



MORPHOLOGICAL CHARACTERIZATION OF JACKFRUIT (*ARTOCARPUS HETEROPHYLLUS* LAM.) IN WEST GARO HILLS DISTRICT OF MEGHALAYA

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Abstract

A survey was conducted in West Garo Hills district of Meghalaya, during 2016-18 to study the diversity of jackfruit (*Artocarpus heterophyllus* Lam.) and record the morphological characters. Data were collected and recorded following the descriptors proposed by IPGRI (International Plant Genetic Resources Institute), Rome, Italy. In the present study, considerable variations were observed in growth habit, leaf characters, inflorescence characters, fruiting behavior and yield attributing characters. Out of the 50 trees surveyed, observations of 10 trees exhibiting significant variations are presented in this paper. GPS coordinates of all trees were recorded to relocate the tree for future reference. Tree height, trunk height and trunk circumference varied significantly ranging between 9.12 to 18.26 m, 0.85 to 3.26 m and 90.12 to 320 cm respectively. Crown size showed huge variation ranging between 4.86-15.64 m (North-South direction) and 5.21-16.33 m (East-West direction). Leaf characters also exhibited significant variation. Emergence of male and female inflorescence started from December and extended till February. Secondary flowering was not common except in one tree (WGHJ-6). Average fruit weight varied significantly ranging between 1.86 to 14.38 kg while number of fruits per tree varied from 20 to 120. Three trees viz. WGHJ-4, WGHJ-8 and WGHJ-10 recorded highest number of fruits per tree. Average yield per tree ranged between 148 to 1177.2 kg per tree, of which three trees yielded above 1000 kg per tree. These germplasm may be considered for future breeding and crop improvement programmes.

Key words : Jackfruit, Diversity, West Garo Hills, Meghalaya.

Introduction

The jackfruit tree (*Artocarpus heterophyllus* Lam.) belonging to the family Moraceae is considered to be indigenous to the rainforests of the Western Ghats of India. Jackfruit is extensively grown in the West Garo Hills of Meghalaya. It is a popular fruit among the Garo tribe and is commonly known as 'Tebrong'. In spite of its multifaceted uses as food and medicine, jackfruit is still an under-exploited fruit crop in this region. Jackfruit is being propagated in the Garo Hills mostly through seeds. As a result, considerable variations are observed in trees and leaf characters, growth habit, fruit bearing, productivity and fruit quality. Such variations provide suitable platform for further crop improvement. Characterization studies on jackfruit are still in its infancy in the West Garo Hills of Meghalaya in spite of the fact

that jackfruit is being grown extensively. Hence a survey was conducted to study the tree, leaf and inflorescence characters, fruit bearing and yield attributing characters of jackfruit trees grown in West Garo Hills of Meghalaya to identify trees with desirable genetic characters.

Materials and Methods

The present study was carried out in the West Garo Hills district of Meghalaya during 2016-2018. Fifty trees were randomly selected for preliminary observation. Out of 50 trees observed, 10 trees exhibiting distinct variation were selected for detailed characterization. GPS coordinates of every plants were recorded to relocate the tree for any future reference. Tree growth, leaf and inflorescence character, fruiting behavior and yield attributing characters were observed and recorded as per the descriptors of IPGRI (International Plant Genetic Resources Institute), Rome, Italy (2000). GPS coordinates

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of every plants were recorded using Garmin 76CSx to relocate the trees for any future reference. Statistical tools such as mean, standard deviation, standard error mean and coefficient of variations were used to analyze the data statistically and to determine the variation among the different types of trees.

Results and Discussion

The tree height varied between 9.21 to 18.26 m, trunk height ranged between 0.85 to 3.26 m and trunk circumference between 90.12 to 320 cm Table 1. The crown diameter in East-West direction varied between 5.21 to 16.33 m and in North-South direction it varied between 4.86 to 15.64 m. The highest tree height (18.26 m), trunk circumference (320 cm), crown diameter in East-West direction (16.33m) and North-South direction were recorded in WGHJ-4. Maximum trunk height of 3.26 m was recorded in WGHJ-3.

Canopy of the tree showed varying shapes like broadly pyramidal, oblong, spherical, semi circular and irregular. Trunk surface ranged from smooth to rough and very rough. Spreading type of growth habit was observed in WGHJ-2, WGHJ-4, WGHJ-8 and remaining types showed erect growth habit. WGHJ-6 and WGHJ-8 exhibited verticillate branching pattern. WGHJ-5, WGHJ-7 and WGHJ-10 showed irregular branching pattern and the remaining types showed opposite branching pattern Table 1.

Among the leaf characters studied, the leaf length varied between 5.8 to 17.4 cm, leaf width ranged from 3.6 to 9.9 cm and petiole length varied from 12 to 30 mm. Longest leaf blade was recorded in WGHJ-6, widest leaf blade in WGHJ-10 and the longest petiole was noted in WGHJ-5 Table 3. Varied leaf shapes like obovate, elliptic, narrowly elliptic and broadly elliptic were observed with acute and acuminate leaf apex; rounded and cuneate leaf base and an entire leaf margin, varying from green to dark green colour, with varying intensity of leaf and midrib pubescence Table 2.

Appearance of 75% of male inflorescence was observed during the month of January to February in most of the trees, while in three trees (WGHJ-5, WGHJ-7 and WGHJ-10) it appeared in February. Appearance of first female inflorescence was recorded in December to January and 75% of female inflorescence appeared during the month of January to February. The colour of all inflorescence was light green and aroma of female flower was mild. Secondary flowering was observed only in WGHJ-6. Female inflorescences were observed on trunk, primary branches and secondary branches while male inflorescences were observed in all position Table 3.

The fruiting season started from May to June and ended during July- August. All the trees under study showed regular bearing habit. WGHJ-1, WGHJ-3, WGHJ-5 and WGHJ-9 bore fruits on main trunk and primary branches while others showed bearing even on secondary branches. All fruits bore in clusters.

Highest number of fruits per plant (120 nos.) was noted in WGHJ-4, WGHJ-8 and WGHJ-10 Table 4. The highest average fruit weight of 14.38 kg was recorded in WGHJ-1, followed by 13.51kg and 9.81 kg in WGHJ-2 and WGHJ-8 respectively. Productivity per hectare was calculated considering the average plant diversity of 100 trees/ha. The highest yield per tree was recorded in WGHJ-8 (1177.2 kg) followed by WGHJ-2 (1080.8 kg) and WGHJ-4 (717.6 kg). The highest productivity was recorded in WGHJ-8 with 1,17,720 kg/ha followed by WGHJ-2 with 1,08,080 kg/ha and WGHJ-4 with 71,760 kg/ha Table 4.

Similar observations have been recorded by Mitra and Mani (2000), Mitra and Maity (2002) and Muthulakshmi (2003), Sharma *et al.*, (2009), Chadda (2009), Phaomei and Pereira (2016a), Phaomei and Pereira (2016b), Phaomei, *et al.*, (2017) and Phaomei, *et al.*, (2018) with respect to tree, leaf, fruit characters and yield per tree in other parts of the country.

Of the 10 types of jackfruit trees observed, highest yield per tree and productivity per hectare were noticed in WGHJ-8, followed by WGHJ-2 and WGHJ-4. Highest number of fruits per plant was noted in WGHJ-4, WGHJ-8 and WGHJ-10. The highest average fruit weight was recorded in WGHJ-1, followed by WGHJ-2 and WGHJ-8. These germplasm may be considered for future breeding and crop improvement programmes.

Conclusion

All the jackfruit trees under the present study exhibited significant variations in growth habit, leaves, inflorescence and fruiting behaviour. Average fruit weight ranging between 1.86 to 14.38 kg while number of fruits per tree varied from 20 to 120. Highest number of fruits per tree was recorded in WGHJ-4, WGHJ-8 and WGHJ-10. Average yield per tree ranged between 148 to 1177.2 kg per tree, of which three trees yielded above 1000 kg per tree. These germplasm may be considered for future breeding and crop improvement programmes.

Acknowledgement

The author would like to thank North Eastern Hill University, Tura Campus, Department of Rural Development and Agricultural Production for providing laboratory facilities and the jackfruit growers of West

Table 1: Growth characters of jackfruit grown in West Garo Hills, Meghalaya.

Jackfruit Types	GPS coordinates	Age of Tree (Yrs)	Tree height (m)	Trunk height (m)	Trunk circumference (cm)	Crown Size North-South (m)	Crown Size East-West	Trunk surface	Vigor of Tree	Crown shape habit	Tree growth	Branching density	Branching pattern	Apical dominance
WGHJ-1	N25°34.116' E090°14.281'	14-15	12.26	0.85	140	12.83	12.31	Rough	High	Broadly Pyramidal	Erect	Medium	Opposite	Strong
WGHJ-2	N25°31.986' E090°11.450'	30-35	16.32	2.13	200	12.5	10.3	Rough	High	Oblong	Spreading	High	Opposite	Intermediate
WGHJ-3	N25°31.001' E090°11.450'	10-12	10.25	3.26	142	4.86	5.21	Smooth	High	Spherical	Erect	Medium	Opposite	Intermediate
WGHJ-4	N25°30.822' E090°12.567'	15-20	18.26	2.34	320	15.64	16.33	Rough	High	Semi-Circular	Spreading	Dense	Opposite	Intermediate
WGHJ-5	N25°31.512' E090°12.644'	15-16	10.32	1.27	121.92	9.9	10.89	Rough	Medium	Irregular	Erect	Sparse	Irregular	Intermediate
WGHJ-6	N25°30.491' E090°11.368'	25-30	9.21	1.49	177.8	7.39	5.79	Very Rough	High	Irregular	Erect	Sparse	Verticillate	Weak
WGHJ-7	N25°30.737' E090°11.729'	15-20	11.74	2.18	90.12	5.48	7.88	Smooth	High	Irregular	Erect	Medium	Irregular	Intermediate
WGHJ-8	N25°56.378' E090°11.763'	25-30	12.67	0.99	238.76	13.95	14.25	Very Rough	High	Broadly Pyramidal	Spreading	Medium	Verticillate	Weak
WGHJ-9	N25°56.778' E090°13.124'	35-40	16.03	2.67	175.26	5.6642	9.27	Very Rough	High	Irregular	Erect	Sparse	Opposite	Strong
WGHJ-10	N25°30.199' E090°10.408'	20-25	12.8	1.58	157.48	11.25	12.01	Rough	Medium	Irregular	Erect	Medium	Irregular	Intermediate
Mean			12.98	1.876	176.334	9.946	10.424							
Range (Min-Max)			9.21-18.26	0.85-3.26	90.12-320	4.86-15.64	5.21-16.33							
STDEV			2.967	0.772	65.275	3.882	3.532							
SEm±			0.938	0.244	20.642	1.228	1.117							
CV%			22.85	41.135	37.018	39.036	33.885							

Table 3: Inflorescence characters of jackfruit grown in West Garo Hills, Meghalaya.

Jackfruit Types	Date of appearance of first male inflorescence	Date of appearance of 75% Male inflorescence	Date of appearance of first Female inflorescence	Date of appearance of 75% female inflorescence	Female flower aroma	Inflorescence colour	Secondary flowering	Female inflorescence position	Male inflorescence position
WGHL-1	December	January	January	January-February	Mild	Light Green	Absent	Trunk, primary and Secondary Branches	All position
WGHL-2	December	January	December - January	January	Mild	Light Green	Absent	Trunk, primary and Secondary Branches	All position
WGHL-3	December	January	December - January	January	Mild	Light Green	Absent	Trunk and primary branches	All position
WGHL-4	December	January	December - January	January	Mild	Light Green	Absent	Trunk, primary and Secondary Branches	All position
WGHL-5	January	January-February	January	January-February	Mild	Light Green	Absent	Trunk, primary and Secondary Branches	All position
WGHL-6	December-January	January	January	January- February	Mild	Light Green	Present	Trunk, primary and Secondary Branches	All position
WGHL-7	January	February	January	February	Mild	Light Green	Absent	Trunk and primary branches	All position
WGHL-8	December	January	December-January	January	Mild	Light Green	Absent	Trunk, primary and Secondary Branches	All position
WGHL-9	December	January	December-January	January	Mild	Light Green	Absent	Trunk, Primary and Secondary Branches	All position
WGHL-10	January	January-February	January	January-February	Mild	Light Green	Absent	Trunk, primary and Secondary Branches	All position

Garo Hills district, Meghalaya for their valuable information and contribution.

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