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RESEARCH ARTICLE

Diversity of jack fruit germplasm in Pudukkottai district of Tamil Nadu

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Abstract

The present investigation was undertaken to develop a variety of jackfruit. Hence, the research was conducted on the bearing trees of different jackfruit genotypes in the Pudukkottai District of Tamil Nadu, India, during the year 2016-2019. Fifty-five jackfruit genotypes, *viz.*, KDM-AhJ-01 to KDM-AhJ-55, were selected for the study to identify superior ones. The season of fruiting in each genotype was recorded and classified into early (March-April), mid-season (May-June), and late (July-August). The genotype 46 was found to be mid-season bearing (May-June, 2016-2019). Meanwhile, KDM-AhJ -08, KDM-AhJ -10, and KDM-AhJ -35 were found to have late season bearing (July to August 2016-2019). The genotypes KDM-AhJ 31 and KDM-AhJ 32 were produced during the main season (March-April, 2016-2019) and also during the off-season (September -November 2016-2019) production of jackfruit. The highest number of fruits per plant (43.33.00) was obtained from 08, followed by 31 (33.33). Maximum individual fruit weight was gained from 46 (16.33 kg) followed by 10 (14.33 kg), and a minimum of (4.67 kg) was observed that genotype 08 was suitable for small families. Yield varied from 62.67 kg/tree to 458.33. Yield was recorded from 10. The highest number of flakes per fruit was obtained from 10 (210.00). The highest Flakes: Seed ratio was obtained from 10 (5.30). Upper limit TSS content recorded to 08 (29.17° brix). The highest total sugar (25.20%), highest protein, lowest acidity (0.10%), and lowest ascorbic acid content were found to be 8. Maximum carotene content was recorded on KDM-AhJ- 46, followed by 8 and 10. Maximum color and appearance of 9.00 were obtained from the genotypes KDM-AhJ- 10. A maximum overall acceptability of 9.75 was observed by genotype 08, followed by 10 (9.00). Genotype 51, recorded for the TSS content of (6° brix) followed by the genotypes *viz.*,6, 18, 20, 21, 22, 24, 25, and 26 (7° brix), was found to have low TSS content, hence it is suitable for diabetic patients. Genotype 37 was identified for vegetable purposes in the immature stage, and ripened fruits were more suitable for table purposes. KDM-AhJ- 31 and 39 identified for thousand fruited jackfruit genotype. Flake color varied from white, yellow, whitish yellow, light yellow, bright yellow, and senthuram/deep orange. The genotypes KDM-AhJ-01, 4, 7, and 10 showed good deep orange (Senthuram color) flakes. Genotype 45 recorded pure white flakes that were very sweet in taste. The owner of this jackfruit farmer, S.Karthick, said this is for Seeni pala. Genotypes 17, 18, and 19 were identified for Tharaipala. The shelf life of flakes varied distinctly among the fifty-five jackfruit germplasms. The genotypes KDM-AhJ -08 and KDM-Ah -10 record for five days. Among the 55 genotypes, diversity was recorded for every genotype. Based on overall performance concerning vegetative

growth, yield, and quality, characters were recorded to identify the superior genotypes.

Keywords

% (per cent); *Artocarpus heterophyllus* Collection; Evaluation, Germplasm, Genotypes, Jackfruit, Kudumiyanmali

Introduction

Jackfruit *(Artocarpus heterophyllus* Lam., Moraceae) is an evergreen tree that comes up well under the humid and warm climate of hill slopes. It also grows well under the arid and warmer plains of south India. Flowering twigs emerge from the trunk and the main branches. Male and female flowers are borne separately on the same tree. The female flower, which has a fleshy ring at the base, is larger than the male flower. Jackfruit is a multiple fruit that contains a large number of flakes, and each flake is a fruit. It is cultivated throughout the tropical lowlands in South and South East Asia, as well as parts of Central and Eastern Africa and Brazil. In India, it is widely distributed in the states of Assam, Bihar, Tripura, West Bengal, Uttar Pradesh, the foothills of the Himalayas, and the South Indian states of Kerala, Tamil Nadu, and Karnataka. The region comprising Assam, Tripura, and West Bengal produces a major share of jackfruit in India (1). Jackfruit shows a considerable range of variations in morpho-agronomic characters, and this may be because jackfruit trees are cross-pollinated and are mostly propagated by seeds. A considerable variation between trees has been observed for traits such as growth habit, canopy structure, fruit shape, size, color, fruit-bearing (age and seasonality), and maturity. Variations also exist in the density, size, and shape of fruits, fruit-bearing, sensory quality, flesh type, sweetness, flavor, and taste (2). Presently, in India, jackfruit is cultivated in an area of 188 thousand hectares with a production of 1946 thousand MT (3). It is the largest fruit-borne tree on the earth and is a heavier yielder than any other fruit tree. (4) and (5).

A biodiversity awareness program initiated by 'International Plant Genetic Resources Institute (IPGRI)' and 'The Food and Agriculture Organization (FAO)' has been ongoingto minimize food and nutrition insecurity (6) and (7-8). Several underutilized plants have been listed as potential alternative nutrition sources, including Jackfruit. Terms that have been used to describe the plants include: 'promising,' 'underutilized,' and 'neglected' (9). The plants are viewed as great potential alternative nutritionsources; however, their potential has not been fully exploited (10). The popularization of these plants would, therefore, provide the required alternative nutrition sources. Jackfruit (*Artocarpus heterophyllus*) has been listed as one of the plants that are 'underutilized.' The popularization of this fruit in areas where it can be cultivated would be beneficial, especially to developing countries that are heavily affected by food and nutrition insecurity (11-15).

Jackfruit is widely cultivated in countries such as India, the Philippines, Pakistan, Sri Lanka, Malaysia, Thailand, and Bangladesh (16). Due to its edaphoclimatic adaptability, the jackfruit tree can grow on almost any type of soil but prefers deep, well-drained sandy- loam soils with plenty of moisture and rich in organic matter. Artocarpus plantations are found on flat or sloping land, on porous soils in tropical areas as well as on light soils. The soils where the crop is to be established must have adequate drainage conditions and must be fertile with water availability, avoiding factors that cause stress, such as excessive heat, wind, and frost (17). Jackfruit is reported to thrive at elevations of 1000 to 1600 m above sea level with annual rainfall of 1000 to 2400 mm. Although it is a cold-tolerant species, trees can suffer from severe frost damage, so a warm-humid climate with temperatures between 19 and 29^0C is best (18). The 50 known species of the genus *Artocarpus* are mostly humid tropical trees originating from areas with moderate monsoon climates and a short dry season (17). The fruits are propagated by seed, cuttings, or grafting, and these methods can be carried out at any time of the year. These fruits are also found in some countries in the Americas, such as Brazil, the United States, and Mexico (17). In Mexico, the state of Nayarit is the main producer of jackfruit, contributing more than 90% of the national production (19). Thus, jackfruit is one of the most important crops in the state, competing with traditional crops such as mango and banana; however, limited information is available on the characteristics of the fruit. (20) reported that the pulp, leaves, and peel of jackfruit have been used in traditional medicine as, for example, anti-inflammatory, anti-proliferative, hypoglycemic, antioxidant, and antimicrobial agents; however, those authors only described the characteristics for certain types of jackfruit. Jackfruit has a high content of phytochemicals, mainly phytosterols, carotenoids, and phenolic compounds (21), which have been found to exhibit a high antioxidant capacity (22); however, the genotypes analyzed in that study were not specified. Most studies on this fruit are from Asia (mainly India) and have reported important morphological, physiological, and chemical variations among genotypes of jackfruit, such as the shape, size, and color of the fruit, the size of the leaves, sensory quality, and pulp color (23-25). Other important parameters considered in studies of jackfruit include the respiration rate (RR) and ethylene production (EP) (26-28) because, during the ripening process, various changes manifest that are interesting concerning the sensory quality of the fruit (color, total soluble solids, texture, acidity, volatile compounds, among others) (28).

The jackfruit is utilized at different stages for various purposes, *viz*., at the tender stage, it can be used as a vegetable in many culinary dishes and can be processed into pickles, chutney, powders, canned slices, and this is the best meat alternative. In its mature stage, it is used for making papads, chips, and various culinary dishes. Ripe fruits are often relished fresh and processed into jam, jelly, juice, squash, fruit powder, and pulp which are used as a natural ingredient in icecream, etc. Due to

the increasing adaptability of a vegan lifestyle, there is a huge demand for dummy meat or meat substitute products. Jackfruit, at the tender stage, will have a meat-like texture because of its fiber. It is often considered a superfood and is in high demand because of its immense nutritive value. The nutritional composition per 100 g of tender fruit includes 84 percent moisture, 2.6 g of protein, 0.3 g of fat, 0.7 g of minerals, 2.8 g of crude fiber, 9.4 g of carbohydrates, 51 Kcal. of energy, 287-323 mg of potassium, 40 mg of phosphorous, 30 mg of calcium and 0.567 mg of iron (29). These phytochemicals possess anti-inflammatory, anti-bacterial, anti-tumor, and other nutraceutical properties with low glycemic index and almost zero cholesterol compared to their ripe stage (15). Jackfruit seeds are very nutritious and an important source of diet. They are boiled or roasted and eaten like chestnuts or cooked in some local dishes (30). The variations witnessed in the qualitative (fruit shape) and quantitative (fruit length, width, and weight of the fruit; thickness and weight of the rind, mesocarp, and core; recovery of edible portion) traits of the tender jackfruit genotypes can be attributed to their virtue of cross-pollination and seed propagation (31 and 32). The screening of the jackfruit genotypes for vegetable purposes will help in the selection of elite trees possessing high yield potential with better nutritional and cooking quality; this will further lead to the development of good varieties, resulting in the commercialization of the tender jackfruit as a vegetable.

Jackfruit is a medium-sized evergreen tree, typically reaching 8-25 m in height, producing higher yields than any other tree species, and bears the largest known edible fruit (up to 35 kg). The jackfruit tree has several uses. Flakes of ripe fruits are high in nutritive value; every 100 g of ripe flakes contains 287-323 mg of potassium, 30.0-73.2 mg of calcium, and 11-19 g of carbohydrates (33). In Bangladesh, it is commonly referred to as “poor man’s food” (34) as it is cheap and plentiful during the season. The nutritious seeds are boiled or roasted and eaten like chestnuts, added to flour for baking, or cooked in dishes. The tree is also known for its durable timber, which ages to an orange or reddish brown color, with anti-termite properties. The leaves and fruit waste provide valuable fodder for cattle, pigs, and goats. Jackfruit wood chips yield a dye that is used to give the famous orange-red color to the robes of Buddhist priests. In addition, many parts of the plant, including the bark, roots, leaves, and fruits, have medicinal properties.

In Bangladesh, it is commonly referred to as “poor man’s food” (34) as it is cheap and plentiful during the season. Varietal improvement in jackfruit is limited to the selection of high-yielding, better-quality genotypes. Several authors (35) have reported the selection of desirable types through germplasm characterization and evaluation. (35) also found variability in fruit quality among 95 selected accessions from Western Ghats. They evaluated the physio-chemical characteristics of fruits and found significant differences, thus indicating wide genetic variability. A significant variation in the physico-chemical characteristics of jackfruit bulbs was observed among the 30 jackfruit selections surveyed and studied from the coastal zone of Karnataka (36). Twenty-three superior genotypes were selected for environmental adaptation and cultural practices. Considering fruit characteristics, i.e., taste, sweetness, hardness of bulb, bulb color, fruit size, %TSS, % edible portion, and yield, the germplasm was found to be suitable for jackfruit cultivation in Jamalpur region, Bangladesh (37).

A systematic investigation of these types may determine consumer preference for jackfruit varieties in Malaysia (38). In 2001, several jackfruit clones were recommended to be grown commercially, including the J29, J31 (NS1), and J3 clones (39). These clones had good demand in the market because their sizes were not too large, their pulp was fleshy, smooth, and sweet (more than 13% Brix), and their colors were strong. However, in 2011, there were new jackfruit clones with unknown consumer acceptance of their characteristics. These clones were J32, known as Mantin; J33, known as Tekam Yellow; and J35, known as Mastura. This is because most studies for jackfruit focused on technical research such as pest surveys and on finding new jackfruit clones with high yields, whereas consumer surveys are also very important in guiding the choosing of clones or varieties that meet the demands and requirements of the consumer market (40). The high yield of fruit does not guarantee marketability if consumers do not like the produce. Because the characteristics of jackfruit vary according to its variety (41), the study of consumer acceptance of jackfruit’s characteristics is very important to growers and marketers during their decision-making process (42).

Jackfruit was very useful in the treatment of the dreaded disease of human beings -AIDS. An extract of jackfruit to inhibit the growth of HIV infection *in vitro*. The power of this substance is called Jacaline (43), Department of Microbiology and Antibacterial Immunology, Montpellier University, France. Jacaline is inactive on lymphocytes that are already infected but have proved it might be protecting the healthy ones. After modifying this molecule to make it less toxic, scientists are planning to use (*in vitro*) (Technical News from France, Centre for Documentation on Universities Science and Technology, Office of the Counsellor for Cultural, Scientific and Technical Co-operation, Embassy of France,2, APJ Kalam Road (former Aurangzeb Road), New Delhi, India. Recently, it has been reported that jackfruit could be very useful in the treatment of the dreaded diseases of human beings, such as AIDS. An extract of jackfruit called ‘Jacaline’ was seen to have inhibited the growth of HIV infection under (*in vitro*) conditions (44). Jacaline is inactive on lymphocytes that are already infected but have proved its might by protecting the healthy ones. Hot water extracts from leaves improve the glucose tolerance level of diabetic patients. The fruit rind and leaves are excellent cattle feed. Besides these beneficial properties, jackfruit may be considered a source of natural antioxidants and consumption of these fruits may supply substantial antioxidants, which may provide health-promoting and disease-preventing effects. The resveratrol content of jackfruit skin was 3.56 µg/g. This was comparatively

similar to the skin extracts of grapes. So, it is essential to study the biochemical properties of jackfruit. There are no well-defined varieties in specific localities; local varieties have different names based on their variability in yield, fruit shape, flake color, total sugars, and so on.

In India, jackfruit production is mostly in Bihar, West Bengal, Uttar Pradesh, Assam, Orissa, Kerala and Tamil Nadu. In Tamil Nadu, districts like Cuddalore and Villupuram have been known as traditional districts for jackfruit cultivation. However, it has come to light that the Pudukkottai district is another potential area for jackfruit cultivation. The unique feature of jackfruit cultivation in this area is that most of the trees are grown as border trees except in a few areas where it is grown on a commercial scale (Single crop) under laterite soil conditions, which is responsible for more color and taste in the flakes. Mumbai market extends sweet welcome to (Vadakadu, Mangadu, Periyavadi, Vanakkankadu, Vandanviduthy, Pallathividuthy, Pullanviduthy, Senthangudi, Kothamangalam, Keeramngalam, Panankulam, Maramadakki, Anavayal, Neduvasal and Karukakurichi of Pudukkottai district) jackfruit. In the Pudukkottai district of Tamil Nadu, there are emerging production and mainstream marketing opportunities (45) (Fig.14.).

In the Pudukkottai district, the area under Jackfruit is 1102 ha (14), with a productivity of 7.00 tonnes/ ha (Tables 8 and 9). The objective of the study was to evaluate the diversity of jack fruit germplasm available at Pudukottai and to identify the superior genotype based on fruit quality for future breeding programs.

Materials and Methods

A survey was conducted in twelve villages in and around Pudukkotai district, Tamil Nadu, India, from 2016 to 2019. In which 55 genotypes were identified. The village includes Periyavadi, Vadakadu, Paramanagar, Mangadu, Mela pullanviduthy, Pullanviduthy, Senthangudi, Kothamangalam, Alankadu, Kothamangalam, Kudumiyanmalai, Vallathirakottai (Table 1). Growth, yield characters, and biochemical characteristics were estimated among all the identified genotypes. Yield per tree was calculated by multiplying the number of fruits harvested per tree per year by the average fruit weight, which was expressed in kilogram (kg). The biochemical characteristics include total soluble solids (hand refractometer), total sugars, reducing sugars, non-reducing sugars (46), titrable acidity of flakes, ascorbic acid content of flakes, and carotene content of flakes (47). Different biochemical parameters were recorded, and the mean data was derived from the flakes of the top, middle, and bottom portions of five ripe fruits from each genotype with three replications. The (Agres) includes Mean, Range, Standard deviation, Standard error, and Coefficient of variation (48).

Morphological characters

Morphological characters *viz*., age of the plant, tree height (m), trunk girth (cm), canopy spread E-W direction (m), canopy spread N-S direction (m), the month of flowering was recorded during November- December and January to February 2016-2019. Harvest during the months of January to March 2016-2019 April to June 2016-2019, and July to September 2016-2019.

Tree height

The height of the tree was recorded from the base to the topmost branching site and expressed in meters (m).

Trunk girth

Trunk girth was recorded at 50 cm above ground level and expressed in centimeters (cm).

Season of fruiting

The season of fruiting in each genotype was recorded and classified into early (March-April), mid-season (May-June), and late (July-August).

Yield and quality quantitative characters

Yield and quality quantitative characters *viz.,* number of fruits per tree, individual fruit weight (kg), yield per tree (kg), fruit length (cm), fruit breadth (cm) and TSS (^{0}brix), rind weight (kg), No. of. flakes per fruit, weight of flakes per fruit (kg), weight of individual flake without seed (g), seed weight (g), and Flakes: seed ratio, total sugars (%), reducing sugars (%), non-reducing sugars (%), Titrable acidity (%), Ascorbic acid content (%), Carotene content (mg/100 g), Protein (g/100 g), color and appearance, flavor, texture/firmness, taste, overall acceptability were recorded and statistically analyzed. The compiled data were analyzed for measuring range, mean, standard deviation (SD), standard error of the mean (SE), and coefficient of variance (CV %) using (Agres). An organoleptic evaluation was carried out with the help of a panel consisting of 10 members. They were asked to evaluate the samples for the appearance, flavor, texture, taste, and overall quality of jackfruit flakes using a five-point Hedonic scale (49).

Fruit weight

Individual fruit weight was recorded using an electronic weighing balance for ten fruits, and the average was expressed in kilograms (kg).

Fruit rind weight

After opening the fruits, flakes and seeds were taken out, and the rind was separated. The rind weight was measured in ten fruits, and the average was expressed in kilograms (kg).

Number of flakes per fruit

The number of flakes per fruit was physically counted in ten fruits, and the average was expressed.

Total weight of flakes per fruit

The total weight of flakes without seed was taken for each genotype and expressed in kilogram (kg).

Weight of individual flake with seed

The weight of twenty individual flakes with seed was taken, and the average was expressed in grams (g).

Weight of individual flake without seed

The weight of twenty individual flakes after removing the seed was taken, and the average was expressed in grams

Table 1. Diversity of jackfruit genotypes KDM-Ah-1to KDM-Ah-55 (Geographical region) in Pudukkottai District of Tamil Nadu, India

Acc. No.	Age of the tree (Years)	Location /District	Tracts/ Zones
KDM-Ah-1	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-2	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-3	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-4	22.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-5	24.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-6	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-7	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-8	27.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-9	30.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-10	30.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-11	30.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-12	26.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-13	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-14	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-15	24.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-16	7.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-17	7.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-18	7.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-19	7.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-20	10.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-21	10.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-22	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-23	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-24	10.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-25	15.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-26	15.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-27	15.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-28	15.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-29	12.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-30	12.00	Pudukkottai District	Rainfed cultivation
KDM-Ah31	33.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-32	33.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-33	26.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-34	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-35	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-36	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-37	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-38	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-39	15.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-40	12.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-41	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-42	15.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-43	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-44	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-45	15.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-46	30.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-47	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-48	22.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-49	22.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-50	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-51	25.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-52	30.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-53	20.00	Pudukkottai District	Rainfed cultivation
KDM-Ah-54	27.00	Pudukkottai District	Rainfed cultivation
KDM-Ah- 55	25.00	Pudukkottai District	Rainfed cultivation

HAPPY DAYS: Jackfruit's arrival at the wholesale market at Vadakadu in Pudukottai district has shown a considerable increase in the last three years.

(g).

Fig.14. Mumbai market extends sweet welcome to Vadakadu jackfruits (Farmers and traders reap rich rewards with drip irrigation, crop management March 30, 2015, 12:00 Am | Updated 06:01 Am IST – Pudukottai)

Flake (Pulp) color

Flake color was recorded at the ripe stage and classified as coppery red, deep yellow, yellow, light yellow, creamy white, and white.

Off-season bearing habit

The 'off-season' bearing habit of the genotypes was recorded and grouped as 'yes' and 'no'. The main fruiting season is normally between March and August, and the off -season is between September and November.

Results and Discussion

According to the International Plant Genetic Resources Institute (50), morphological variation among jackfruit trees was recorded using the jackfruit descriptor.

Growth Characters

The age of the genotypes varied greatly and significantly. The age of the tree ranged from 07.00 to 33.00 years. The germplasm KDM-AhJ-31 and KDM-AhJ-32 were the oldest aged plants (33.00 years), while KDM-AhJ -16, 17, 18, and 19 were the low 7.00 years old plants. The yield of jackfruit trees increases with the plant's age. The height of the tree was greatly varied (Table 2). Tree height varied from 2.20 m to 10.30 m. The germplasm KDM-AhJ-19 had the lowest plant height of 2.20 m, while the genotype KDM-AhJ-52 recorded the highest tree height of 10.25 m. Trunk girth has differed significantly. The highest trunk girth was observed in the germplasm KDM-AhJ-38 (158.00 cm). The genotype KDM-AhJ-04 was recorded for the lowest trunk girth of 55.00 cm. The yield of jackfruit trees increases with the increase of tree trunk girth of the plant. Higher stem circumference gives better support for the main branches and reflects the vigour of trees indirectly; bearing more fruits leads to higher yield. The lesser the trunk height with spreading nature, the greater the number of fruits per tree due to more primary and secondary branches (Fig.12.). Similar variability was reported by Muthulakshmi (51), (52). A diversity of canopy spread was observed in the genotypes. Significance variation was observed in the case of canopy spread E-W direction of 1.20 m to 3.60 m (Fig.1). The genotypes KDM-AhJ-36 and KDM-AhJ-46 observed with the highest canopy spread of 3.60 m and the lowest of 1.15 m to KDM-AhJ-30. The yield of the jackfruit plant increases with the increase of the canopy spread of the plant. The highest canopy spread N-S direction of 3.60 m was observed by the germplasm KDM-AhJ-01 and the lowest of 1.12 m by KDM-AhJ-30. The yield of the jackfruit plants increases due to the highest canopy spread in the east-west and north-south directions. This may be due to the genetic nature of the genotypes and the growing environment. Similar variability was reported by Muthulakshmi (51), (52), (53), and (54) in jackfruit.

Based on the fruiting season, the selected genotypes were grouped into early season (January-March), mid-season (April -June), and late season (July-August). Among the genotypes, the majority showed early season bearing habit (January-March). Whereas KDM-AhJ-46 mid-season bearer (April -June) (Fig.2.) Meanwhile, KDM-AhJ-08, KDM-AhJ-10, and 35 flowerings were started by the month of January-February, and harvest was extended to the month of August to September (late season bearing) (Fig.3). For the meantime the genotypes KDM-AhJ-31 and KDM-AhJ-32 have produced the main season (March to April) and off-season (September-November) jackfruit (Fig.4.).

Yield Characters

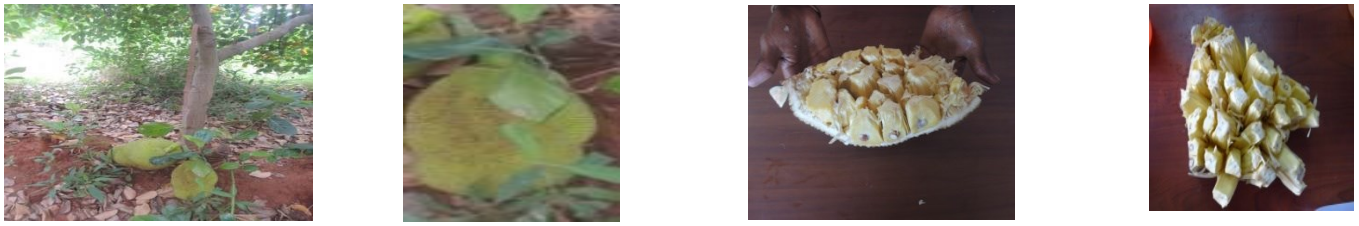
The highest number of fruits per plant (43.33.00) was obtained from KDM-AhJ-08, followed by KDM-AhJ-31 (33.33), and the minimum of (8.00), was from KDM-AhJ-16 (Table 3). Yield is directly correlated with the number of fruits and the weight of the individual fruit (Table 3). Individual fruit weights differed significantly. Maximum individual fruit weight was gained from KDM-AhJ- 46 (16.33 kg) followed by KDM-AhJ-10 (14.33 kg), and a minimum of (4.67 kg) was observed by the genotype KDM-AhJ-08. Nowadays small-sized jackfruit is preferred due to the nuclear family (Fig.5.). Farmer's point of view is that medium and large-sized fruits are economically viable, and the export market is preferable (Table 3). The fruit length

Table 2. Growth characters of jackfruit genotype KDM-Ah-1to KDM-Ah-55

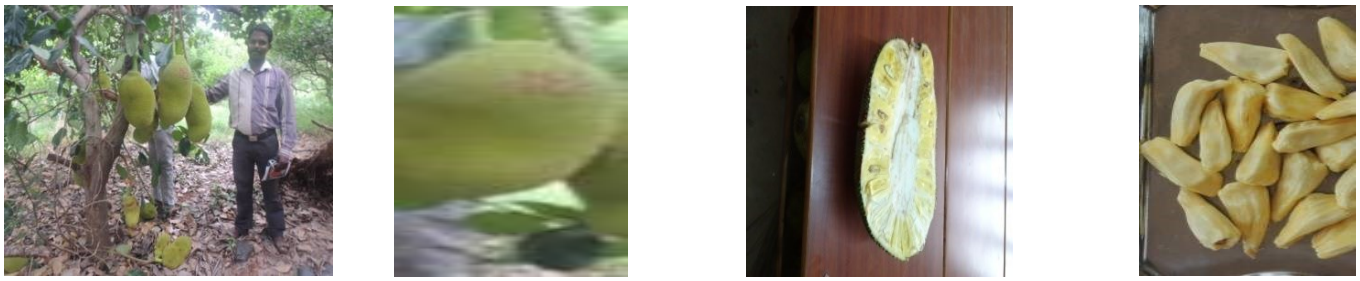
Acc. No.	Age of the tree (Years)	Tree height (m)	Trunk girth (cm)	Canopy spread E-W (m)	Canopy spread N-S (m)	Month of flowering	Month of harvest
KDM-AhJ-1	27	9.5	115.67	3.50	3.60	Nov- Dec	March-June
KDM-AhJ-2	22	6.0	110.67	2.50	2.90	Nov- Dec	March-June
KDM-AhJ-3	27	6.2	115.67	3.60	2.90	Nov-Dec	March-June
KDM-AhJ-4	24	4.1	60.33	2.60	2.70	Nov-Dec	March-June
KDM-AhJ-5	26	8.5	105.67	3.50	2.40	Nov-Dec	March-June
KDM-AhJ-6	22	6.0	70.67	1.90	2.50	Nov-Dec	March-June
KDM-AhJ-7	22	7.0	75.67	1.60	1.80	Nov-Dec	March-June
KDM-AhJ-8	29	10.5	81.00	3.00	3.20	Jan-Feb	June-July (late season)
KDM-AhJ-9	32	9.0	81.67	2.70	2.90	Nov-Dec	March-June
KDM-AhJ-10	32	8.0	81.00	3.40	3.50	Jan-Feb	June-July (late season)
KDM-AhJ-11	32	7.0	73.00	1.90	2.50	Nov-Dec	March-June
KDM-AhJ-12	28	8.0	75.33	1.40	1.90	Nov-Dec	March-June
KDM-AhJ-13	27	6.0	77.67	2.20	2.40	Nov-Dec	March-June
KDM-AhJ-14	22	5.6	75.67	1.70	1.72	Nov-Dec	March-June
KDM-AhJ-15	26	5.8	77.00	1.50	1.60	Nov-Dec	March-June
KDM-AhJ-16	9	3.9	50.33	1.50	1.40	Nov-Dec	March-June
KDM-AhJ-17	9	5.8	110.33	2.50	3.50	Nov-Dec	March-June
KDM-AhJ-18	9	3.9	81.00	1.80	1.42	Nov-Dec	Dec
KDM-AhJ-19	9	2.7	77.00	1.40	1.50	Nov-Dec	March-June
KDM-AhJ-20	12	5.0	110.33	2.20	1.72	Nov-Dec	March-June
KDM-AhJ-21	12	6.9	115.00	1.72	1.80	Nov-Dec	March-June
KDM-AhJ-22	22	5.8	101.00	1.30	1.42	Nov-Dec	March-June
KDM-AhJ-23	22	6.0	76.00	1.50	1.60	Nov-Dec	March-June
KDM-AhJ-24	12	4.6	111.00	1.40	1.65	Nov-Dec	March-June
KDM-AhJ-25	17	5.6	105.00	1.20	1.30	Nov-Dec	March-June
KDM-AhJ-26	17	4.9	85.67	1.40	1.45	Nov-Dec December	March-June
KDM-AhJ-27	17	4.7	80.33	1.42	1.65	Nov-Dec	March-June
KDM-AhJ-28	17	3.7	75.67	1.20	1.25	Nov-Dec	Dec
KDM-AhJ-29	14	3.9	64.00	1.30	1.70	Nov-Dec	March-June
KDM-AhJ-30	14	8.9	105.33	1.15	1.12	Nov-Dec	March-June
KDM-AhJ-31	35	9.7	115.33	2.90	1.90	Nov-Dec	March-June (off-season October to November
KDM-AhJ-32	35	6.8	103.00	3.12	3.15	Nov-Dec	March-June (off-season October to November
KDM-AhJ-33	28	4.7	115.67	1.40	1.30	Nov-Dec	March-June
KDM-AhJ-34	27	7.6	61.67	1.20	1.40	Nov-Dec	March-June
KDM-AhJ-35	27	5.8	75.33	2.20	2.65	Nov-Dec	March-June
KDM-AhJ-36	27	6.6	127.00	3.60	3.80	Nov-Dec	March-June
KDM-AhJ-37	27	5.6	150.67	2.25	2.20	Nov-Dec	March-June
KDM-AhJ-38	22	8.5	163.00	2.60	2.75	Nov-Dec	March-June

KDM-AhJ-39	17	10.6	140.33	2.15	2.30	Nov-Dec	March-June
KDM-AhJ-40	14	7.7	153.33	3.30	3.20	Nov-Dec	March-June
KDM-AhJ-41	22	5.6	70.00	1.65	1.85	Nov-Dec	March-June
KDM-AhJ-42	17	10.7	133.00	2.32	2.25	Nov-Dec	Dec
KDM-AhJ-43	22	5.6	100.67	2.30	2.10	Nov-Dec	March-June
KDM-AhJ-44	22	8.9	115.33	3.35	3.50	Nov-Dec	March-June
KDM-AhJ-45	17	7.7	80.33	2.30	2.40	Nov-Dec	March-June
KDM-AhJ-46	32	8.2	105.33	3.60	3.50	Nov-Dec	Apil-June (mid season)
KDM-AhJ-47	22	7.7	78.67	1.70	1.85	Nov-Dec	March-June
KDM-AhJ-48	24	9.5	85.67	2.20	2.30	Nov-Dec	March-June
KDM-AhJ-49	24	8.6	85.00	1.90	2.20	Nov-Dec	March-June
KDM-AhJ-50	27	10.6	70.33	1.40	1.30	Nov-Dec	March-June
KDM-AhJ-51	27	8.9	96.00	2.20	2.30	Nov-Dec	March-June
KDM-AhJ-52	32	10.8	126.00	2.30	2.40	Nov-Dec	March-June
KDM-AhJ-53	22	5.7	100.67	1.90	1.75	Nov-Dec	March-June
KDM-AhJ-54	29	6.7	120.33	2.30	2.20	Nov-Dec	March-June
KDM-AhJ- 55	27	7.8	111.00	2.20	1.70	Nov-Dec	March-June
Grand mean	22.4533	6.9071	96.5152	2.60	2.20	-	-
SEd =	1.1166	0.1507	1.3996	0.14	0.13	-	-
CD(.05)=	2.2132	0.2987	2.7743	0.27	0.3	-	-
CV% =	6.09	2.67	1.78	7.87	7.5	-	-

Nov- November, Dec- December



KDM-AHJ-17 Jackfruit Germplasm



KDM-AHJ-18 Jackfruit Germplasm

KDM-AHJ-19 Jackfruit Germplasm

Fig. 12. Tharaipala or Velipala

Opposite growing KDM-AHJ-35

Horizontal growing KDM-AHJ-36

Dwarf growing KDM-AHJ-04

Tall growing KDM-AHJ-52

Opposite growing KDM-AHJ-6

Erect growing KDM-AHJ-9

Fig. 1. Diversity of tree height, canopy shape, fruit shape, and colour of flakes

1 and2 slender shape,62. round shape,63. 8. Small size

Light yellow

Bright yellow

Bright yellow

Fig. 1. Diversity of tree height, canopy shape, fruit shape, and colour of flakes

KDM-AHJ-46 Jackfruit Germplasm

Fig. 2. Mid-season bearing genotype (May to June 2016-2019)

KDM-AHJ-08 Jackfruit Germplasm

KDM-AHJ-10 Jackfruit Germplasm

KDM-AHJ-35 Jackfruit Germplasm

Fig. 3. Late season bearing genotypes (July to August 2016-2019)

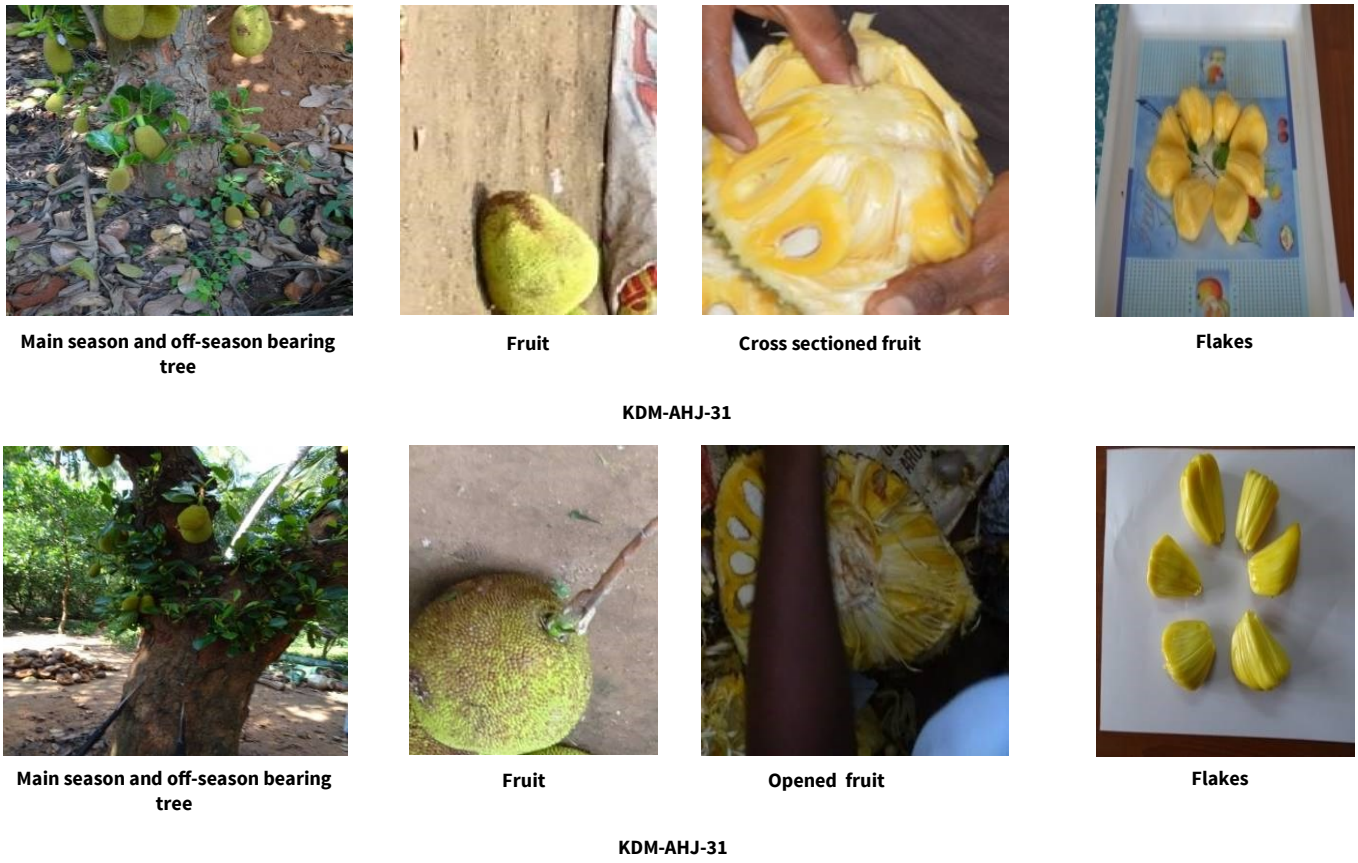


Fig. 4. Main season (March to April 2016-2019) and off-season (October to November 2016) production of genotypes

Fig. 5. Small-sized fruit suitable for small families

and breadth of fifty-five jackfruit were significantly varied (Table 3). Yield was varied from 62.67kg/tree to 458.33. The highest yield was recorded from KDM-AhJ- 10. Fruit length ranged from 10.33 to 43.00 cm and breadth from 16.00 to 55.67 cm, with a mean of 22.88 cm and 31.71 cm, respectively. The longest fruit was obtained from KDM-AhJ-46 (45.00 cm), followed by the KDM-AhJ-10 (40.00 cm), and the shortest fruit in KDM-AhJ-25 (12.00 cm). The germplasm KDM-AhJ-46 fashioned the wider fruit breadth (55.67 cm) followed by KDM-AhJ-10 (38.00 cm) and narrower fruit into

Table 3. Yield characters of jackfruit genotype KDM-Ah-1to KDM-Ah-55

Acc. No.	No. of fruits /tree	Individual Fruit weight (kg)	Yield /tree (kg)	Fruit Length (cm)	Fruit breadth (cm)
KDM-AhJ-1	10.67	9.67	108.33	37.67	40.00
KDM-AhJ-2	16.00	11.00	179.33	25.00	34.00
KDM-AhJ-3	13.67	11.33	155.33	24.67	42.67
KDM-AhJ-4	15.00	5.00	111.67	10.33	16.00
KDM-AhJ-5	12.67	11.00	141.33	21.67	45.00
KDM-AhJ-6	13.33	6.67	93.33	14.00	16.33
KDM-AhJ-7	11.33	8.33	95.00	15.33	28.00
KDM-AhJ-8	43.33	4.67	211.67	24.00	30.00
KDM-AhJ-9	15.00	13.00	209.33	28.00	21.00
KDM-AhJ-10	30.00	14.33	458.33	38.00	48.00
KDM-AhJ-11	25.67	13.67	355.00	14.00	22.00
KDM-AhJ-12	24.67	10.33	271.33	19.33	32.00
KDM-AhJ-13	22.67	10.67	254.67	20.00	29.33
KDM-AhJ-14	30.00	10.67	320.00	20.33	32.00
KDM-AhJ-15	19.33	8.33	170.33	24.67	29.00
KDM-AhJ-16	8.00	7.33	62.67	24.33	30.00
KDM-AhJ-17	9.33	7.67	75.33	30.00	22.00
KDM-AhJ-18	9.00	8.00	73.67	26.67	29.00
KDM-AhJ-19	12.33	8.00	102.67	23.67	26.00
KDM-AhJ-20	14.00	9.00	130.67	24.00	29.00
KDM-AhJ-21	10.33	8.00	86.67	20.00	42.00
KDM-AhJ-22	8.33	9.67	85.33	21.33	28.00
KDM-AhJ-23	9.00	10.00	95.33	26.33	38.33
KDM-AhJ-24	10.33	8.67	95.33	19.33	27.00
KDM-AhJ-25	15.00	8.00	124.67	11.00	23.00
KDM-AhJ-26	23.33	7.67	192.00	22.00	30.00
KDM-AhJ-27	24.33	11.67	299.67	24.00	32.00
KDM-AhJ-28	24.67	10.67	280.67	24.00	31.00
KDM-AhJ-29	21.67	11.33	265.67	30.33	38.00
KDM-AhJ-30	22.33	9.67	230.67	26.00	48.67
KDM-AhJ-31	33.33	7.00	243.33	10.67	42.00
KDM-AhJ-32	19.00	10.67	214.67	20.00	25.00
KDM-AhJ-33	23.00	8.00	195.00	10.33	25.67
KDM-AhJ-34	27.00	9.00	255.33	31.00	40.00
KDM-AhJ-35	24.67	11.00	281.33	28.33	45.00
KDM-AhJ-36	14.00	10.33	152.00	29.33	45.67
KDM-AhJ-37	12.00	7.67	99.33	24.67	34.33
KDM-AhJ-38	10.00	10.00	104.67	16.00	25.00
KDM-AhJ-39	10.33	10.67	112.00	18.67	28.33
KDM-AhJ-40	12.67	8.00	107.00	20.33	24.67
KDM-AhJ-41	15.00	9.00	140.33	28.00	40.00
KDM-AhJ-42	28.33	10.00	296.33	16.67	28.33
KDM-AhJ-43	16.67	9.00	158.00	28.00	43.00
KDM-AhJ-44	29.00	12.00	347.33	30.00	32.00
KDM-AhJ-45	22.67	11.00	260.00	25.67	35.33
KDM-AhJ-46	29.00	16.33	480.67	43.00	54.67
KDM-AhJ-47	14.00	13.33	188.00	23.00	30.00
KDM-AhJ-48	17.67	10.00	183.67	30.33	34.00
KDM-AhJ-49	18.00	13.33	242.00	25.00	32.00
KDM-AhJ-50	16.33	11.33	187.00	15.33	21.33
KDM-AhJ-51	15.33	9.00	144.00	18.00	21.67
KDM-AhJ-52	27.00	11.33	309.67	16.00	23.33
KDM-AhJ-53	23.00	9.00	218.00	14.00	18.00
KDM-AhJ-54	30.67	12.00	382.33	20.00	24.67
KDM-AhJ- 55	29.67	11.00	340.67	26.33	31.00
Grand mean	199.6121	9.8909	189.758	22.8848	31.7152
SEd=	5.4285	0.7427	5.4285	1.0620	1.3842
CD(.05)=	10.7602	1.4722	10.7602	2.1051	2.7437
CV% =	35.04	9.20	35.04	5.68	5.35

KDM-AhJ -06 (18.00 cm).

In a breeding program, even though many characteristics are studied in terms of morphology, physiology, biochemistry, fruit, and fruit quality, yield is the most important trait by which an accession or variety can be evaluated. In the case of jack, trees with more fruits and high fruit weight generally produce high yields. In the present study, wide variation was recorded in yield per tree per year (Table 3). The highest number of fruits per plant (43.33.00) was obtained from KDM-AhJ-08, followed by KDM-AhJ-31 (33.33), and the minimum of fruits (8.00) was observed from KDM-AhJ-16. Meanwhile, the yield varied from 62.67kg/tree to 458.33. The highest yield was recorded from KDM-AhJ- 10. Similar variations in yield per tree per year were reported (55), (56), and (31) in jackfruit and (57). Among the 55 genotypes, the genotypes KDM-AhJ-31 and 32 produced off-season bearing during the month of September to December.

From this study, the genotypes KDM-AhJ-37 were identified for the preparation of curry in the immature stage, and ripened fruits were more suitable for table purposes (Fig.6.) (15). KDM-AhJ-31 and 39 were identified for the thousand-fruited jackfruit genotype (Fig.10.).

Quality Characters

Significant variation was noticed among the fifty-five jackfruit germplasms in terms of the weight of the rind (Table 4). The weight of the rind ranged from 3.00 to 8.00 kg, with an average value of 5.80 kg. The highest weight of rind was found from KDM-AhJ-9 and KDM-AhJ-11 (8.00 kg), and the lowest rind was recorded for KDM-AhJ-04 and KDM -AhJ-08 (3.00 kg). The weight of the rind is directly proportionate to the edible portion of the fruit of jackfruit germplasm. Significant variation was found in the number of flakes per fruit. It ranged from 30.00 to 210.00 with a mean value of 81.00 (Table 4). A maximum number of flakes per fruit was obtained from KDM-AhJ-10 (210.00), followed by the germplasm KDM-AhJ-46 (150.00), and the minimum was from KDM-AHJ-32, KDM-Ah33 (40.00).

A maximum total flake weight per fruit was recorded in the genotype KDM-AhJ-10 (13.60 kg), and a minimum of 3.10 kg was observed in the genotype KDM-AhJ-17. Significant variation was found in the weight of individual flakes with seed**.** Individual seed weight ranged from 08.00 gm to 60.00 gm with a mean value of 25.24g. The maximum weight of individual seed weight was obtained from KDM-AhJ-32 (65.00 gm), and a minimum of 09.00gm was found from the germplasm KDM-AhJ-06. Flakes: seeds ranged from 0.42.00 to 7.00, with a mean value of 2.28. Maximum Flakes: seed ratio was obtained from KDM-AhJ-10 (5.30), and a minimum of 0.42 was found from the germplasm KDM-AhJ-12. A similar result was

Fig. 6. KDM-AhJ-37 identified for the vegetable purpose and table purpose

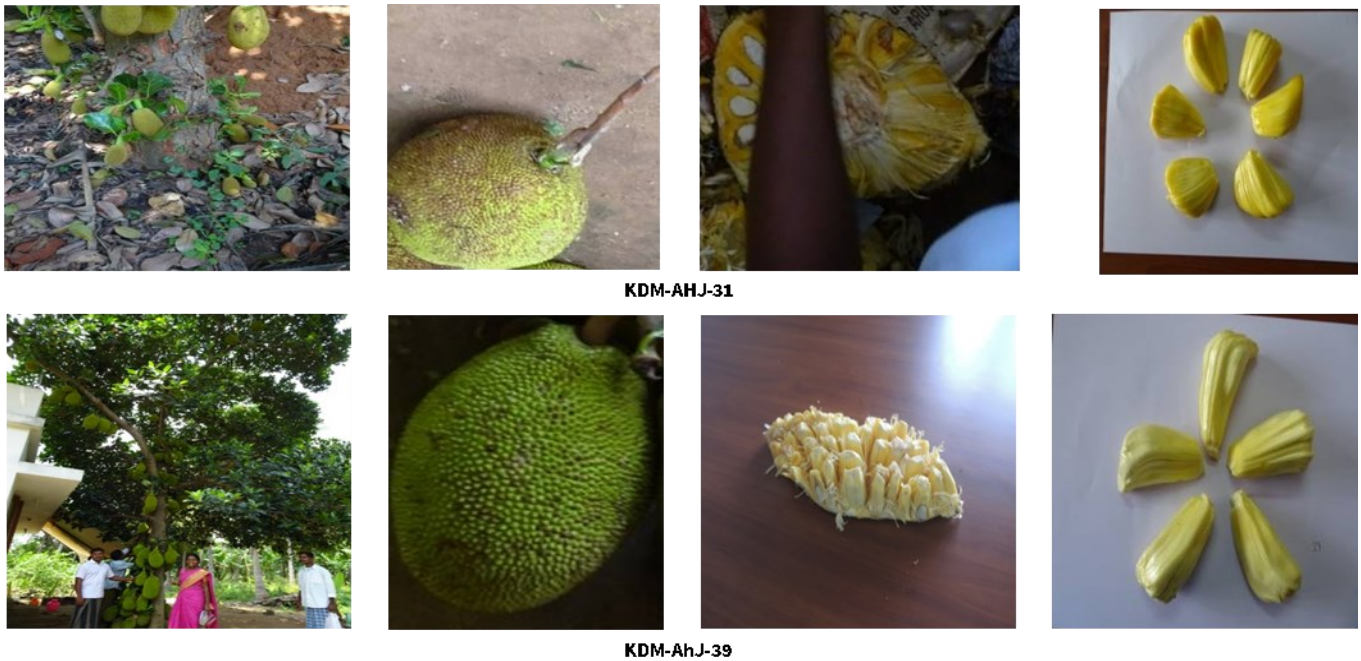


Fig. 10. Thousand-fruited jackfruit genotypes

Table 4. Quality characters of jackfruit genotype KDM-AhJ-1to KDM-AhJ-55

Acc. No.	Rind weight (kg)	No. of. Flakes per fruit	Weight of flakes per fruit (kg)	Weight of individual flake without seed (g)	Seed weight (g)	Flakes: seed ratio
KDM-AhJ-1	4.50	100.00	5.50	40.00	15.00	2.66
KDM-AhJ-2	5.00	75.00	6.00	55.00	25.00	2.20
KDM-AhJ-3	6.50	120.00	5.50	30.00	15.00	2.00
KDM-AhJ-4	3.00	100.00	5.00	40.00	10.00	4.00
KDM-AhJ-5	7.00	75.00	5.00	50.00	16.00	3.10
KDM-AhJ-6	4.50	105.00	3.50	25.00	9.00	2.70
KDM-AhJ-7	5.50	100.00	3.50	20.00	15.00	1.30
KDM-AhJ-8	3.00	75.00	5.00	43.00	10.00	4.30
KDM-Ah-9	8.00	101.00	7.00	40.00	29.00	1.40
KDM-AhJ-10	5.00	150.00	11.00	70.00	13.00	5.30
KDM-AhJ-11	8.00	100.00	7.00	45.00	25.00	1.80
KDM-AhJ-12	6.50	130.00	6.50	15.00	35.00	0.42
KDM-AhJ-13	5.50	80.00	5.50	50.00	19.00	2.60
KDM-AhJ-14	7.00	100.00	5.00	35.00	15.00	2.30
KDM-AhJ-15	5.00	120.00	4.00	20.00	13.00	1.50
KDM-AhJ-16	4.50	65.00	3.50	40.00	14.00	2.80
KDM-AhJ-17	5.00	50.00	3.10	45.00	15.00	3.00
KDM-AhJ-18	4.50	50.00	4.50	50.00	40.00	1.25
KDM-AhJ-19	5.00	60.00	3.10	35.00	15.00	2.30
KDM-AhJ-20	5.00	50.00	4.00	55.00	25.00	2.20
KDM-AhJ-21	5.00	105.00	3.00	18.00	10.00	1.80
KDM-AhJ-22	6.00	55.00	4.00	40.00	32.00	1.25
KDM-AhJ-23	5.50	45.00	5.50	62.00	60.00	1.03
KDM-AhJ-24	5.00	45.00	4.00	40.00	48.00	0.83
KDM-AhJ-25	6.00	30.00	3.10	55.00	45.00	1.22
KDM-AhJ-26	5.00	50.00	3.30	35.00	25.00	1.40
KDM-AhJ-27	7.00	60.00	6.00	45.00	55.00	0.81
KDM-AhJ-28	6.00	68.00	7.00	50.00	52.00	0.96
KDM-AhJ-29	7.00	75.00	5.00	37.00	30.00	1.23
KDM-AhJ-30	6.00	60.00	4.00	40.00	26.00	1.53
KDM-AhJ-31	3.20	72.00	4.80	40.00	27.00	1.48
KDM-AhJ-32	6.00	40.00	5.00	60.00	65.00	0.9
KDM-AhJ-33	4.00	40.00	4.00	60.00	40.00	1.50
KDM-AhJ-34	5.00	100.00	4.00	25.00	15.00	1.60
KDM-AhJ-35	6.00	150.00	6.00	30.00	10.00	3.00
KDM-AhJ-36	6.00	100.00	4.00	30.00	10.00	3.00
KDM-AhJ-37	5.00	150.00	3.20	12.00	8.00	1.50
KDM-AhJ-38	5.00	75.00	5.00	50.00	17.00	2.90
KDM-AhJ-39	4.50	150.00	8.00	30.00	25.00	1.20
KDM-AhJ-40	3.50	50.00	3.50	60.00	15.00	4.00
KDM-AhJ-41	4.70	78.00	4.30	30.00	25.00	1.20
KDM-AhJ-42	4.00	100.00	6.00	40.00	20.00	2.00
KDM-AhJ-43	3.00	75.00	6.00	70.00	10.00	7.00
KDM-AhJ-44	5.40	100.00	7.60	60.00	15.00	4.00
KDM-AhJ-45	6.60	52.00	4.40	60.00	25.00	2.40
KDM-AhJ-46	4.40	210.00	13.60	67.00	13.00	5.20
KDM-AhJ-47	6.50	75.00	5.50	55.00	25.00	2.20
KDM-AhJ-48	5.20	50.00	6.80	60.00	50.00	1.20
KDM-AhJ-49	6.90	42.00	7.10	110.00	60.00	1.80
KDM-AhJ-50	7.00	50.00	5.00	60.00	40.00	1.50
KDM-AhJ-51	5.00	60.00	4.00	45.00	17.00	2.60
KDM-AhJ-52	6.50	50.00	5.50	65.00	45.00	1.40
KDM-AhJ-53	4.70	62.00	4.30	55.00	15.00	3.60
KDM-AhJ-54	6.00	75.00	6.00	65.00	15.00	4.30
KDM-AhJ- 55	5.50	50.00	4.50	75.00	25.00	3.00
Mean	5.38	81.00	5.20	46.16	25.24	2.28
SEd=	1.18	35.77	1.89	17.51	15.10	1.30
CD(.05)=	0.43	2.30	0.30	2.56	1.20	0.11
CV% =	1.37	1256.36	3.52	301.08	223.96	1.66

reported by Aseef (2016).

TSS ranged from 6.00 to 29.17, with a mean value of 14.55 (Table 5). The highest TSS content was recorded for KDM-AhJ-08 (29.17° brix), and the lowest TSS content was observed for KDM-AhJ-51 (6° brix). Total sugars (%) varied from 6.15 to 25.20 with a mean value of 12.06. The highest total sugar was recorded from KDM-AhJ- 8, and the lowest of 6.15 was found from the germplasm KDM-AhJ-52. Reducing sugars (%) varied from 1.12 to 6.20 with a mean value of 2.35. The highest reducing sugars (%) were recorded as KDM-AhJ- 8 (6.10) and a minimum of 1.01% KDM-AhJ- 51. Non-reducing sugars (%) varied from 4.41 to 19.25 with a mean value of 9.71. The highest Non reducing sugars (%) recorded for KDM-AhJ- 10 (19.25%), and the lowest was 5.30% for the genotype KDM-AhJ- 21. Titrable acidity (%) varied from 0.10 to 0.40 with a mean value of 0.24, and the lowest acidity was found in the genotype

Table 5. Quality characters of jackfruit genotype KDM-Ah-1to KDM-Ah-55

Acc. No.	TSS (°brix) R3	Total sugars (%)	Reducing sugars (%)	Non Reducing sugars (%)	Titrable acidity (%)	Ascorbic acid content (%)	Carotene content (mg/100 g)	Protein (g/100 g)
KDM-AhJ-1	9.93	9.10	1.75	7.35	0.30	11.50	0.895	0.65
KDM-AhJ-2	11.03	9.75	1.25	8.50	0.25	12.00	0.450	0.45
KDM-AhJ-3	10.07	8.99	1.12	7.87	0.30	10.50	0.320	0.65
KDM-AhJ-4	20.10	16.50	3.75	12.75	0.11	9.20	0.820	0.78
KDM-AhJ-5	9.10	8.45	1.95	6.50	0.37	10.75	0.250	0.50
KDM-AhJ-6	7.10	6.50	1.12	5.38	0.40	12.50	0.350	0.55
KDM-AhJ-7	24.10	18.50	4.10	14.40	0.10	9.10	0.850	0.65
KDM-AhJ-8	29.17	25.20	6.10	19.10	0.10	7.10	0.839	1.08
KDM-AhJ-9	12.10	10.50	2.10	8.40	0.20	11.25	0.750	0.50
KDM-AhJ-10	27.43	24.25	5.00	19.25	0.11	7.20	0.835	1.06
KDM-AhJ-11	10.20	8.50	1.15	7.35	0.30	10.15	0.750	0.65
KDM-AhJ-12	10.17	7.95	1.10	6.85	0.32	11.12	0.650	0.50
KDM-AhJ-13	22.10	16.50	3.60	12.90	0.15	9.20	0.820	0.85
KDM-AhJ-14	12.23	10.20	2.10	8.10	0.20	11.50	0.650	0.45
KDM-AhJ-15	13.23	10.50	2.10	8.40	0.25	12.15	0.680	0.50
KDM-AhJ-16	8.23	6.85	1.25	5.60	0.32	12.75	0.250	0.60
KDM-AhJ-17	10.23	7.50	1.50	6.00	0.30	11.50	0.350	0.45
KDM-AhJ-18	7.43	5.50	1.10	4.40	0.35	13.00	0.250	0.50
KDM-AhJ-19	9.23	8.50	1.25	7.25	0.29	10.50	0.350	0.60
KDM-AhJ-20	7.43	6.50	1.12	5.38	0.35	12.50	0.250	0.45
KDM-AhJ-21	7.23	6.45	1.15	5.30	0.35	12.40	0.325	0.58
KDM-AhJ-22	7.27	6.75	1.16	5.59	0.34	12.50	0.350	0.60
KDM-AhJ-23	8.47	6.50	1.30	5.20	0.25	12.50	0.320	0.45
KDM-AhJ-24	7.17	6.35	1.32	5.03	0.30	12.45	0.250	0.35
KDM-AhJ-25	7.10	6.25	1.50	4.75	0.32	12.50	0.350	0.45
KDM-AhJ-26	7.10	6.15	1.25	4.90	0.35	12.25	0.650	0.52
KDM-AhJ-27	18.17	15.50	3.25	12.25	0.25	9.50	0.750	0.54
KDM-AhJ-28	12.13	9.50	1.75	7.75	0.20	12.20	0.650	0.35
KDM-AhJ-29	24.27	21.62	4.26	17.36	0.16	7.75	0.750	0.78
KDM-AhJ-30	18.37	15.60	3.50	12.10	0.20	9.10	0.350	0.65
KDM-AhJ-31	27.13	24.23	4.50	19.73	0.18	7.20	0.750	0.85
KDM-AhJ-32	23.03	20.50	4.10	16.40	0.16	7.60	0.650	0.75
KDM-AhJ-33	12.27	10.10	2.12	7.98	0.23	12.50	0.520	0.45
KDM-AhJ-34	21.17	16.50	3.12	13.38	0.19	9.20	0.750	0.95
KDM-AhJ-35	9.17	6.5	1.10	5.40	0.20	12.75	0.520	0.25
KDM-AhJ-36	10.17	6.85	1.25	5.60	0.22	12.70	0.650	0.45
KDM-AhJ-37	7.17	5.5	1.09	4.41	0.28	13.10	0.560	0.35
KDM-AhJ-38	20.17	18.54	3.95	14.59	0.15	7.50	0.750	0.95
KDM-AhJ-39	10.17	6.5	1.10	5.40	0.32	12.10	0.550	0.45
KDM-AhJ-40	20.23	15.50	3.15	12.35	0.20	9.75	0.750	0.50
KDM-AhJ-41	26.27	23.20	3.95	19.25	0.12	7.10	0.652	0.85
KDM-AhJ-42	24.10	21.32	4.10	17.22	0.15	7.30	0.420	0.65
KDM-AhJ-43	9.13	6.45	1.25	5.20	0.29	12.50	0.450	0.35
KDM-AhJ-44	28.27	22.30	4.10	18.20	0.10	7.20	0.550	0.95
KDM-AhJ-45	20.23	15.50	3.10	12.40	0.15	9.30	0.250	0.85
KDM-AhJ-46	28.23	24.20	5.20	19.00	0.12	7.10	0.895	0.90
KDM-AhJ-47	17.23	12.50	2.50	10.00	0.20	8.20	0.650	0.35
KDM-AhJ-48	10.17	6.50	1.10	5.40	0.30	12.50	0.720	0.55
KDM-AhJ-49	10.23	6.25	1.10	5.15	0.26	12.15	0.520	0.60
KDM-AhJ-50	7.10	6.35	1.08	5.27	0.30	12.50	0.750	0.45
KDM-AhJ-51	6.10	5.56	1.01	4.55	0.32	13.10	0.720	0.55
KDM-AhJ-52	7.17	6.15	1.10	5.05	0.35	12.25	0.630	0.54
KDM-AhJ-53	8.17	6.75	1.15	5.60	0.32	12.50	0.750	0.45
KDM-AhJ-54	25.17	23.52	4.50	19.02	0.12	7.10	0.650	0.90
KDM-AhJ- 55	24.17	19.50	3.75	15.75	0.10	6.90	0.550	0.95
Grand mean	14.5509	12.06	2.35	9.71	0.24	10.55	0.59	0.59
SEd=	0.1087	0.82	0.12	0.58	0.2	0.64	0.04	0.04
CD(.05)=	0.2155	1.62	0.24	1.16	0.03	1.28	0.07	0.07
CV% =	0.92	8.32	6.44	7.4	7.92	7.50	8.00	7.42

KDM-AhJ- 8. Ascorbic acid content (%) varied from 7.10 to 12.75 with a mean value of 10.55, and the lowest was recorded to KDM-AhJ- 8. Carotene content (mg/100 g) varied from 0.25 to 0.895 with a mean value of 0.59, and the highest was recorded on KDM-AhJ- 46 followed by KDM -AhJ- 8 and KDM-AhJ- 10. Protein (g/100 g) varied from 0.35 to 1.08 with a mean value of 0.90 and the highest protein found in KDM-AhJ- 8.

According to (58), TSS (>25 ° brix) and total sugars (>20 %) are important for dessert purposes jackfruits. (59) Highest TSS, lowest acidity, and highest reducing sugars are the superior types for table purposes. Higher carotene content of the genotypes indicates the possibility of selecting elite genotypes with rich Vitamin A (52). (60) Reported that the biochemical composition of jackfruit flakes is influenced by both genotype and place of growth.

The minimum of (6 °brix) was found from the germplasm KDM- Ah-51 and the genotypes 6, 18, 20, 21,

Fig.7. Low TSS content Jackfruit genotypes

22, 24, 25, 26 and 43 recorded to 7°brix (Fig.7.). The incidence of diabetes has recently increased in developing countries. Scientific data on glycemic index (GI) values of common meals is essential to modify the diets for diabetes mellitus patients. GI is an important tool for determining the sugar level of jackfruit. The glycemic index is defined as the incremental area under the blood glucose response curve elicited over two hours by a 75g carbohydrate portion of food, expressed as a percentage of the response to the same amount of carbohydrate from a standard food taken by the same subject. Degrees Brix or °Brix is a measure of the total soluble solids (TSS) present in the fruit. Brix is taken as a measure of the sugar or sweetness of fruits or fruit juices (61). Brix values are important because they can be measured objectively, and they relate to a subjective criterion that buyers and eaters use to assess fruit or vegetable quality, flavor, or sweetness. When obtained and applied correctly, brix values can aid in variety selection, harvest scheduling, and other aspects of crop production, including irrigation, fertility, and post-harvest management. There are many methods to determine the maturity of fruits. Some methods need an external examination of fruits, while others require a more detailed analysis of the internal Composition of fruits. Brix is a measure of internal components. Though it is not universally applicable as some other measures of maturity, Brix provides vital information of interest to the fruit industry and associated processing factories. Therefore, it is important to find out its strengths and limitations.

Color and appearance ranged from 4.00 to 9.00 with a mean value of 6.30 (Fig.1a.). The highest color and

Light yellow colour flakes

White colour flakes

Bright yellow colour flakes

Yellow colour flakes

Sendhuram colour flakes

Light yellow colour flakes

Fig. 1a. Diversity of jackfruits (flakes colour) in Pudukkottai district of Tamil Nadu, India

appearance of 9.00 were obtained from KDM-AhJ -10, and the lowest of 4.00 was found from the germplasm KDM-AhJ-43. Flavors ranged from 4.00 to 8.50, with a mean value of 6.21. Texture/Firmness ranged from 4.00 to 9.00, with a mean value of 6.31. The highest texture /firmness of 9.00 was obtained from KDM-AhJ -08, and the minimum of 4.00 was recorded for the genotypes KDM-Ah-37 and KDM-Ah-38. Taste ranged from 3.00 to 9.00 with a mean value of 6.22. The highest taste of 9.00 was obtained from KDM-AhJ -08, followed by KDM-AhJ -10, and the lowest of 3.00, was found from the germplasm of KDM-AhJ-37. Overall acceptability ranged from 5.00 to 9.75, with a mean value of 6.66. The highest overall acceptability of 9.75 was observed by the genotype KDM-AhJ -08, followed by KDM-

Table 6. Quality characters of jackfruit genotype KDM-Ah-1to KDM-Ah-55

Acc. No.	Colour and appearance	Flavor	Texture/ Firmness	Taste	Overall acceptability
KDM-AhJ-1	7.6	6.8	7.2	7.1	7.8
KDM-AhJ-2	7.2	6.2	6.2	5.0	5.20
KDM-AhJ-3	6.4	5.9	6.6	6.5	5.70
KDM-AhJ-4	6.7	5.7	5.9	5.8	7.80
KDM-AhJ-5	6.7	7.0	6.1	6.4	6.30
KDM-AhJ-6	6.3	6.0	6.0	4.9	5.30
KDM-AhJ-7	7.9	7.5	7.7	8.1	7.50
KDM-AhJ-8	7.0	8.0	9.0	9.5	9.75
KDM-AhJ-9	8.0	8.0	8.0	8.0	7.5
KDM-AhJ-10	9.0	8.5	8.5	8.5	9.0
KDM-AhJ-11	7.3	6.6	6.8	8.3	8.10
KDM-AhJ-12	6.6	7.1	7.7	7.1	6.90
KDM-AhJ-13	7.6	7.4	7.1	8.0	8.10
KDM-AhJ-14	6.8	6.7	7.0	6.3	5.90
KDM-AhJ-15	7.0	7.3	6.9	7.2	7.40
KDM-AhJ-16	5.3	6.4	6.1	5.9	5.70
KDM-AhJ-17	7.1	6.8	6.6	6.4	5.90
KDM-AhJ-18	5.2	5.7	6.1	6.5	5.80
KDM-AhJ-19	6.0	5.4	5.7	6.2	5.60
KDM-AhJ-20	7.0	7.2	7.5	7.1	6.90
KDM-AhJ-21	7.1	7.3	7.0	6.9	6.70
KDM-AhJ-22	5.9	5.7	6.1	6.1	5.60
KDM-AhJ-23	6.1	6.5	6.2	5.7	6.80
KDM-AhJ-24	6.2	5.4	6.1	5.3	5.80
KDM-AhJ-25	5.8	6.1	6.2	5.7	5.80
KDM-AhJ-26	6.1	5.7	5.5	5.8	6.20
KDM-AhJ-27	7.2	6.9	5.9	6.3	6.40
KDM-AhJ-28	6.4	6.8	7.1	7.3	6.70
KDM-AhJ-29	7.3	7.8	7.1	6.9	6.00
KDM-AhJ-30	5.3	5.7	6.2	5.4	5.50
KDM-AhJ-31	6.3	6.5	6.1	6.8	8.50
KDM-AhJ-32	6.2	6.4	5.3	6.1	9.00
KDM-AhJ-33	7.4	7.6	7.1	7.5	6.20
KDM-AhJ-34	6.9	5.9	6.1	7.1	8.10
KDM-AhJ-35	7.8	7.1	7.9	7.7	8.50
KDM-AhJ-36	6.0	4.0	6.0	4.0	5.0
KDM-AhJ-37	5.0	5.0	4.0	3.0	6.00
KDM-AhJ-38	6.0	5.0	4.0	4.0	7.00
KDM-AhJ-39	5.0	4.0	5.0	6.0	5.20
KDM-AhJ-40	6.0	5.0	4.0	6.0	7.00
KDM-AhJ-41	6.0	6.0	7.0	6.0	8.00
KDM-AhJ-42	5.0	5.0	6.0	5.0	8.00
KDM-AhJ-43	4.0	5.0	5.0	5.0	6.00
KDM-AhJ-44	5.0	5.0	6.0	6.0	6.00
KDM-AhJ-45	6.0	5.0	7.0	6.0	7.00
KDM-AhJ-46	9.0	8.5	8.5	8.5	9.00
KDM-AhJ-47	5.0	6.0	5.0	5.0	6.00
KDM-AhJ-48	4.0	5.0	4.0	5.0	5.30
KDM-AhJ-49	5.0	6.0	5.0	4.0	5.70
KDM-AhJ-50	5.0	6.0	7.0	5.0	5.30
KDM-AhJ-51	5.0	7.0	5.0	6.0	5.00
KDM-AhJ-52	6.0	5.0	4.0	5.0	6.00
KDM-AhJ-53	6.0	5.0	6.0	5.0	6.00
KDM-AhJ-54	5.0	5.0	6.0	7.0	6.00
KDM-AhJ- 55	6.0	6.0	7.0	5.0	7.00
Grand mean	6.3006	6.2170	6.2945	6.2218	6.6661
SEd=	0.3876	0.3532	0.4106	0.3916	0.3927
CD(.05)=	0.7682	0.7001	0.8138	0.7762	0.7784
CV% =	7.53	6.96	7.99	7.71	7.22

Ah J-10 (9.00), and the lowest of 5.00 was observed by the germplasm KDM-AhJ-36 and KDM-AhJ-51(Table 6).

Flake color varied from white, yellow, whitish yellow, light yellow, and bright yellow. The genotypes KDM -AhJ-01, KDM-AhJ-4, KDM-AhJ-7, and KDM-AhJ-10 showed good deep orange (Senthuram color) flakes (Fig.8.)

This is the first time in India that a jackfruit variety is named after a farmer. 'Siddu jack' is the best among the varieties that we have studied in the Tumakuru region so far," says Dr G Karunakaran, senior scientist at at Central Horticultural Experiment Station (CHES), Hirehalli, Tumakuru district (13). Siddu Jack stands out in terms of taste and fruit quality. This variety has entered the international market, and non-resident Indians from Dubai and California are placing orders for saplings. While farmers from different regions of Karnataka have bought the saplings, there is a demand for over 10,000 saplings from across the country. The success of this variety has enthused scientists to research four more varieties (Fig.9.).

The red jackfruit is an evergreen tree with leathery leaves that bear fruits throughout the year. Red jackfruit trees are mostly cultivated throughout tropical regions like most jackfruits. Even though South India is one of the best places to cultivate red jackfruit, it is rare to find it in these regions compared to other common jackfruits. Their flesh color is between yellowish red and dark red, and they have a very high nutrient, which is the reason for their naming. We can use both of their creamy flesh and the seeds to make dishes. They are a wide variety of red jackfruit in many parts of the world, like the Borneo Red Jackfruit, Dark red jackfruits, Royal Red Jack, etc.… Red jack fruit contains all the qualities of common jackfruit with a high content of nutrients.

The present study revealed remarkable variation by organoleptic evaluation in all the characters of flakes. Genotypes, namely KDM-AhJ-08 (9.75) followed by KDM-AhJ-10 (9.00), have higher scores for the overall quality of flakes. This may be due to the genetic nature of the

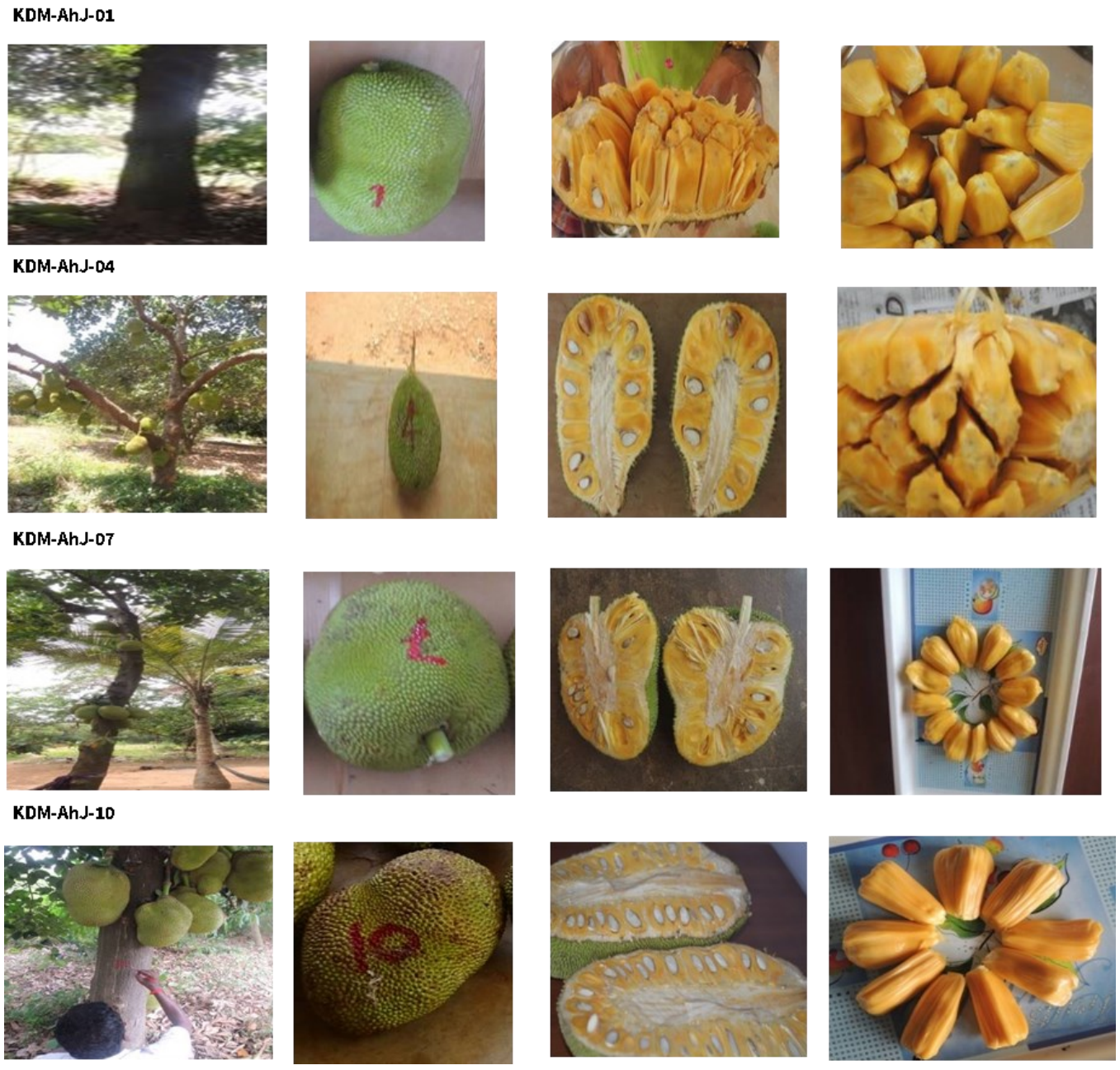


Fig. 8. Identified Red fleshed Jackfruit genotypes (Pudukkottai District of Tamil Nadu, India)

Fig. 9. Red fleshed Jackfruit (IIHR, Bangalore, India)

genotypes and the growing environment. Similar findings were reported by Murugan (38).

Fruit shapes varied from oval, oval, round, and slender. The genotypes KDM-Ah -08, KDM-AhJ -10, and KDM-AhJ -46 record the slender shape of fruits (Table 7). The shelf life of flakes varied distinctly among the fifty-five jackfruit germplasms. The genotypes KDM-AhJ -08 and KDM-Ah -10 recorded extended shelf life for five days (Fig.13.). Among the 55 genotypes, the genotype KDM-AhJ -45 recorded pure white flakes and a very sweet taste. The owner of this jackfruit farmer, S.Karthick, said this is for Seeni pala (Fig.11.).

Cluster analysis

From the below cluster analysis (Fig.15.), the highest coefficient value of 2.33 was recorded for the 5th cluster of KDM-AhJ-10 and KDM-AhJ-46, and the lowest coefficient value of 0.41 was recorded for the genotypes KDM-AhJ-16, 19, 22, 24, 27, 28, 7 and 15. The third cluster recorded a coefficient value of 1.37 for the genotypes KDM-AhJ-8, 31, 42, 44. The remaining genotypes are on par with the coefficient value.

Age of the tree: KDM-AhJ-31 and KDM-AhJ-32 have the best treatments, and KDM-AhJ-16, 17, 18, and 19 have the poorest performing treatments. The remaining treatment group is on par with the age of the tree.

Tree height: KDM-AhJ-42 and KDM-AhJ-52 have the best treatments. KDM-AhJ-19 has the poorest performing treatments. The remaining treatment group is on par with tree height.

Trunk girth: KDM-AhJ-38 has the best treatments, and KDM-AhJ-16 has the poorest performing treatments. The remaining treatment group is on par with trunk girth.

No. of fruits /trees: KDM-Ah-08 and 31 have the best treatments. The remaining treatment groups are on par with the number of fruits per tree.

Individual fruit weight: KDM-Ah-46 had the best treatments, and KDM-Ah-4 and 8 had the poorest performing treatments. The remaining treatments were on par with Individual fruit weight.

Number of fruits per tree: KDM-Ah-08 and 31 had the best treatments. The remaining treatments were on par with the number of fruits per tree.

Fruit length: KDM-Ah-46 had the best treatments, and 4, 25, 31, and 33 had the poorest performing treatments. The remaining treatments were on par with fruit length.

Fig. 11. Seenipala

Table 7. Quality characters of jackfruit genotypes KDM Ah1 – KDM Ah55 (2018-2019)

Acc.No.	Fruit shape	Flakes colour	Shelf life of flakes
KDM-AhJ-1	Slender	Senthuram/dark reddish colour	One day
KDM-AhJ-2	Slender	Light yellow	One day
KDM-AhJ-3	Round/oval	Light yellow	One day
KDM-AhJ-4	Slender	Senthuram/dark reddish colour	One day
KDM-AhJ-5	Oval	Light yellow	One day
KDM-AhJ-6	Round	white	One day
KDM-AhJ-7	Oval	Senthuram/dark reddish colour	One day
KDM-AhJ-8	Slender	Light yellow	Five days
KDM-Ah-9	Slender	Yellow	One day
KDM-AhJ-10	Slender	Senthuram/dark reddish colour	Five days
KDM-AhJ-11	Round	Yellow	One day
KDM-AhJ-12	Round	yellow	One day
KDM-AhJ-13	Round	yellow	one day
KDM-AhJ-14	Round	Light yellow	One day
KDM-AhJ-15	Slender	Yellow	One day
KDM-AhJ-16	Slender	Pure white	One day
KDM-AhJ-17	Slender	Yellow	One day
KDM-AhJ-18	Slender	Pure White	One day
KDM-AhJ-19	Slender	Pure white	One day
KDM-AhJ-20	Round	White	One day
KDM-AhJ-21	Round	Light yellow	Half day
KDM-AhJ-22	Round	Light yellow	One day
KDM-AhJ-23	Slender	White	Half day
KDM-AhJ-24	Slender	White	One day
KDM-AhJ-25	Round	Light Yellow	One day
KDM-AhJ-26	Round	Light yellow	One day
KDM-AhJ-27	Round	Yellow	Two days
KDM-AhJ-28	Round	Yellow	Two days
KDM-AhJ-29	Slender	yellow	Two days
KDM-AhJ-30	Round	Light yellow	two days
KDM-AhJ-31	Slender	Light Yellow	One day
KDM-AhJ-32	Slender	Bright yellow	Two days
KDM-AhJ-33	Round	Yellow	One day
KDM-AhJ-34	Slender	Yellow	One day
KDM-AhJ-35	Slender	Bright yellow	Three days
KDM-AhJ-36	Oval	Light yellow	One day
KDM-AhJ-37	Slender	Light yellow	One day
KDM-AhJ-38	Slender	Yellow	One day
KDM-AhJ-39	Round	yellow	one day
KDM-AhJ-40	Round	Yellow	One day
KDM-AhJ-41	Slender	yellow	One day
KDM-AhJ-42	Slender	yellow	One day
KDM-AhJ-43	Slender	Light yellow	One day
KDM-AhJ-44	Round	Light yellow	One day
KDM-AhJ-45	Round	Light yellow	One day
KDM-AhJ-46	Slender	Bright Yellow	Three days
KDM-AhJ-47	Round	Light yellow	One day
KDM-AhJ-48	Oval	Light yellow	One day
KDM-AhJ-49	Oval	Light yellow	One day
KDM-AhJ-50	Round	yellow	One day
KDM-AhJ-51	Round	yellow	One day
KDM-AhJ-52	Round	Bright yellow	One day
KDM-AhJ-53	Round	yellow	One day
KDM-AhJ-54	Round	yellow	Two days
KDM-AhJ-55	Slender	Light yellow	Two days

International Plant Genetic Resources Institute. *Descriptors for Jackfruit (Artocarpus heterophyllus Lam)*. Rome: IPGRI; 2000.

Fig. 13. Shelf life of flakes in different genotypes

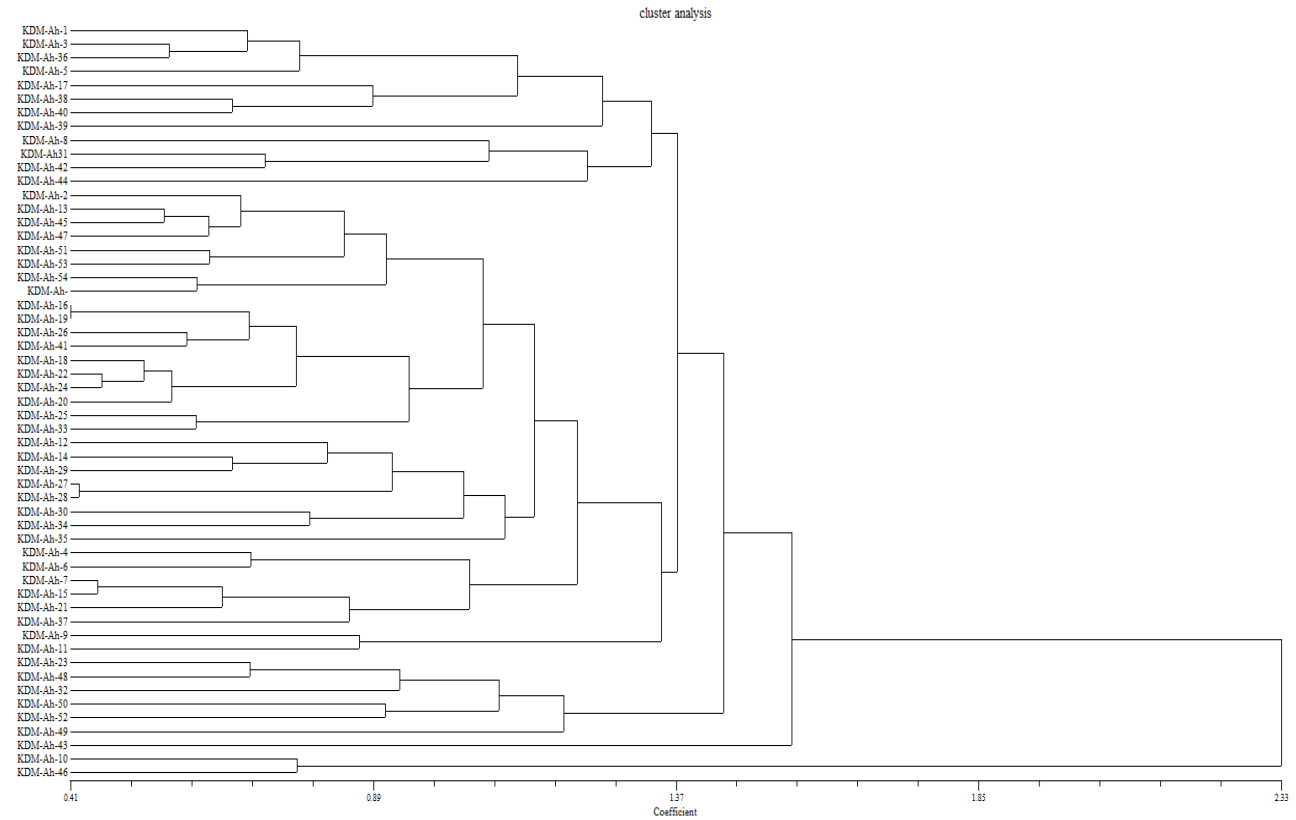


Fig.15. Cluster analysis of jackfruit genotypes

Fruit breath: KDM-Ah-46 had the best treatments, and 4, 6, and 53 had the poorest performing treatments. The remaining treatments were on par with fruit breath.

TSS: KDM-Ah-8 has the best treatments, and 51 had the poorest performing treatments.

Color and appearance: KDM-Ah-10 and 46 had the best treatments, and KDM-Ah-43 and 48 had the poorest performing treatments. The remaining treatment groups are on par with Colour and appearance.

Flavor: KDM-Ah-8, 9, 10, 29, and 46 have the best treatments, and KDM-Ah-36 and 39 have the poorest performing treatments.

Texture/Firmness: KDM-Ah-8, KDM-Ah-10, and 46 have the best treatments, and KDM-Ah- 37, 38, 40, 48, and 52 have the poorest performing treatments. The remaining treatments were on par with Texture/Firmness.

Taste: KDM-Ah-8 has the best treatments, and KDM-Ah-37 has the poorest performing treatments.

Overall acceptability: KDM-Ah-8, 10, 32, and 46 have the best treatments, and KDM-Ah-2, 3, 6, 16, 19, 22, 30, 36, 39, 48, 49, 50 and 51 have the poorest performing treatments.

Weather analysis

Average rainfall during the year 2016 to 2019 was recorded at 465.10 mm under Pudukkottai District and Alangudi and Thiruvarankulam Taluk of Tamil Nadu (Table 8). A maximum temperature of 39^{0}C was recorded during the period of May 2019, and a minimum temperature of 25^{0}C was recorded during December 2018 under the Pudukkottai District of Alangudi and Thiruvarankulam Taluk of Tamil Nadu. Jackfruit is a tropical and subtropical fruit (Table 9). Rainfall and temperature are important factors for initiation flowering and fruiting of jackfruit. Dry tract jackfruits are mostly sweeter compared to irrigated areas. This may be due to the climatic conditions.

Table 8. Rainfall of Pudukkottai District during the year 2016-19 (mm)

Month	2016	2017	2018	2019
January	-	38.40	-	-
February	-	6.00	-	-
March	-	31.00	-	-
April	-	0	6.2	24
May	251.14	77.20	123	
June	78.7 0	210.40	40.60	
July	146.60	104.60	155.00	
August	74.60	174.20	18.80	
September	111.50	124.80	69.80	
October	215.40	147.00	115.80	
November	0	92.80	184 (263)	
December	59.80	34.60	29.40	
Average Rainfall	**859.04**	**1041.00**	**821.60**	**24.00**

Table 9. Temperature of Pudukkottai District during the year 2016-19

Month	2016	2017	2018	2019
January	30	32	32	32
February	29	33	32	34
March	32	32	32	36
April	33	34	34	39
May	34	35	35	39
June	33	34	32	34
July	30	32	30	32
August	28	30	28	32
September	28	32	28	30
October	26	32	30	28
November	26	30	31	26
December	25	28	30	24

Conclusion

From this study, the highest number of fruits per plant (43.33.00) was recorded for KDM-AhJ-8. Maximum individual fruit weight was gained from the genotype 46 (16.33 kg), and a minimum of (4.67 kg) was observed by the genotype 08 was suitable for small families. Meanwhile, genotypes 31 and 32 were recorded in the main season (March to April) and off-season (September to November) production of jackfruit. Yield was varied from 62.67 kg/tree to 458.33. The highest TSS content of 29.17° brix was recorded for genotype 08, and the highest overall acceptability was 9.75. Genotype 51 was recorded for the 6° brix, followed by genotypes 6, 18, 20, 21, 22, 24, 25, and 26 for the TSS content of 7° brix was found to be low TSS content. Hence, it is suitable for diabetic patients. Genotype 37 was identified for vegetable purposes in the immature stage, and ripened fruits were more suitable for table purposes. The genotypes KDM-AhJ- 31 and 39 were identified for the thousand-fruited jackfruits. The genotypes KDM-AhJ-01, 4, 7, and 10 showed good deep orange (Senthuram color) flakes. Genotype 45 recorded the pure white flakes, which were very sweet in taste (Seeni pala). Genotypes 17, 18, and 19 were identified for the Tharaipala or Velipala. The shelf life of flakes varied according to the genotypes KDM-AhJ -08 and KDM-Ah -10 record for five days. Based on the growth, yield, and quality characteristics, the above-mentioned genotypes have unique characteristics.

Promising genotypes planted by Honourable Vice-Chancellor on 11.11. 2020

Promising genotypes along with check varieties red-fleshed siddu, shankra, and PLR1, PL2

Honorable Vice–Chancellor review on 12.03.21

KDM-AHJ-08

KDM-AHJ-10

KDM-AHJ-46

SIDDU (Red flesh)

SHANKARA
(Red flesh)

PLR1

PLR2

Rootstocks

In general, this study showed differences among the jackfruit genotypes used in India, which could help identify superior ones (Fig.16.).

Inarch/Approach grafting of jackfruit at AC&RI, Kudumiyanmalai

Approach grafts kept under the shade net for hardening

Fig. 16. Field view of promising genotypes at AC&RI, Kudumiyanmalai

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Authors' contributions

We are the authors of this research work.

Compliance with ethical standards

Conflict of interest: The authors declare that they have no known competing financial interests or personal relationship that could have appeared to influence the work reported in this paper

Ethical issues: None

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