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Morphological Characterization of Jackfruit (*Artocarpus heterophyllus* Lam.) Local Genotypes under Coffee Ecosystem of Lower Pulney Hills

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ABSTRACT

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Evaluation of 35 local genotypes of jackfruit under coffee ecosystem of lower Pulney hills was conducted at Horticultural Research Station, Thadiyankudisai and its adjoining areas, during 2016-2017. Evaluation of the local genotypes was carried out and wide variability was observed in morphological, inflorescence, fruit and biochemical characters. Based on overall performance with respect to vegetative growth, inflorescence characters, yield and quality characters were recorded to identify the superior local genotypes. Various statistical analyses also carried out in this study.

Introduction

The jackfruit (*Artocarpus heterophyllus* Lam.) belongs to family moraceae and is believed to have originated in the rain forests of Western Ghats of India, but it is now widely cultivated in throughout the tropical lowlands of northern and southern hemisphere. It is the national fruit of

Bangladesh. Jackfruit serves as a food for millions of hunger people in the countryside during the season, where there is a scarcity of food. Therefore, this fruit is regarded as “poor man’s food” in Eastern and Southern parts of India. Jackfruit valued for its heavy yields of nutritious fruits and durable timber. It is one of the potential new crops, that has attracted increased interest in the world. Jackfruit is

widely cultivated in India, Vietnam, Malaysia, Myanmar, Indonesia, Bangladesh, Sri Lanka, Brazil, West Indies, Pakistan and other tropical countries.

In India, it is quite popular in Southern and Eastern states like Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal, Maharashtra, Assam, Andaman and Nicobar Islands (APAARI, 2012).

The area under jackfruit cultivation in India is 1.51 lakh hectares and the production is 20.37 lakh MT. In Tamil Nadu, the estimated total area under cultivation is 2,930 hectares with an annual production of 46,600 MT and productivity of 15.90 MT per hectare (NHB, 2015).

It is considered as one of the most preferred support and shade trees for black pepper and coffee cultivation respectively in hilly tracts. Under the coffee ecosystem of hilly tracts, jackfruit seedlings are planted at wider spacing while the coffee plants are planted at closer spacing. Since, it provides adequate ground cover and high turnover, this system enriches and conserves the soil ecosystem in the hilly tracts. Integration of timber and fruit trees in coffee garden forms yet another jackfruit-multi strata agroforestry practice popular in Indonesia (Ginoga *et al.*, 2002).

Jackfruit, being cross-pollinated and mostly seed propagated, exhibits great variation in economic traits, which is considered as a pre-requisite for any crop improvement program. Thus, there is a need to identify and locate areas of rich genetic diversity of jackfruit (Haq, 2006). In this background, in the Dindigul district of Tamil Nadu, genetic variants are available in larger number, particularly in the lower Pulney hills, Dindigul district of Tamil Nadu, which are grown as shade trees in the coffee plantation. A systematic investigation on these types may

lead to identification of superior ones with the objectives of characterization, screening for yield and quality.

Materials and Methods

A study entitled “Evaluation of jackfruit (*Artocarpus heterophyllus* Lam.) local genotypes under coffee ecosystem of lower Pulney hills” was conducted at Horticultural Research Station, Tamil Nadu Agricultural University, Thadiyankudisai and its adjoining areas, during 2016-2017. Various morphometric and quality characters were observed in all the 35 genotypes identified.

Horticultural Research Station, Thadiyankudisai and its adjoining areas (Thandikudi and Pachalur) which is located at a latitude of 10° 17' North and longitude of 77° 42' East and altitude of 1100 m above MSL with an average annual rainfall of 1400 mm with a relative humidity of 60-90 %, maximum and minimum temperature of 30-40°C and 15-25°C respectively.

Pachalur is located at an altitude of 1500 m above MSL. The descriptor developed for *Artocarpus heterophyllus* Lam. (Jackfruit) compiled by Bioversity international was used in this study for characterising the selected genotypes during 2016- 2017. The genotypes were marked and observations were made for morphological, yield and quality parameters. Trees of 15 to 20 years age group were selected for this study.

Results and Discussion

In the present investigation, an attempt was made to identify superior genotypes with respect to morphological features, inflorescence characters, yield and quality parameters, under lower Pulney hills, where seedling-originated jackfruit trees are being grown as shade tree under coffee plantations

extensively. The results obtained from the study are discussed hereunder.

Tree characters

Tree height (Table 1)

Among the thirty five genotypes, tree height ranged from 10.94 to 23.64 m with the mean of 17.01 m. The tree height was the lowest in HRS TKD AH-24 (10.94 m) followed by HRS TKD AH-7 (11.96 m) and it was the highest in HRS TKD AH-23 (23.64 m) and HRS TKD AH-20 (22.27 m) which were on par. The coefficient of variation for tree height was 19.16 per cent. Variability in tree height in jackfruit is an important criterion for selection of superior genotype as higher tree height may have difficulty in controlling pest and diseases by spraying and harvest. Among the genotypes of same age group studied, the genotypes HRS TKD AH-1, HRS TKD AH-7, HRS TKD AH-9, HRS TKD AH -24 and HRS TKD AH-29 have recorded lower height than other genotypes.

Trunk circumference (Table 1)

The trunk circumference of thirty five genotypes observed ranged from 60.18 to 273.13 cm with a mean of 154.25 cm. The trunk circumference was the lowest in HRS TKD AH-11 (60.18 cm) followed by HRS TKD AH-9 (82.77 cm) and it was the highest in HRS TKD AH-23 (273.13 cm). The coefficient of variation for trunk circumference was 31.40 per cent. More than the tree height, trunk circumference is another important character which has more bearing on productivity in jackfruit as it supports many scaffold branches, which in turn support secondary and tertiary branches, the main fruit bearing zones. Greater trunk circumference was noticed in genotypes viz., HRS TKD AH-4, HRS TKD AH-23, HRS TKD AH-33 and HRS TKD AH-35. Higher stem circumference gives better support for

the main branches and reflects the vigour of trees indirectly, bearing more number of fruits lead to higher yield. Lesser the trunk height with spreading nature, greater will be the number of fruits per tree due to more primary and secondary branches. Similar variability was reported by Muthulakshmi (2003), Murugan (2007), Manikandan (2015) and Aseef (2016) in jackfruit.

Trunk height (Table 1)

The trunk height of the thirty five genotypes varied from 1.79 to 9.58 m with a mean of 3.76 m. The trunk height was significantly lowest in HRS TKD AH-27 (1.79 m) and significantly highest in HRS TKD AH-23 (9.58 m). The coefficient of variation for trunk height was 51.86 per cent.

Crown diameter (Table 1)

The crown diameter of the thirty five genotypes varied from 7.35 to 28.75 m with mean of 16.87 m. The crown diameter was significantly lowest in HRS TKD AH-9 (7.35 m) and significantly higher in HRS TKD AH-23 (28.75 m). The coefficient of variation for crown diameter was 25.48 per cent.

Tree canopy shape (Table 2)

A diversity of canopy shapes was observed among the genotypes (Figure 1). Out of the thirty five genotypes, 54.28 per cent of genotypes had 'irregular' canopy shape, 28.57 per cent were 'elliptical' and 17.14 per cent were 'spherical'. The presence of more number of trees with 'irregular' canopy shape is a desirable factor from the point of fruit set and yield. Genotypes namely, HRS TKD AH-2, 5, 6, 7, 9, 11, 18, 20, 21, 22, 23, 24, 25, 27, 28, 29, 31, 32, 35 have recorded 'irregular' canopy shape. Similar variability was reported by Muthulakshmi (2003), Murugan (2007) and Aseef (2016) in jackfruit.

Tree growth habit (Table 2)

Erect growth habit was found more frequent (54.28 %) followed by semi-erect (42.85 %) and 2.85 per cent of genotypes were observed with irregular growth habit. Regarding tree growth habit, it is an important trait which decides whether the genotype is suitable for normal planting or high-density planting. Semi erect growth habit is suitable for high density planting. Other growth habits like erect and spreading type are not so desirable. Extensive tall nature may cause self-shading, affecting the quality of fruits. Different types of tree growth habit namely 'erect', 'semi erect' and 'spreading' growth habit was recorded. Genotypes namely HRS TKD AH-1, 2, 7, 8, 12, 13, 16, 17, 20, 23, 24, 29, 30, 31, 33 have recorded 'semi-erect' and HRS TKD AH-6 have recorded 'spreading' growth habit. The high variability of tree characters observed in all genotypes confirmed the presence of heterozygosity which was influenced by the environment and also as the trees had arisen as a result of high cross pollination, monoecious and dichogamy nature of jackfruit trees. Similar variability was reported by Muthulakshmi (2003), Murugan (2007) and Manikandan (2015) in jackfruit, Podgornik *et al.*, (2010) in fig and Manigandan (2015) in Soursop.

Branching pattern (Table 2)

Various branching patterns were noticed (Figure 2) in thirty five genotypes. Based on the branching pattern, 57.14 per cent of the genotypes had 'erect' branching habit, 31.42 per cent had 'irregular' branching habit, each 5.71 per cent had 'opposite' and 'verticillate' branching habit. In this study, the genotypes namely HRS TKD AH-3, 4, 5, 8, 9, 10, 11, 13, 14, 15, 16, 18, 21, 22, 25, 26, 27, 30, 32, 34 have recorded 'erect' branching habit whereas HRS TKD AH-2, 7, 17, 20, 23, 24, 28, 29, 31, 33, 35 have recorded 'irregular'

branching habit, HRS TKD AH-1, 12 have recorded 'opposite' branching habit and HRS TKD AH-6, 19 have recorded 'verticillate' branching habit. Similar variability was reported by Muthulakshmi (2003), Murugan (2007) and Manikandan (2015) in jackfruit, Podgornik *et al.*, (2010) in fig and Manigandan (2015) in Sour sop.

Leaf characters

Leaf blade length (Table 1)

The leaf blade length of the all genotypes ranged from 12.36 to 22.47 cm with a mean of 16.73 cm. The leaf blade length was significantly lower in HRS TKD AH-35 (12.36 cm) and significantly higher in HRS TKD AH-20 (22.47 cm). The coefficient of variation for leaf blade length was 15.42 per cent.

Leaf blade width (Table 1)

The leaf blade width of the all genotypes ranged from 10.58 to 5.62 cm with a mean of 7.87 cm. The leaf blade width was significantly lower in HRS TKD AH-10 (cm) and significantly higher in HRS TKD AH-20 (10.58 cm). The coefficient of variation for leaf blade width was 17.53 per cent.

Petiole length (Table 1)

The petiole length of the all genotypes ranged from 35.29 to 13.56 mm with a mean of 20.88 mm. The petiole length was significantly lower in HRS TKD AH-35 (13.56 mm) and significantly higher in HRS TKD AH-28 (35.29 mm). The coefficient of variation for petiole length was 27.58 per cent.

Leaf apex shape

Leaf apex shapes were noticed among the genotypes studied and are presented in Table

2. All the thirty-two genotypes were showing 'acuminate' type of leaf apex shape.

Leaf base shape

Leaf base shapes were noticed and are presented in Table 2. Among the 35 genotypes studied, 13 genotypes were showing 'oblique' type, 10 genotypes were showing cuneate type, six genotypes showing rounded type and six genotype were showing shortly attenuate type of leaf base shape.

Wide variation was noticed among the genotypes studied in respect of leaf characters which are in accordance with the observations of CSIR (1992), Mitra and Maity (2002) and Sharma *et al.*, (2006) in jackfruit. Leaf traits like leaf blade length, leaf blade width, leaf blade shape, leaf apex shape, leaf base shape, leaf upper surface pubescence and leaf lower surface pubescence also exhibited considerable variations, further highlighting the heterogeneous nature of the seedling population owing to cross pollination of jackfruit trees. Variability in leaf blade length and leaf blade width has been well documented (Azad *et al.*, 2007; Khan *et al.*, 2010; Sarker and Zuberi, 2011; Sarker *et al.*, 2015) in jackfruit. These leaf traits might be probably useful to identify a chosen plus tree from the rest of the seedling trees or from the clonal materials.

Inflorescence characters

Position of female inflorescence (Table 2)

The position of female inflorescence was divergent among the genotypes. The position was predominantly found in 'mainly on trunk and 'primary branches' (54.28%) followed by 'trunk, primary and secondary branches' (25.71%), 'main trunk' (11.42 %) and 'whole stem including primary, secondary and tertiary branches' (8.57 %).

Position of male inflorescence (Table 2)

The position of male inflorescence was found to be varying among the thirty five genotypes. Male inflorescence on 'tertiary branches' was recorded in 31.42 per cent of genotypes followed by 25.71 per cent of genotypes having on 'trunk' only, 22.85 per cent of genotypes on 'all positions equally', 14.28 per cent of genotypes on 'primary branches' and 5.71 per cent of genotypes on 'secondary branches'.

About 19 genotypes had their female inflorescence mainly on 'trunk and primary branches' followed by 9 genotypes having mainly on 'trunk, primary and secondary branches' alone. It is generally observed that the fruits are borne on main trunk and primary branches are normally found to be good in size and quality. In that way, the position of female inflorescence borne on trunk and primary branches is a desirable factor. Genotypes namely HRS TKD AH-1, 3, 5, 7, 8, 10,11, 15, 16, 19, 20, 22, 25, 26, 27, 29, 30, 31, 34 have the position of female inflorescence on trunk and primary branches. Similar variability was reported by Murugan (2007), Manikandan (2015) and Aseef (2016) in jackfruit.

Fruit characters

Based on the fruiting season, the selected genotypes were grouped into early season (January-March), mid-season (April -June) and late season (July-August) genotypes. Among the genotypes, majority of the genotypes showed early season bearing habit. Genotypes namely HRS TKD AH-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 and 33 have recorded early season fruiting habit whereas HRS TKD AH-31, 32, 34 and 35 are mid-season bearers. The fruit length of the genotypes ranged from 15.59 to 43.67 cm

with a mean of 27.70 cm. The average fruit weight of genotypes studied varied from 3.51 to 9.69 kg with a mean fruit weight of 6.09 kg.

Seed characters

Seed length (Table 1)

The seed length of 35 genotypes varied from 1.75 to 4.13 cm with a mean of 3.23 cm. The lowest seed length was recorded in genotype HRS TKD AH-4 (1.75 cm) and highest in genotype HRS TKD AH-6 (4.13 cm). The coefficient of variation for seed length was 19.50 per cent.

Seed width (Table 1)

The seed width of the 35 genotypes varied from 1.74 to 5.13 cm with a mean of 2.97 cm. Among the genotypes, the lowest seed width was noticed in genotype HRS TKD AH-22 (1.74 cm) and highest was in genotype HRS TKD AH-33 (5.13 cm). The coefficient of variation for seed width was 22.89 per cent.

Number of seeds per fruit (Table 1)

The number of seeds per fruit ranged from the lowest of 29.66 (HRS TKD AH-29) to the highest of 177.39 (HRS TKD AH-5) with a mean value of 82.73. The coefficient of variation for number of seeds per fruit was 39.07 per cent.

100 seed weight (Table 1)

The 100 seed weight of the selected genotypes varied from 291.88 to 739.54 g with a mean value of 522.38 g. Among the genotypes, the highest 100 seed weight was recorded in HRS TKD AH-33 (739.54 g) and lowest in HRS TKD AH-4 (291.88 g). The coefficient of variation for 100 seed weight was 20.57 per cent.

Flake: seed ratio (Table 1)

Among the genotypes, the flake: seed ratio varied from 1.56 to 5.70 with a mean value of 3.64. The lowest flake: seed ratio was recorded in genotype, HRS TKD AH-6 (1.56) and highest in genotype, HRS TKD AH-20 (5.70). The coefficient of variation for flake: seed ratio was 26.92 per cent.

Seed length, seed width, number of seeds per fruit and 100 seed weight had considerable variation among the genotypes studied. Regarding flake: seed ratio, remarkable variation was observed in the genotypes. Among them, genotype HRS TKD AH-20 had higher flake: seed ratio. Hence, the edible portion is more in this genotype. But, apart from the edible part *i.e.*, flake, size of the seed is also one of the important criteria as it has many industrial uses (Dutta, 1957). Therefore, jackfruit with higher flake weight and higher seed weight is also preferred which was concomitant with results of Aseef (2016).

Yield characters

Number of fruits per tree per year (Table 1)

The number of fruits per tree per year ranged from 28 to 145 with a mean of 69.71. Among the thirty five genotypes studied, HRS TKD AH-1 produced the minimum number of fruits (28) while, the genotype, HRS TKD AH-33 produced the maximum number of fruits.

Yield per tree (Table 1)

The yield per tree ranged from 118.73 to 854.05 kg with a mean of 392.02 kg. Among the genotypes, the highest yield was recorded in genotype, HRS TKD AH-33 (854.05 kg) followed by genotype, HRS TKD AH-32 (704.76 kg) and it was the lowest in genotype, HRS TKD AH-4 (118.73 kg).

Table.1 Growth and yield characteristics of local genotypes of jackfruit under coffee ecosystem of lower Pulney hills

Name of the genotypes	TrH	TrkC	TkH	CrD	LbL	LbW	PtL	FrL	FrW	NFr/T	SdL	SdW	NSd/F	100 SdWt	Fl:Sd	Y/T
HRS TKD AH-1	12.65	110.42	3.24	13.73	17.97	9.22	23.83	18.47	6.37	28	3.12	2.47	89.12	541.79	3.23	178.36
HRS TKD AH-2	16.85	155.67	2.95	9.75	17.34	6.35	16.37	24.95	4.97	47	2.27	2.9	60.16	372.61	5.41	233.59
HRS TKD AH-3	13.32	121.45	5.81	15.84	18.63	6.37	24.23	27.23	3.64	51	3.64	3.11	85.36	603.17	2.63	185.64
HRS TKD AH-4	21.45	253.81	7.21	13.71	16.26	6.26	30.81	15.71	3.83	31	1.75	2.13	69.68	291.88	3.37	118.73
HRS TKD AH-5	17.90	183.43	1.93	19.16	15.60	9.70	20.17	38.46	7.81	128	3.66	1.97	177.39	548.61	3.48	625.76
HRS TKD AH-6	16.87	164.59	4.76	17.37	17.40	9.20	23.16	24.63	5.25	96	4.13	3.57	79.48	634.54	1.56	474.00
HRS TKD AH-7	11.96	110.48	2.38	14.79	15.72	6.53	17.36	31.55	7.12	35	3.88	2.87	131.66	539.27	3.49	249.29
HRS TKD AH-8	14.34	211.24	3.64	24.28	20.42	9.83	28.93	28.31	4.94	61	2.94	2.55	120.73	473.24	2.27	301.34
HRS TKD AH-9	12.73	82.77	1.87	7.35	15.86	5.71	19.78	16.91	4.28	93	3.23	2.76	37.19	497.55	3.74	364.04
HRS TKD AH-10	14.68	134.58	2.75	10.95	13.95	5.62	13.61	15.59	5.73	44	3.35	3.02	58.91	568.19	3.77	252.12
HRS TKD AH-11	15.79	60.18	3.62	19.97	15.86	6.34	27.77	22.67	6.06	34	2.73	2.21	104.49	410.35	3.56	206.04
HRS TKD AH-12	19.74	132.64	3.18	21.45	17.63	7.41	15.86	26.39	5.99	55	3.76	3.28	88.73	527.55	4.85	329.45
HRS TKD AH-13	18.82	213.89	6.74	22.55	19.39	8.96	21.78	21.42	5.53	86	3.34	2.81	62.55	489.22	3.57	415.58
HRS TKD AH-14	14.94	105.43	3.65	15.54	14.56	7.18	14.69	33.38	6.97	48	3.65	2.42	145.37	560.14	3.67	334.56
HRS TKD AH-15	20.32	137.84	2.87	16.46	18.17	7.42	21.66	20.72	4.63	62	2.68	2.39	49.18	426.11	3.07	287.06
HRS TKD AH-16	15.87	128.32	2.43	19.87	15.73	6.87	23.68	17.34	3.94	49	3.75	3.24	47.33	568.66	5.43	193.06
HRS TKD AH-17	14.83	158.61	3.42	19.13	20.94	10.14	31.79	26.86	7.68	31	4.01	3.87	124.28	689.74	3.97	238.08
HRS TKD AH-18	16.52	112.47	1.85	14.65	14.73	7.68	21.78	35.92	3.51	42	1.89	2.36	31.94	367.28	4.54	147.42
HRS TKD AH-19	21.59	143.54	2.95	15.96	18.59	7.37	18.23	30.24	6.72	67	2.94	2.49	90.72	418.36	4.31	420.24
HRS TKD AH-20	22.27	179.44	7.48	20.65	22.47	10.58	20.23	21.42	5.80	74	2.97	2.59	69.45	380.33	5.70	409.20

HRS TKD AH-21	21.89	113.80	2.29	22.55	14.18	7.26	17.52	34.73	6.17	83	3.68	2.84	94.32	604.39	3.47	512.11
HRS TKD AH-22	17.36	116.26	6.73	13.95	12.59	7.62	18.58	32.11	4.83	48	2.83	1.74	62.10	423.16	1.98	231.84
HRS TKD AH-23	23.64	273.13	9.58	28.75	14.73	6.58	16.36	17.26	5.03	58	3.89	3.46	59.57	597.22	4.21	291.74
HRS TKD AH-24	10.94	123.88	6.51	14.40	19.23	8.34	19.38	43.67	7.27	118	2.93	3.56	94.11	589.47	3.01	607.14
HRS TKD AH-25	15.76	148.25	2.37	13.55	16.47	7.82	19.29	29.46	6.74	87	3.85	3.15	77.24	527.62	3.51	516.38
HRS TKD AH-26	13.92	147.46	2.38	15.05	16.27	6.53	16.89	26.95	6.12	53	3.55	3.18	98.33	571.66	3.38	324.36
HRS TKD AH-27	17.35	141.31	1.79	11.25	18.94	9.48	34.78	33.27	8.13	66	2.26	1.97	87.54	337.85	3.22	536.58
HRS TKD AH-28	18.85	176.55	2.11	14.21	22.37	10.57	35.29	20.73	6.97	103	3.86	3.43	65.17	654.76	5.00	520.91
HRS TKD AH-29	12.48	92.57	2.37	15.38	16.84	8.29	13.75	31.59	3.78	56	2.23	3.84	29.66	521.67	5.11	211.68
HRS TKD AH-30	14.86	185.31	3.15	18.53	17.38	8.52	18.82	37.32	8.46	77	2.93	2.69	130.84	408.13	3.26	601.42
HRS TKD AH-31	14.56	145.99	2.86	15.38	12.62	6.89	16.72	38.49	9.31	98	3.49	3.71	71.15	684.67	4.01	672.38
HRS TKD AH-32	18.57	184.11	3.67	17.34	16.37	8.42	18.23	29.37	7.56	121	3.17	3.59	74.69	589.65	3.99	704.76
HRS TKD AH-33	19.24	235.63	3.13	20.35	14.57	8.31	17.35	43.21	9.69	145	4.13	5.13	78.51	739.54	3.10	854.05
HRS TKD AH-34	16.59	146.14	2.68	16.93	13.56	7.26	18.78	19.52	5.70	86	3.88	3.37	86.28	621.33	2.40	440.20
HRS TKD AH-35	21.58	223.78	4.78	16.75	12.36	8.91	13.56	33.93	6.94	79	2.94	3.46	62.47	503.81	2.36	518.26
Mean	17.01	154.25	3.76	16.87	16.73	7.87	20.88	27.70	6.09	69.71	3.23	2.97	82.73	522.38	3.64	392.02
Maximum	23.64	273.13	9.58	28.75	22.47	10.58	35.29	43.67	9.69	145	4.13	5.13	177.39	739.54	5.70	854.05
Minimum	10.94	60.18	1.79	7.35	12.36	5.62	13.56	15.59	3.51	28	1.75	1.74	29.66	291.88	1.56	118.73
SE of mean	0.56	8.30	0.33	0.73	0.43	0.23	0.97	1.32	0.26	5.03	0.10	0.11	5.46	18.16	0.166	30.58
SD	3.26	48.44	1.95	4.30	2.58	1.38	5.76	7.85	1.59	29.80	0.63	0.68	32.33	107.46	0.98	180.93
CV (%)	19.16	31.40	51.86	25.48	15.42	17.53	27.58	28.33	26.10	42.74	19.50	22.89	39.07	20.57	26.92	46.15

Whereas,

HRS TKD AH – Horticultural Research Station, Thadiyankudisai. *Artocarpus heterophyllus*, **SE**- Standard Error, **SD**-Standard Deviation,

CV- Coefficient of Variation

TrH: Tree Height (m), **TrkC**: Trunk Circumference (cm), **TkH**: Trunk Height (m), **CrD**: Crown diameter (m), **LbL**: Leaf blade length (cm), **LbW**: Leaf blade width (cm), **PtL**: Petiole length (mm), **FrL**: Fruit length (cm), **FrW**: Fruit weight (kg), **NFr/T**: Number of fruits per tree per year, **SdL**: Seed length (cm), **SdW**: Seed width (cm), **NSd/F**: Number of seeds per fruit., **100 SdWt**: 100 Seed Weight (g), **Fl:Sd**: Flake: Seed ratio, and **Y/T**: Yield per tree (Kg)

Table.2 Frequency distribution of the jackfruit genotypes for tree canopy shape, tree growth habit, branching pattern, position of female inflorescence and position of male inflorescence

Characters		No. of trees	Frequency distribution (%)
Tree canopy shape	Spherical	6	17.14
	Elliptical	10	28.57
	Irregular	19	54.28
Tree growth habit	Erect	19	54.28
	Semi-erect	15	42.85
	Spreading	1	2.85
Branching pattern	Erect	20	57.14
	Opposite	2	5.71
	Verticillate	2	5.71
	Irregular	11	31.42
Leaf apex shape	Acute	3	8.57
	Acuminate	32	91.42
Leaf base shape	Oblique	13	39.39
	Rounded	6	17.14
	Cuneate	10	28.57
	Shortly attenuate	6	17.14
Position of female inflorescence	Mainly on trunk	4	11.42
	Mainly on trunk and primary branches	19	54.28
	Mainly on trunk, primary and secondary branches	9	25.71
	On the whole stem including primary, secondary and tertiary branches	3	8.57
Position of male inflorescence	Mainly on tertiary branches	11	31.42
	Mainly on secondary branches	2	5.71
	Mainly on primary branches	5	14.28
	Mainly on trunk	9	25.71
	All positions equally	8	22.85

Table.3 Organoleptic evaluation of flakes of jackfruit genotypes

Name of the genotypes	Flake colour	Flavour	Texture	Taste	Overall quality
HRS TKD AH-1	3.10	2.65	2.50	2.75	2.75
HRS TKD AH-2	4.25	3.40	3.15	3.60	3.60
HRS TKD AH-3	2.80	3.11	2.89	3.21	3.00
HRS TKD AH-4	3.22	3.56	3.24	2.96	3.24
HRS TKD AH-5	4.65	3.86	3.05	4.15	3.92
HRS TKD AH-6	3.86	2.71	2.86	3.12	3.13
HRS TKD AH-7	3.14	3.63	2.22	3.38	3.09
HRS TKD AH-8	2.94	2.88	2.97	3.17	2.99
HRS TKD AH-9	2.77	3.14	2.34	2.95	2.80
HRS TKD AH-10	3.02	2.95	3.26	3.04	3.06
HRS TKD AH-11	2.31	3.57	3.19	3.91	3.24
HRS TKD AH-12	4.34	3.04	2.77	3.24	3.34
HRS TKD AH-13	2.83	3.24	2.46	2.91	2.86
HRS TKD AH-14	2.55	3.31	3.61	2.84	3.07
HRS TKD AH-15	4.53	2.86	3.14	3.22	3.43
HRS TKD AH-16	3.06	2.78	3.44	2.71	2.99
HRS TKD AH-17	4.41	3.54	2.74	3.14	3.45
HRS TKD AH-18	2.29	3.26	3.14	3.38	3.01
HRS TKD AH-19	4.26	3.37	2.63	2.95	3.30
HRS TKD AH-20	2.73	3.44	3.08	3.09	3.08
HRS TKD AH-21	4.16	2.61	2.49	2.86	3.03
HRS TKD AH-22	4.41	3.20	2.89	2.64	3.28
HRS TKD AH-23	3.31	2.67	3.27	3.43	3.17
HRS TKD AH-24	4.15	2.98	3.19	3.26	3.39
HRS TKD AH-25	4.46	3.33	2.88	3.22	3.47
HRS TKD AH-26	2.89	2.56	2.76	3.36	2.89
HRS TKD AH-27	2.97	3.41	3.06	2.79	3.05
HRS TKD AH-28	4.22	2.79	3.35	3.37	3.43
HRS TKD AH-29	3.19	3.28	2.49	3.15	3.02
HRS TKD AH-30	2.61	3.21	3.28	3.11	3.05
HRS TKD AH-31	4.42	3.04	2.76	3.20	3.35
HRS TKD AH-32	3.34	3.12	3.37	3.29	3.28
HRS TKD AH-33	3.17	2.95	3.79	3.18	3.27
HRS TKD AH-34	3.44	3.32	2.93	2.97	3.16
HRS TKD AH-35	4.19	3.10	3.25	3.01	3.38
Mean	3.48	3.13	2.98	3.15	3.18
Maximum	4.65	3.86	3.79	4.15	3.92
Minimum	2.29	2.56	2.22	2.64	2.75
SE of mean	0.12	0.05	0.06	0.05	0.04
SD	0.73	0.32	0.36	0.31	0.24
CV (%)	20.97	10.22	12.08	9.84	7.54

HRS TKD AH – Horticultural Research Station, Thadiyankudisai. *Artocarpus heterophyllus*, SE- Standard Error, SD-Standard Deviation, CV- Coefficient of Variation

Figure.1 Diversity in tree canopy shape

Irregular

Elliptical

Spherical

Figure.2 Diversity in branching pattern

Verticillate

Erect

Opposite

Opposite

In a breeding programme, yield is the most important trait by which a genotype or variety will be evaluated. In the case of jackfruit, trees with more number of fruits and high fruit weight generally produce high yield. In the present study, wide variation was recorded in number of fruits per tree and yield per tree per year. Genotypes *viz.*, namely HRS TKD AH- 5, 6, 9, 24, 28, 31, 32 and 33 have recorded higher number of fruits per tree whereas HRS TKD AH-5, 21, 24, 25, 27, 28, 30, 31, 32, 33 and 35 recorded higher yield per tree.

Organoleptic evaluation (Table 3)

Organoleptic evaluation of ripe flakes was carried out using five parameters namely flake colour and appearance, flavour, texture, taste and overall quality.

Flake colour and appearance

The mean of flake colour and appearance was 3.48 and it ranged from 2.29 to 4.65. The coefficient of variation was 20.97 per cent. Most of the genotypes (24) had 'good' flake colour and appearance followed by few genotypes falling under the group 'attractive' (6) and 'fair' (5).

Flake flavour

The flake flavour ranged from 2.56 to 3.86 with mean of 3.13. The coefficient of variation for the flake flavour was 10.22 per cent. 'Intermediate' flavour was observed in majority of the genotypes (23) followed by few coming under 'fair' (7) and 'strong' (5) flavour.

Flake texture

The flake texture ranged from 2.22 to 3.79 with a mean of 2.98. Most of the genotypes had 'coarse' (17) textured flakes followed by

few with 'firm' (12) and 'fibrous' (6) textured flakes. The coefficient of variation was 12.08 per cent.

Flake taste

The flakes taste of the flakes ranged from 2.64 to 4.15 with a mean of 3.15. The coefficient of variation for the flake taste was 9.84 per cent. Majority of the genotypes (24) had 'good' taste followed by few with 'fair' (4) and quite acceptable' (7) taste.

Overall quality

The range of overall quality was 2.75 to 3.92 with mean value of 3.18. The coefficient of variation was 7.54 per cent. Most of the genotypes (29) had 'good' overall quality followed by few with 'fair' (6) quality.

The organoleptic test is the final judgment for acceptance of the fruit quality of the selected genotypes. The present study revealed that remarkable variation by organoleptic evaluation in all the characters of flakes. Genotypes namely HRS TKD AH-2, 4, 5, 11, 12, 15, 18, 23, 24, 25, 26, 28, 31, 32, 33 and 35 have higher score for overall quality of flakes. This may be due to genetic nature of the genotypes and growing environment. Similar findings were reported by Murugan (2007), Manikandan (2015) and Aseef (2016) in jackfruit.

In conclusion, based on morphological characteristics, inflorescence characteristics, yield and quality characteristics studied in local genotypes of jackfruit under coffee ecosystem of lower Pulney hills, it is concluded that all trees found in hilly regions are erect growth habit due to essential sunlight requirement for its metabolic process. In this study, majority of genotypes are regular habit and fruits borne on throughout the year. Wide variability reported

in all characters regarding trees, fruits, flakes, seeds and their biochemical characteristics. Genotypes namely HRS TKD AH-5, 9, 17, 24, 28, 31, 32 and 33 were found to be promising which needs further observation closely for the future breeding purpose and post-harvest processed products.

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