubarajnagar, Tripura, India	$24^0$19'20.8"	$92^0$8'28.4"
24	JF-24	House of Surendra Nath, Noagaon, Purba Tilthoi, Tripura, India	$24^0$18'22.4"	$92^0$8'36.0"
25	JF-25	House of Lamlingul Halam, Paschim Tilthoi, Tripura, India	$24^0$16'35.5"	$92^0$6'13.3"
26	JF-26	House of Pritesh Malakar, Maheshpur, Tripura, India	$24^0$27'1.1"	$92^0$1'10.9"
27	JF-27	House of Abdul Hannan, Jubarajnagar, Tripura, India	$24^0$19'6.9"	$92^0$8'21.8"
28	JF-28	House of Vanchungngir Halam, Laxminagar, Tripura, India	$24^0$24'26.3"	$92^0$14'19.2"
29	JF-29	House of Nantu Ghosh, Hurua, Tripura, India	$24^0$22'25.4"	$92^0$12'40.7"
30	JF-30	House of Arjun Nath, Uttar Padmabil, Tripura, India	$24^0$17'56.6"	$92^0$10'57.5"
31	JF-31	House of Darsunliyn Halam, Vati Sailen Bari, Bilthoi, Tripura, India	24°15'23.4"	$92^0$7'23.6"
32	JF-32	House of Goutam Datta, Chandrapur, Dharmanagar, Tripura, India	24°23'49.2"	92°9'27.6"
33	JF-33	House of Ayub Ali, Purba Halflong, Tripura, India	$24^0$19'26.1"	$92^0$8'7.7"
34	JF-34	House of Anjana Rani Reang, Ahalyapur, Kanchanpur, Tripura, India	24°3'9.7"	92°12'24.1"
35	JF-35	House of Khetrajoy Reang, Piplacherra, Damcherra, Tripura, India	$24^0$14'17.5"	$92^0$17'34.1"
36	JF-36	House of Pintu Nath, Pratyekroy, Tripura, India	$24^0$24'36.8"	$92^0$12'57.6"
37	JF-37	House of Basudeb Ghosh, Ganganagar, Tripura, India	$24^0$22'24.6"	$92^0$12'39.9"
38	JF-38	House of Sulaka Nath, laljuri Paper Area, Tripura, India	$24^0$7'7.6"	$92^0$12'12.6"
39	JF-39	House of Dahanjoy Reang, Hemsukla Para, Ujanc Machmara, Tripura, India	$24^0$6'45.8"	$92^0$13'48.6"
40	JF-40	House of Rahul Nath, Dakshin Padmabil, Tripura, India	$24^0$17'22.3"	$92^0$11'5.6"
41	JF-41	House of Ranamoy Das, Helenpur, Dasda, Laxmipur, Tripura, India	$23^0$56'13.3"	$92^0$13'16.3"
42	JF-42	House of Amir Uddin, Challish Drone, Kadamtala, Tripura, India	$24^0$27'54.8"	$92^0$12'50.5"
43	JF-43	House of Madhu Debnath, Deocherra, Ramnagar, Tripura, India	$24^0$18'13.7"	$92^0$9'36.8"
44	JF-44	House of Prasenjit Malakar, Churaibari, Kadamtala Road, Tripura, India	$24^0$26'14.0"	$92^0$14'43.0"
45	JF-45	House of Toniwa Goswami,East Chandrapur, Dharmanagar, Tripura, India	$24^0$23'35.6"	$92^0$09'57.0"
46	JF-46	House of Subir Malakar,Padmapur, Dharmanagar, Tripura, India	$24^0$21'28.0"	$92^0$9' 39.1"
47	JF-47	House of Dipti Debbarma,Uptakhali,Tripura, India	$24^0$19'37.1"	$92^0$12' 3.9"
48	JF-48	House of Tingpaikhup Halam,madhuban word 3,Paschim Tilthoi,Tripura, India	$24^0$16'28.3"	$92^0$6' 24.5"
49	JF-49	House of Bappu Chakroborty, Damcherra, Tripura, India	$24^0$14'18.9"	$92^0$17'14.7"
50	JF-50	House of Nishikanta Nath, Mathabpur, Jalebasha, Tripura, India	$24^0$15' 9.7"	$92^0$11'40.7"

Procedure for data collection on Morphological and quality characters

Observations on Quantitative traits were taken manually as per the unit of scale. Qualitative characters had been registered as per the "Jackfruit Descriptor" (published from Bio-diversity International). For Bio-chemical attributes Standard Methods of analysis were followed.

Statistical Analysis and Interpretation of collect Data

The data were analyzed to test the significance of differences between them through descriptive statistics and analysis of variance for Randomized Block Design (RBD) following the procedure suggested by Panse and Sukhatme (1978).

Results and Discussion

The Jackfruit (*Artocarpus heterophyllus* L.) tree is a resource with several uses, including the production of commodities for industry, medicine, food, fuel, and other uses. But there hasn't been a lot of systematic research on its morphological, genetic variability estimates, genetic diversity assessments for characterization, or screening of superior kinds found in India, particularly in North-east India, including Tripura. So, keeping in mind the above, the present investigation was carried out, and data was collected, assessed, and statistically processed to produce more definitive findings. The result has been depicted in tabular form and illustrated with tables and graphs in order to obtain a comprehensive idea of the investigation. The results obtained and discussed under the appropriate heading are as follows:

Extent of variation

The existence of enormous variability is the fundamental basis of any crop improvement programme, without which neither the improvement of existing cultivars nor the development of new varieties is feasible. It also enriches biodiversity and improves interaction with the biotic and abiotic factors of its environment. The study of variability is the foremost step to carry out a breeding programme that plays a key role in selecting the best genotypes. The natural variability present in the crop species can be exploited to create novel variability that can cope with all present-day challenges. To carry out a quality breeding approach, magnitude of genetic variability plays a paramount role.

Quantitative traits

The 7 (seven) quantitative morphological traits were observed in the present study for 50 (fifty) jackfruit germplasm. These traits are described under the following heads and subheads:

Tree morphological quantitative traits:

The quantitative tree morphological traits such as tree height, trunk height, trunk circumference and crown diameter showed variations among the jackfruit genotypes, which are presented as follows:

Among the fifty investigated genotypes, tree height ranged from 4.30 m to 17.20 m [Table 2]. The tree height was the maximum in the genotype JF-12, followed by JF-16 (17.00 m), JF-40 (16.80 m), JF-30 (16.70 m), JF-14and JF-20 (both having a tree height of 16.50 m), while the shortest tree was seen for JF-48, preceded by JF-45 (4.60 m) and JF-43 (5.20 m). The trunk height of the investigated genotypes varied from 0.50 m to 3.10 m with an average value of 1.61 m [Table 2 and Plate 1]. The highest trunk height was recorded in JF-35 (3.10 m), followed by JF-12 (3.00 m), JF-16 (2.80 m), JF-25 (2.60 m) and JF-47 (2.50 m) and the lowest trunk height of 0.50 m was recorded in the genotype JF-19 and this value was preceded by 0.70 m (for JF-48), 0.80 m (for JF-33) and 0.90 m (for JF-29 and JF-45). The trunk circumference of jackfruit genotype JF-35 (322.00 cm) was the maximum [Table 2], followed by JF-12 (310.00 cm), JF-16 (302.00 cm) and JF-14 (290.00 cm) and the lowest in JF-48 (45.00 cm).

The crown diameter of fifty jackfruit types was found to be ranged between 3.00 to 11.00 m [Table 2 and Plate 1]. Crown diameter of jackfruit JF-12 and JF-35 were maximum (11.00 m), followed by JF-14, JF-16 (having 10.00 m each), JF-6, JF-13, JF-15 and JF-48 (each having crown diameter of 8.50 m) and the minimum value for this parameter was observed in JF-33, JF-45 and JF-48 (all having crown diameter of 3.00 m).

Singh *et al*. (2018) conducted a study to evaluate the genetic diversity of jackfruit cultivated in Tripura's agroforestry domestic gardens in order to select elite forms of jackfruit germplasm. From 20 significant jackfruit growing regions that are bordered by forests, 42 jackfruit genotypes were chosen. They found that the jackfruit genotypes' tree heights ranged from 5.00 to 30.00 m. Chandrashekhar e*t al*. (2018) evaluated 35 local genotypes of jackfruit under the coffee ecosystem of lower Pulney hills at Horticultural Research Station, Thadiyankudisai and its adjoining areas, during 2016-2017. According to their research findings, the tree height, trunk height, trunk circumference and crown diameter ranged between 10.94 to 23.64 m, 1.79 to 9.58 m, 60.18 to 273.13 cm and 7.35 to 28.75 m, respectively.

Table 2: Tree morphological quantitative traits of jackfruit (*Artocarpus heterophyllus* Lam.) germplasm

Sl. No.	Accession Codes	Tree height (m)	Trunk height (m)	Trunk circumference(cm)	Crown diameter (m)
1	**JF-1**	15.40	2.40	243.00	7.50
2	**JF-2**	6.50	1.20	99.00	4.00
3	**JF-3**	6.80	1.40	123.00	4.50
4	**JF-4**	9.10	1.00	150.00	5.00
5	**JF-5**	10.00	1.60	101.00	5.50
6	**JF-6**	11.80	1.80	188.00	8.50
7	**JF-7**	13.50	2.00	204.00	8.00
8	**JF-8**	8.80	1.60	115.00	6.00
9	**JF-9**	11.00	1.50	132.00	6.00
10	**JF-10**	9.00	1.30	173.00	5.00
11	**JF-11**	12.60	1.50	190.00	7.50
12	**JF-12**	17.20	3.00	310.00	11.00
13	**JF-13**	12.20	2.20	210.00	8.50
14	**JF-14**	16.50	2.10	290.00	10.00
15	**JF-15**	13.30	1.80	208.00	8.50
16	**JF-16**	17.00	2.80	302.00	10.00
17	**JF-17**	11.20	1.50	127.00	6.50
18	**JF-18**	10.30	1.10	136.00	7.50
19	**JF-19**	6.00	0.50	67.00	4.50
20	**JF-20**	16.50	2.10	222.00	6.50
21	**JF-21**	12.50	1.80	138.00	8.00
22	**JF-22**	12.20	1.60	144.00	6.50
23	**JF-23**	12.00	1.40	125.00	5.50
24	**JF-24**	10.30	1.20	100.00	6.00
25	**JF-25**	14.00	2.60	234.00	8.00
26	**JF-26**	12.40	1.80	202.00	7.50
27	**JF-27**	11.00	1.40	105.00	7.00
28	**JF-28**	6.40	1.00	88.00	5.00
29	**JF-29**	6.60	0.90	55.00	4.00
30	**JF-30**	16.70	2.40	160.00	7.00
31	**JF-31**	10.00	1.30	105.00	3.50
32	**JF-32**	9.80	1.00	92.00	4.00
33	**JF-33**	9.00	0.80	71.00	3.00
34	**JF-34**	14.60	1.60	132.00	6.50
35	**JF-35**	16.00	3.10	322.00	11.00
36	**JF-36**	15.30	1.80	170.00	7.00
37	**JF-37**	12.00	1.50	164.00	6.50
38	**JF-38**	15.30	1.60	173.00	6.50
39	**JF-39**	13.40	2.00	210.00	7.00
40	**JF-40**	16.80	1.60	135.00	5.00
41	**JF-41**	11.30	1.20	96.00	5.00
42	**JF-42**	10.00	1.20	74.00	3.50
43	**JF-43**	5.20	1.10	60.00	5.00
44	**JF-44**	12.70	1.70	190.00	7.00
45	**JF-45**	4.60	0.90	68.00	3.00
46	**JF-46**	13.40	1.60	118.00	6.50
47	**JF-47**	12.30	2.50	224.00	8.50
48	**JF-48**	4.30	0.70	45.00	3.00
49	**JF-49**	14.00	1.40	177.00	7.50
50	**JF-50**	15.60	1.50	200.00	7.50
	Mean	**11.69**	**1.61**	**155.34**	**6.43**
	C.V.	**11.325**	**10.905**	**6.089**	**5.182**
	Range	**4.30-17.20**	**0.50-3.10**	**45.00-322.00**	**3.00-11.00**

Significant differences were observed with respect to leaf blade length of various jackfruit germplasm under the present study [Table 3, Fig. 1 and Plate 2]. The mean leaf blade length was recorded as 13.10 cm. The highest leaf blade length of genotype JF-35 (19.00) was followed by JF-14 (17.00 cm), JF-50 (17.00 cm), JF-4, JF-7, JF-25, JF-40 and JF-46 (having leaf blade length of 15.00 cm). JF-35 was found statistically at par with JF-14 and JF-50. Genotypes JF-4, JF-7, JF-25, JF-40 and JF-46 were also found as statistically at par with JF-14 and JF-50. Leaf-blade length of JF-35 was 1.90 times higher than those of JF-24, JF-33, JF-42, JF-43 and JF-48. The data on leaf blade width is given in Table 3, Fig. 2 and Plate 3. The genotypes varied statistically for this character. The character value varied from 5.20 cm to 12.10 cm. Genotype JF-36 revealed the highest leaf blade width, followed by JF-34 (11.80 cm), JF-26 (11.60 cm) and JF-40 (10.30 cm). The lowest leaf blade width was recorded in genotype JF-30 (5.20 cm), proceeded by JF-35 (5.50 cm) and JF-12 (5.60 cm).

Variation in length and width of the leaf blade in different jackfruit types was earlier reported by Maiti *et al*. (2003). Similar findings were also reported by Sarkar & Zuberi (2011), Chandrashekhar (2014), Phaomei *et al*. (2017) and Roy *et al*. (2018). Phaomei *et al*. (2017) carried out an investigation in West Garo Hills, Meghalaya, and reported that leaf blade length varied from 8.2 cm to 17.7 cm among the twenty studied genotypes with a mean leaf blade length of 14.57 cm, which nearly corroborates with our finding. The present finding is in partial accordance with the finding of Roy *et al*. (2018), who reported maximum and minimum leaf blade width of 9.56 cm and 5.50 cm respectively in a study carried out under *tarai* condition of Uttarakhand.

Leaf petiole length of the selected types varied between 12.00 mm in JF-48 and 38.00 mm in JF-36 and it showed remarkable variation [Table 3 and Plate 4]. Considerably longer petiole length had been documented from JF-34 (35.00 mm), JF-26 (33.00 mm), JF-37 (33.00 mm), JF-6 (32.00 mm) and JF-50 (30.00 mm). On the other hand, petiole length was seen at the lower side for JF-36 (13.00 mm), JF-16 (14.00 mm), JF-33 (14.00 mm) and JF- 45 (15.00 mm). A similar finding was reported by Chandrashekhar *et al*. (2018) who observed petiole length of all the studied genotypes ranged from 35.29 mm to 13.56 mm with a mean of 20.88 mm in an investigation of 35 local genotypes of jackfruit under the coffee ecosystem of lower Pulney hills. The finding is also in line with the finding of Phaomei *et al*. (2017).

Table 3: Foliage morphological quantitative traits of jackfruit (*Artocarpus heterophyllus* Lam.) germplasm

Sl. No.	Accession Codes	Leaf blade length (cm)	Leaf blade width (cm)	Petiole length (mm)
1	**JF-1**	16.00	6.40	21.00
2	**JF-2**	12.00	8.00	17.00
3	**JF-3**	13.00	8.50	19.00
4	**JF-4**	15.00	8.40	24.00
5	**JF-5**	12.00	6.90	27.00
6	**JF-6**	14.00	9.10	32.00
7	**JF-7**	15.00	9.20	28.00
8	**JF-8**	12.00	8.20	19.00
9	**JF-9**	13.00	9.50	22.00
10	**JF-10**	14.00	7.80	29.00
11	**JF-11**	11.00	9.50	31.00
12	**JF-12**	14.00	5.60	18.00
13	**JF-13**	13.00	8.90	24.00
14	**JF-14**	17.00	6.70	19.00
15	**JF-15**	13.00	7.70	24.00
16	**JF-16**	14.00	6.00	14.00
17	**JF-17**	13.00	7.60	21.00
18	**JF-18**	13.00	9.80	29.00
19	**JF-19**	11.00	7.10	25.00
20	**JF-20**	13.00	8.30	18.00
21	**JF-21**	12.00	8.80	27.00
22	**JF-22**	14.00	8.50	25.00
23	**JF-23**	12.00	8.20	29.00
24	**JF-24**	10.00	8.20	35.00
25	**JF-25**	15.00	9.80	28.00
26	**JF-26**	13.00	11.60	33.00

27	**JF-27**	11.00	8.00	26.00
28	**JF-28**	14.00	7.50	21.00
29	**JF-29**	11.00	7.90	18.00
30	**JF-30**	14.00	5.20	17.00
31	**JF-31**	13.00	8.10	25.00
32	**JF-32**	11.00	9.00	26.00
33	**JF-33**	10.00	8.00	14.00
34	**JF-34**	13.00	11.80	33.00
35	**JF-35**	19.00	5.50	13.00
36	**JF-36**	13.00	12.10	38.00
37	**JF-37**	12.00	8.70	33.00
38	**JF-38**	16.00	9.80	26.00
39	**JF-39**	13.00	9.60	29.00
40	**JF-40**	15.00	10.30	25.00
41	**JF-41**	11.00	8.90	26.00
42	**JF-42**	10.00	8.20	21.00
43	**JF-43**	10.00	7.60	18.00
44	**JF-44**	13.00	8.80	26.00
45	**JF-45**	12.00	7.10	15.00
46	**JF-46**	15.00	7.50	26.00
47	**JF-47**	14.00	8.50	25.00
48	**JF-48**	10.00	6.80	12.00
49	**JF-49**	14.00	7.70	28.00
50	**JF-50**	17.00	9.00	30.00
	Mean	**13.10**	**8.32**	**24.18**
	C.V.	**10.445**	**1.766**	**7.012**
	S.Em. (±)	**0.790**	**0.085**	**0.979**
	C.D.	**2.221**	**0.238**	**2.751**
	Range	**10.00-19.00**	**5.20-12.10**	**12.00-38.00**

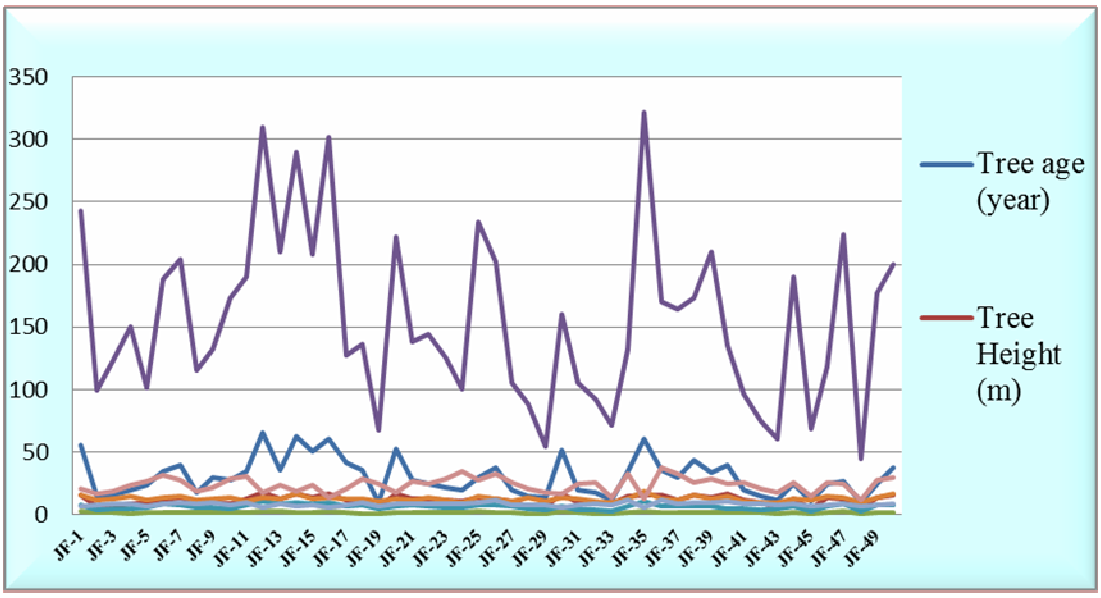

Fig. 1: Various Tree and Foliage quantitative traits of different Jackfruit germplasm

Conclusion

The Statistical (Tabular) and Graphical representation suggest that all the quantitative traits related to Tree morphology (namely, Tree age, Tree height, Trunk height, Trunk circumference and Crown diameter varied significantly among the Jackfruit germplasm under the present investigation. The observation on the oldest tree was taken for germplasm

JF-12 (65 years), whereas the youngest trees were recorded for JF-19 and JF-48 (10 years for both). The tallest Tree height was recorded for the genotype JF-12 (17.20 m) and it was recorded as the shortest for JF-48 (4.30 m). These results may be indicative towards the fact that the height of Jackfruit tree continues to increase with aging. Trunk height and circumference were measured as the maximum of 3.10 m and 322.00 cm for JF-35 and the least values for Trunk height was 0.50 m (JF- 19) and Trunk diameter was 45.00 cm (JF-48), respectively. The maximum Crown diameter was observed in case of JF-12 and JF-35.

The Foliage traits (such as Leaf blade length, Leaf blade width and Petiole length) also showed a considerable amount of variations among the Jackfruit germplasm and the highest values for these were documented as 19.00 cm (JF-35), 12.10 cm (JF-36) and 38.00 mm (JF-36). respectively.

The comprehensive field evaluation of 50 jackfruit genotypes across North Tripura revealed pronounced and statistically meaningful variation in both tree architecture and foliage morphology, with clear stand-outs for specific traits—JF-12 for tree height and crown spread, JF-35 for trunk stature and leaf length, and JF-36 for leaf width and petiole length. This breadth of variation confirms the region's rich genetic base and underscores the opportunity for systematic conservation and improvement. Prioritizing elite accessions for propagation, establishing ex-situ and in-situ conservation blocks, and advancing multi-location trials will accelerate development of regionally adapted, high-yielding planting material and strengthen value-chain prospects for growers in the North-East.

Plate - 1 and 2 (from left to right): The maximum trunk height, crown diameter and longest leaf blade length were observed for jackfruit (*Artocarpus heterophyllus* Lam.) germplasm JF-35

Plate – 3 and 4 (from left to right): The widest leaf blade width and longest petiole length had been seen in jackfruit (*Artocarpus heterophyllus* Lam.) germplasmJF-36

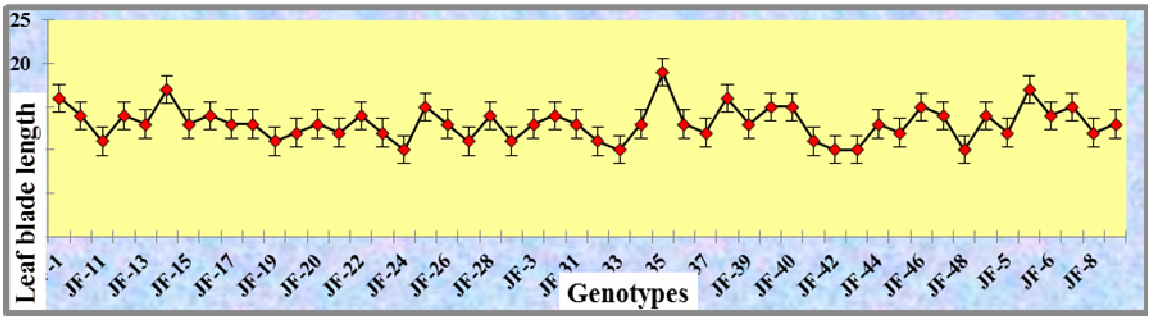

Fig. 2: Leaf blade length of various jackfruit (*Artocarpus heterophyllus* Lam.) germplasm Through Least Square Means

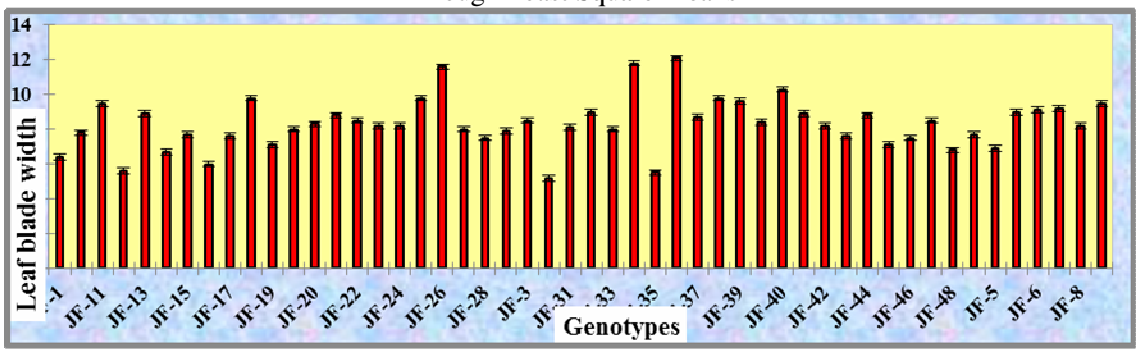

Fig. 3: Leaf blade width of various jackfruit (*Artocarpus heterophyllus* Lam.) germplasm Through Least Square Means

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