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Evaluation of jackfruit tree genotypes and estimation of genetic parameters based on fruit characteristics

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Abstract

The jackfruit tree (*Artocarpus heterophyllus*) is a fruit tree widely distributed in Brazil, especially on the tropical coast, in the Amazon region and in the Northeast. Despite the ideal conditions for cultivation, production occurs spontaneously and with great genetic variability, resulting in fruits of irregular quality, insufficient to meet the demands of the industry and fresh consumption. The objective of this study was to evaluate jackfruit tree genotypes based on fruit characteristics and to estimate genetic parameters to identify promising genotypes in crop breeding. The experiment used a completely randomized design with three replications, the treatments were composed of 10 genotypes and the experimental plot consisted of one fruit. The following characteristics were evaluated, such as: fruit mass (FM), pulp (PM), seeds (SM) and residues (RM); longitudinal (LD) and transverse (TD) diameters; number of viable (NS) and non-viable (NSI) seeds; pulp yield (RP); fruit shape index (IFF); Total soluble solids (TSS); titulable acidity (TA) and the ratio of soluble solids to titratable acidity (ratio). High heritability was identified for PR (93.68%), NS (84.52%), TA (92.39%), and ratio (90.89%), indicating that these traits are strongly influenced by genetic factors. The PM9 and PM3 genotypes were pointed out as promising for the genetic improvement of the species.

Keywords: *Artocarpus heterophyllus*; genetic diversity, genetic improvement, physicochemical characteristics

Introduction

Jackfruit (*Artocarpus heterophyllus* Lam.), belonging to the Moraceae family, is classified in the genus *Artocarpus*. In Brazil, jackfruit cultivation is predominant in the North and Northeast regions, especially in the states of Bahia and Pará. In these areas, there are three main varieties: soft, hard and butter (Mitra, 2023). Despite the potential of the species, production occurs spontaneously from plants of seminal origin. The result of this is the wide genetic variability and fruits of irregular quality, which limits both fresh consumption and industrial use.

The genetic diversity existing in jackfruit tree populations is a valuable resource, as it offers conditions to identify and select genotypes with desirable agronomic characteristics. In the search for characteristics for breeding, it is common to consider multiple attributes, such as the positive correlation between fruit diameter and mass (Negreiros et al., 2007) and the negative correlation between the number of fruits per plant and the mass (Pimentel et al., 2008). The soluble solids content is also an essential characteristic, as it indicates maturity, sweetness, and concentration of dissolved compounds (Silva et al., 2022; Mathiazhagan et al., 2021). In the case of jackfruit, characteristics such as the shape and size of the leaves, latex content, and pulp color stand out (Valeeta et al., 2018).

In this context, the estimation of genetic parameters, such as heritability, genotypic variance, and coefficient of variation, represents an essential tool. These indicators allow understanding the genetic control of traits of interest, guiding selection strategies and maximizing gains from breeding (Andrade et al., 2003; Cruz et al., 2012). Thus, it becomes possible to direct efforts to more stable attributes with greater economic impact.

In view of the above, the objective of this work was to evaluate jackfruit tree genotypes based on fruit

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characteristics and to estimate genetic parameters that indicate the potential for improvement.

Material and Methods

The experiment was conducted from January to March 2023 in the cabruca and permanent preservation areas of the Universidade Estadual de Santa Cruz (UESC), located in Ilhéus, Bahia (39°13'59"W; 14°45'15"S). 10 plants were selected for study, based on visual characteristics such as vigor and phytosanitary status of the plants.

After selection, the matrices were georeferenced using GPS (**Table 1**). When the fruits reached the state of physiological maturation, three fruits were randomly collected per plant.

The experimental design was completely randomized with three replications, with the treatments represented by 10 genotypes of jackfruit trees and each experimental plot consisting of one fruit. After collection, the fruits were properly packaged, identified and sent to the Agroindustry laboratory of the State University of Santa Cruz, for analysis físicas, químicas e físico-químicas.

The following characteristics were evaluated: a) fruit mass, pulp, seeds and residues (pomace and peel together) through the balance; b) longitudinal and transverse diameter of the fruits with the use of a tape measure; c) number of berries and seeds that are not viable by direct counting; d) pulp yield, calculated by the ratio between pulp mass and fruit mass; e) fruit shape index, calculated by the ratio between longitudinal diameter and transverse diameter, f) total soluble solids with the digital refractometer, g) titulable acidity and h) ratio calculated by the ratio between soluble solids and acidity.

The titratable acidity was determined according to the methodology of the Adolfo Lutz Institute (2008), which is based on the neutralization of the acids present in the fruit with a standardized alkaline solution by means of titrology. For the analysis, a 125 mL Erlenmeyer was prepared containing 5 mL of the pulp, plus 25 mL of water and 3 drops of phenolphthalein. After homogenization, the solution was titrated with a standardized 0.1 mol L-1 sodium hydroxide solution with the aid of a burette, up to the turning point, with persistent pink color. The volume of NaOH used was noted and the acidity result was calculated according to the equation and expressed in g of citric acid per 100 mL of pulp.

AT % citric acid = ((V x M x F x mEq)/ P) x 100 where :

V = volume of sodium hydroxide solution spent on titration in mL.

M = molarity of the sodium hydroxide solution.

F = correction factor of the sodium hydroxide solution.

mEq = milliequivalent of citric acid = 0.06404.

P = Sample weight or volume

The data obtained were submitted to analysis of variance. Then, the genetic parameters were estimated: environmental (CVe) and genotypic (CVg) coefficient of variation, relationship between the genotypic and environmental coefficient of variation (CVg/CVe), phenotypic variance (Vf), genotypic variance (Vg), and heritability of the traits evaluated in the broad sense (h2). The genotype means were compared by the Scott-Knott test, at 5% probability. All statistical analyses were performed with the aid of the Genes program.

Table 1 - Location of jackfruit tree genotypes at the State University of Santa Cruz, Ilhéus -BA

Genotypes	Variety	S	W	Alt
PM1	Hard	14° 47' 41.8"	039° 10' 30.5"	35m
PM2	Soft	14° 47' 44.1"	039° 10' 16.6"	23m
PM3	Hard	14° 47' 45.4"	039° 10' 16.9"	21m
PM4	Hard	14° 47' 42.8"	039° 10' 14.5"	24m
PM5	Hard	14° 47' 45.8"	039° 10' 14.4"	22m
PM6	Hard	14° 47' 47.1"	039° 10' 20.1"	20m
PM7	Soft	14° 47' 42.9"	039° 10' 19.2"	19m
PM8	Soft	14° 47' 37.0"	039° 10' 18.0"	24m
PM9	Soft	14° 47' 35.3"	039° 10' 15.2"	26m
PM10	Soft	14° 47' 39.0"	039° 10' 13.9"	27m

Source: Authors (2023)

Results and Discussion

Significant differences were observed between the genotypes for seed mass (SM), pulp mass (PM), pulp yield (PY), number of seeds (NS), titratable acidity (TA) and ratio. The other characteristics did not differ from each other (**Table 2**).

In Table 2, the mean FM among the genotypes was 5.97 kg, with a high coefficient of variation (CV) of 42.5%, indicating high dispersion in the genotypes evaluated. A similar result was observed by Dey (2024) evaluating 24 Indian jackfruit genotypes found an

Table 2 – ANOVA results (ns = not significant; *p < 0.05 and **p < 0.01) for the effects of genotypes on jackfruit fruit traits.

Characteristics	Genotypes	Mean	CV (%)
FM	ns	5.97	42.5
RM	**	2.97	38.4
SM	*	0.89	40.1
PM	**	1.96	53.42
PY	ns	30.7	13.77
LD	ns	80.58	12.4
TD	ns	20.59	16.8
FSI	ns	3.96	9.3
SN	**	252.2	33.4
NVS	ns	31.4	71.1
TSS	ns	20.4	16.3
TA	**	0.11	12.5
Ratio	**	202.1	19.9

Source: Authors (2023)

FM: fruit mass (kg); RM: residue mass (kg); SM: seed mass (kg); PM: pulp mass (kg); PY: pulp yield (%); LD and TD: longitudinal and transverse diameter (cm); FSI: fruit shape index; SN and NSV: seed number and number of non-viable seeds; TSS: total soluble solids (°Brix); TA: titratable acidity (% citric acid) and Ratio.

average of 4.61 kg.

The mean RM among the genotypes was 2.97 kg, with a coefficient of variation (CV) of 38.4%, indicating a moderate variation in the values. Sousa (2016) analyzing jackfruit trees in Paraíba found an average mass for the bark of 1.48 kg and for the shaft it was 0.44 kg, totaling an RM of 1.92 kg. A (RM) is an important indicator in the evaluation of fruit efficiency, being inversely related to pulp yield. The transformation of waste dough into flour can be a way to make better use of it, it has several components, such as: fiber, vitamins, minerals, phenolic substances and flavonoids, which are beneficial to health (Ozores et al., 2015).

For LD, the mean was 80.58 cm and for TD, 20.59 cm; the coefficients of variation (CV) were 12.4%; 16.8% for LD and TD, respectively. This indicates a slight variation between genotypes, which is favorable for the standardization of the final product in the market. Shidenur et al. (2024), seeking an optimization for the processing of jackfruit trees, observed an average of 38 cm for LD and 22.67 cm for TD. The transverse diameter (TD) and longitudinal diameter (LD) are essential indicators in the evaluation of fruits, determining their shape, size and uniformity, important factors for commercial acceptance.

The fruit shape index (FSI) showed an average value of 3.96 among the genotypes, showing more elongated fruits for all accessions. The absence of significant difference together with the low CV value suggest that the fruit shape is a restricted genetic basis trait for the jackfruit genotypes analyzed.

This stability can be advantageous for commercial standardization, Guedes et al. (2014) observed that the shape and diameter of the fruits are important attributes for commercialization, as they affect the attractiveness and, consequently, the choice of individual units of the product by the consumer.

The number of non-viable seeds (NVS) presented an average value of 31.4. In a similar study, Rodrigues et al. (1999), when analyzing different tangerine genotypes, found an average of 7.3 non-viable seeds per fruit. The variability observed for this trait (71.1) may be associated with unfavorable environmental conditions during fruit formation.

The mean TSS for the genotypes was 20.4 °Brix. This result was higher than that found by Jayavalli et.al (2024) who analyzed 55 jackfruit genotypes in the Tamil Nadu region and obtained an average of 14.6 °Brix. Total soluble solids (TSS) are fundamental because they reflect the concentration of sugars, acids and other soluble compounds, directly influencing the flavor, sensory quality and commercial acceptance of the fruits. They are used as a parameter to assess ripeness, classifying fruits for fresh consumption and adjusting the sensory balance in processed products (Neto et al. 2010)

All traits evaluated in the analysis of variances were tested by the Scott and Knott test at 5% probability. **Table 3** shows that the TA and PY traits presented four distribution classes; Ratio, three; SM, PM and SN, two.

For seed mass, the genotypes PM2 and PM7 presented the highest values, with an average of 1.70 kg and 1.40 kg, with no statistical difference between them. The lowest mean was observed in the PM3 genotype, 0.53 kg. Dhakar et al. (2020), when analyzing 28 jackfruit genotypes, found values ranging from 0.21 kg to 2.34 kg. The seeds can be used for culinary purposes, as well as for the production of starch, in addition to being consumed roasted and/or cooked, in the regions of India (Dhakar et al., 2020). Allied to this, the presence of large seeds in quantity is an important criterion for the selection of genotypes, especially aiming at vegetative propagation, as in the use of seminal rootstocks.

The pulp mass varied between 0.79 kg and 3.65 kg, highlighting the PM9 genotype as superior for this trait. Similar results were reported by Morelos - Flores et al. (2022), who found averages between 1.57 and 4.63 kg. On the other hand, Dhakar et al. (2020) observed greater variability, with averages between 0.4 and 10.07 kg. Jackfruit pulp is one of the main components of the fruit, being consumed fresh in natura, but due to its rapid deterioration, it can also be processed into products such as jellies, jams, fruit pulps, juices and soft drinks (Swami & Kalse, 2018).

The pulp yield (PY) was higher in the PM9 genotype (48.5%) and lower in the PM2 genotype (14.57%). Genotypes with higher PR are preferred, as they increase the productivity and commercial value of the fruits, meeting both the fresh consumption market and the demands of the processing industry. Fonseca (2010), when evaluating two varieties of jackfruit in the

Table 3 - Average fruit traits of 10 jackfruit genotypes collected in Ilhéus, Bahia (Brazil)

Genotype	SM	PM	PY	SN	TA	Ratio
PM1	0.60 b	2.06 b	38.87 b	278 b	0.12 b	142.0 c
PM2	1.70 a	0.83 b	14.57 d	555 a	0.11 b	186.4 c
PM3	0.53 b	1.20 b	24.83 c	152 b	0.06 d	389.0 a
PM4	0.67 b	1.80 b	30.2 c	250.3 b	0.16 a	145.7 c
PM5	0.63 b	1.17 b	28.83 c	166 b	0.09 c	251.1 b
PM6	0.80 b	1.50 b	23.13 c	206 b	0.13 b	131.9 c
PM7	1.40 a	3.57 a	35.5 b	254.6 b	0.08 c	247.0 b
PM8	0.96 b	3.00 a	37.9 b	269.5 b	0.10 c	181.1 c
PM9	1.03 b	3.67 a	48.5 a	293.6 b	0.14 a	181.8 c
PM10	0.63 b	0.80 b	24.73 c	96.6 b	0.12 b	165.1 c

Source: Authors (2023)
SM: seed mass (kg); PM: pulp mass (kg); PY: pulp yield (%);SN TA: titratable acidity (% citric acid) and Ratio. Médias seguidas de letras iguais não diferem entre si pelo teste Scott-Knott, a 5% de probabilidade .

Recôncavo Baiano, found a yield of 46.07% for the soft-fleshed variety and 49.63% for the hard-pulped variety, reinforcing the importance of genotypes with high PR. This characteristic is essential, as the pulp is the by-product of greatest commercial interest of jackfruit, being a priority for genetic improvement programs.

Titratable acidity (TA) also showed relevant variations. The acidity ranged between 0.06 % and 0.13 % of citric acid, with PM9 and PM6 representing the extremes of this range. Dhakar (2020) found acidity values with a greater variation, ranging between 0.08% and 0.21% between genotypes. Genotypes with lower acidity, such as PM9, tend to be better accepted for fresh consumption, due to the less acidic flavor.

The genotypes PM8 (389.0) and PM7 (247.0) stood out in relation to the ratio. Dey (2024) in its analysis found values ranging from 50.29 - 229.57 with an overall average of 111.87. The ratio is an important measure in the perception of sweetness and in the balance between sugar and acidity, directly influencing the sensory acceptance of consumers, being indispensable for the evaluation of the quality and acceptability of fruits, guiding both consumption and production and marketing strategies.

In grapes, Tecchio et al. (2022) demonstrated that the ratio is consistently related to better sensory acceptance, highlighting the importance of a good balance between sugar and acidity in the perception of fruit quality.

The estimates of genetic parameters are presented in **Table 4**. The fruit mass (FM) showed Vf of 3.29, Ve of 2.14 and Vg of 1.15, with h² of 34.92%, indicating environmental predominance over genetic contribution. The CVg of 17.96% and the CVg/CVe ratio of 0.42 reinforce the environmental influence. These data demonstrate that FM is strongly affected by the environment, requiring environmental control for advances in breeding programs. In contrast, Chandrasekhar (2018) reported a CVg of 63.88% and h² of 92.16%, highlighting greater genetic influence for Indian jackfruit trees.

The residue mass (RM) showed Vf of 0.67, Ve of 0.43 and Vg of 0.23, with h² of 35.14%, indicating that approximately 35% of the variation is of genetic origin, while 65% is attributed to environmental factors. The CVg was 16.35%, and the CVg/CVe ratio of 0.43 reflects the predominance of environmental influence. These results suggest that RM is less indicated as a priority in breeding programs, due to its low heritability and high dependence on environmental factors.

Table 4 - Estimates of genetic parameters: phenotypic variance (Vp), environmental variance (Ve), and genotypic variance (Vg); heritability (h²); genotypic coefficient of variation (CVg); and the ratio between genotypic and environmental coefficients of variation (CVg/CVe) for fruit traits of 10 jackfruit genotypes collected at Universidade Estadual de Santa Cruz, Ilhéus – BA (Brazil).

Characteristics	Vf	VE	Vg	h^2	CVg (%)	CVg/CVe
FM	3.29	2.14	1.15	34.92	17.96	0.42
RM	0.67	0.43	0.23	35.14	16.35	0.43
SM	0.14	0.04	0.10	71.18	36.36	0.90
PM	1.18	0.36	0.81	69.09	46.12	0.86
PY	94.41	5.96	88.44	93.68	30.62	2.22
LD	62.91	33.33	29.58	47.02	6.75	0.54
TD	5.99	3.98	2.00	33.4	6.87	0.41
FSI	0.11	0.045	0.07	62.17	6.86	0.74
SN	15353.03	2375.28	12977.75	84.52	45.17	0.91
NVS	425.65	166.11	259.53	60.97	51.33	0.72
TSS	7.55	3.70	3.85	51.03	9.62	0.58
TA	0.000833	0.000063	0.00077	92.39	25.14	2.01
Ratio	5950.12	541.90	5408.21	90.89	36.38	1.82

Source: Authors (2023)
FM: fruit mass (kg); RM: residue mass (kg); SM: seed mass (kg); PM: pulp mass (kg); PY: pulp yield (%); LD and TD: longitudinal and transverse diameter (cm); FSI: fruit shape index; SN and NVS: seed number and number of non-viable seeds; TSS: total soluble solids (°Brix); TA: titratable acidity (% citric acid) and Ratio .

The seed mass (SM) showed Vf of 0.14, Ve of 0.04 and Vg of 0.10, with h² of 71.18%. The CVg of 36.36% indicates an expressive genetic variability, while the CVg/CVe ratio of 0.90 shows that the genetic variability is close to the environmental variability, but does not exceed it. Despite the high genetic contribution, environmental factors still have a relevant impact. Nakintu et al. (2023) corroborate these results, reporting a CVg of 42.72% and an h² of 99.4% in studies with 249 jackfruit trees in Uganda, highlighting the great genetic potential of SM. With high h², SM is a strategic trait for breeding programs, especially due to the direct impact on pulp yield.

The pulp mass (PM) showed Vf of 1.18, Ve of 0.36 and Vg of 0.81, with h² of 69.09%, indicating that 69% of the variation is of genetic origin and 31% is influenced by environmental factors. The CVg of 46.12% shows a high genetic variability, while the CVg/CVe ratio of 0.86 suggests that, although significant, the genetic influence still competes with the environmental one. Chandrasekhar et al. (2018) reported an elevated CVg of 77.87% for Indian genotypes. These results demonstrate the potential of PM for genetic improvement programs, reinforcing the importance of controlling environmental conditions to maximize efficiency in selection.

The pulp yield (PY) showed Vf of 94.41, Vg of 88.44 and Ve of 5.96, with h² of 93.67%, indicating that 94% of the variation is explained by genetic factors. The CVg of 46.11% and the CVg/CVa ratio of 2.22 ratify the genetic predominance over the environmental one. Ribeiro et al. (2018), when evaluating 32 breadfruit (*Artocarpus altilis*) genotypes, observed lower h² (40.38%), evidencing greater environmental influence on this species. The strong genetic control of PY in jackfruit highlights its potential for breeding programs, targeting genotypes with higher yield, essential for fresh consumption and industrial processing.

The longitudinal diameter (LD) presented Vf of 62.91, Vg of 29.58 and Ve of 33.33, with h² of 47.02%, indicating that 47% of the variation is explained by genetic factors and 53% by environmental factors. The CVg was 6.75%, and the CVg/CVe ratio of 0.54 highlights the greater environmental influence. The transverse diameter (TD) had Vf of 5.99, Vg of 2.00 and Ve of 3.98, with h² of 33.34%, indicating that 33% of the variation is of genetic origin and 67% environmental. The CVg of 6.87% and the CVg/CVe ratio of 0.41 reinforce the environmental predominance. Both characteristics are significantly influenced by the environment, making it essential to control environmental conditions to improve selection efficiency in breeding programs. Chandrasekhar et al. (2018) found Vg of 16.03 and Vf of 19.09 for LD, and Vg of 60.73 and Vf of 73.38 for TD, with h² of 80.18% for DL and 83% for TD, in contrast, indicating a greater genetic influence on these traits in their study conditions.

The fruit shape index (FSI) showed a Vf of 0.11, a Vg of 0.045 and a Ve of 0.065, with an h² of 40.97%. This indicates that approximately 41% of the variation in IFF is explained by genetic factors, while the remaining 59% is attributed to environmental factors. The CVg was 6.86%, and the CVg/CVe ratio of 0.74 reinforces the greater environmental influence on this characteristic. Although FSI has a moderate genetic contribution, environmental predominance may hinder significant advances in breeding programs. This characteristic, as it is relevant for standardizing the shape of the fruit, has potential in markets that demand uniform products, but requires environmental control for greater efficiency in selection.

The number of seeds (NS) showed a Vf of 15,353.03, Vg of 12,977.75 and Ve of 2,375.28, with a h² of 84.52%. The CVg was 51.30%, and the CVg/CVa ratio of 2.22 highlighted the genetic predominance. Nakintu et al. (2023) observed a CVg of 58.12% and h² of 83.22%, corroborating the genetic potential of NS for breeding programs, directly influencing the pulp.

The number of non-viable seeds (NVS) showed Vf of 425.65, Vg of 166.11 and Ve of 259.53, with h² of 39.03%, indicating that 39% of the variation is of genetic origin and 61% is influenced by the environment. The CVg was 51.33%, and the CVg/CVa ratio of 0.72 reflects the balance between genetic and environmental influence. The significant environmental impact can limit the efficiency of the selection, making it essential to control environmental conditions.

The total soluble solids (TSS) showed Vf of 7.55, Vg of 3.85 and Ve of 3.70, with h² of 51.03%, indicating moderate genetic contribution (51%) and significant environmental influence (49%). The CVg was 9.92%, and the CVg/CVa ratio of 0.58 reinforces the environmental impact. Dey (2024) reported Vf of 14.19, Vg of 14.18 and CVg of 17.25%, highlighting a similar balanced genetic contribution, with lower environmental impact in its study conditions.

The titratable acidity (TA) showed Vf of 0.000833, Ve of 0.00063 and Vg of 0.00077, with an h² of 75.60%, indicating that 76% of the variation is explained by genetic factors and 24% by environmental factors. The CVg of 25.14% shows considerable genetic variability, while the CVg/CVa ratio of 2.01 reinforces the genetic predominance over the environmental one. These results indicate that TA has high potential for genetic improvement programs, allowing the efficient selection of genotypes with acidity levels appropriate to market and industry demands. Ribeiro et.al (2018) evaluating breadfruit found a divergent result where TA has an extreme of 0% in genetic contributions to breadfruit.

The ratio showed Vf of 5950.12, Ve of 540.91 and Vg of 5410.21, with h² of 91%, indicating strong genetic influence (91%) and low environmental influence (9%). The CVg of 36.38% and the CVg/CVa ratio of 1.82 confirm the genetic predominance. These results highlight the ratio as a promising trait for breeding programs, essential to meet market demands for the balance between sweetness and acidity.

Traits with high heritability (h²) ≥ 70%, indicate that the observed variation is mainly of genetic origin, allowing greater efficiency in selection for breeding programs.

CVg/CVe ratio > 1, indicates that genetic variability outweighs environmental variability. This suggests that these traits have a good response to selection and can be improved with greater predictability.

Conclusion

There was significant variability among the jackfruit tree genotypes evaluated. The PM9 genotype stood out for its higher yield and pulp mass, desirable characteristics for consumption and industrial processing. PM3 showed high ratio and low acidity, attributes favorable to sensory quality. These results indicate that PM9 and PM3 are promising genotypes and should be prioritized in breeding programs and commercial use.

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References

Andrade, F.N., Rocha, M.D.M., Gomes, R.L.F., Freire Filho, F.R., Ramos, S.R.R. 2003. Estimativas de parâmetros genéticos em genótipos de feijão-caupi de tegumento branco. *Revista Científica Rural* 8: 135–141.

Chandrasekhar V., Babu B.R., Rajasekhar M. 2018. Evaluation and genetic variability studies in germplasm of jackfruit available in certain districts of Andhra Pradesh. *Plant Archives* 19: 2047-2052.

Cruz C.D., Regazzi A.J., Carneiro P.C.S. 2012. *Modelos biométricos aplicados ao melhoramento*. UFV, Viçosa, Brasil. 514 p.

Dey B. 2024. Diversity and variability studies in jackfruit (Artocarpus heterophyllus Lam.) genotypes of Assam, India. *Journal of Horticultural Sciences* 19: 1–8.

Dhakar, M., Das, B., Sarkar, P., Nath, V., Singh, A., Bhatt, B. 2020. Diversity in jackfruit (Artocarpus heterophyllus Lam.): insights into fruit characterization for the identification of superior genotypes. Plant Genetic Resources18: 307–315.

Fonseca V.J.A. 2010. *Caracterização, seleção e propagação vegetativa de genótipos de jaqueira*. 109 p. (Tese) – Universidade Federal do Recôncavo da Bahia, Cruz das Almas, Brasil.

Guedes, M.N.S., Rufini, J., Azevedo, A., Dessimoni-Pinto, N. 2014. Fruit quality of jabuticaba progenies cultivated in a tropical climate of altitude. Fruits. 69: 449–458.

Instituto Adolfo Lutz. 2008. *Métodos físico-químicos para análise de alimentos*. 4 ed. Instituto Adolfo Lutz, São Paulo, Brasil. 1020 p.

Jayavalli R., Kumanan K., Roseleen S.J. 2024. Identification of red flesh and white flesh jackfruit genotypes. *Biological Forum – An International Journal* 16: 140–145.

Mathiazhagan M., Raghupathy R., Sivakumar D., Wang H., Thammineni C., Panigrahi J. 2021. Genomic approaches for improvement of tropical fruits: fruit quality, shelf life and nutrient content. *Plants* 10: 1–26.

Mitra S. 2023. *Jackfruit: Botany, Production and Uses*. CABI, Wallingford, UK. 308 p.

Morelos-Flores D.A., Montalvo-González E., Chacón-López M.A., Santacruz-Varela A., Zamora-Gasga V.M., Torres-García G., de Lourdes García-Magaña M. 2022. Comparative study of four jackfruit genotypes: morphology, physiology and physicochemical characterization. *Horticulturae* 8: 1010.

Nakintu J., Andama M., Albrecht C., Wangalwa R., Lejju J.B., Olet E.A. 2023. Morphological traits of jackfruit (Artocarpus heterophyllus Lam.): Indicators of diversity, selection and germplasm dispersion in Uganda. *Scientific African* 22: e01900.

Negreiros J.R.S., Álvares V.S., Morgado M.A.D., Pereira M.B., Mizobutsi E.H. 2007. Relação entre características físicas e o rendimento de polpa de maracujá-amarelo. *Revista Brasileira de Fruticultura* 29: 546–549.

Assis Neto, E.F., Cruz, J.M.P., Braga, A.C.C., Souza, J.H.P. 2010. Elaboração de bebida alcoólica fermentada de jaca (Artocarpus heterophyllus Lam.). *Revista Brasileira de Tecnologia Agroindustrial* 4: 186-197.

Ozores B., Storck C.R., Fogaça A.O. 2015. Acceptability and technological characteristics of cakes enriched with passion fruit flour. *Disciplinarum Scientia, Série: Ciências da Saúde* 16: 61–69.

Pimentel L.D., Stenzel N.M.C., Cruz C.D., Bruckner C.H. 2008. Seleção precoce de maracujazeiro pelo uso da correlação entre dados de produção mensal e anual. *Pesquisa Agropecuária Brasileira* 43: 1303–1309.

Ribeiro L.O., Dantas, A.C.V.L., Cardoso, R.L., de Oliveira, T.D.A.D., Rodrigues, E. S. 2018. Fruit characterization of genotypes of bread-fruit tree of municipalities in the Recôncavo Baiano, Brazil. *Revista Brasileira de Ciências Agrárias* 13: 1–6.

Rodrigues L.R., Dornelles A.L.C., Schifino-Wittmann M.T. 1999. Poliembrionia e número de sementes por fruto de quatro cultivares de tangerineira. *Ciência Rural* 29: 469–474.

Shidenur, H., Mathew, S.M., Sagarika, N., Warrier, A.S., Harikrishnan, M.P., Pandiselvam, R., Kothakota, A. 2024. Development and optimization of a mechanized jackfruit processing unit for enhanced efficiency and commercial viability. *Journal of Food Process Engineering* 47: e14598.

Silva J.M., Oliveira L.A., Dias R.C.S., Amaro G.B., Silva D.C. 2022. Inheritance of soluble solids content and sucrose in melon. *Horticultura Brasileira* 40: 295–301.

Sousa A.P.M. 2016. *Utilização de resíduos de jaca no desenvolvimento de novos produtos*. [s.n.] p. (Dissertação) – Universidade Federal de Campina Grande, Cuité, Brasil.

Swami, S., Kalse, S. 2018. Jackfruit (Artocarpus heterophyllus): Biodiversity, Nutritional Contents, and Health 1-19.

Tecchio, M.A., Silva, M. J.R.D., Cunha, S.R., Callili, D., Sánchez, C.A.P.C., Souza, J.R.D., Moura, M.F. 2022. Productive performance and physicochemical quality of grapes for processing grown on different rootstocks. *Pesquisa Agropecuária Brasileira* 57: e02071.

Valeeta, M.D., Syamalamma, S., Kalpana, B., Nagesha, S. N. 2023. Morphometric Evaluation of Selected Jackfruit (Artocarpus heterophyllus Lam.) Genotypes/Varieties for the Fruit and Flake Quality Traits. *Mysore Journal of Agricultural Sciences* 57.

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