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Viability and Vigor in Jackfruit Seed *(Artocarpusheterophyllus)* Subjected to Different Substrates

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Authors' contributions

This work was performed in collaboration with all authors. Authors IEMB, IRPC designed the study and performed the statistical analysis. Authors JMMA, DIB wrote the protocol and wrote the first draft of the manuscript. Authors HVN, BHNN managed the study analyzes. Authors EAR, JLS, and LBO managed the bibliographic searches. All authors read and approved the final manuscript.

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ABSTRACT

The use of substrates is a good option and should present some important characteristics, such as availability of acquisition and transportation, absence of pathogens, richness in essential nutrients, suitable pH, texture and structure. However, each species exhibits different behavior on the same substrate, it is necessary to scientifically verify which substrate or combination of these allows obtaining seedlings with higher physiological quality. The experiment was conducted in a greenhouse at the Federal Institute of Education, Tocantins Science, and Technology, Gurupi/TO. Jackfruit seeds (*Artocarpus heterophyllus*) were used, directly removed from the fruits that were

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collected in the same period. The highest root length value was obtained when the seeds were sown in the substrates: BS (13.9 cm), HW + WS + BS (14.6 cm), PP + Sawdust + BS (13.8 cm) and CS (17 cm), intermediate value on the WS substrate (11.9 cm) and low on CS + BM + WS (6.6 cm). It was also observed that the highest length value of shoot was obtained in BS substrates (20.7 cm), HW + WS + BS (18.2 cm), PP + Sawdust + BS (16,5 cm) CS (16.4 cm) and low on the WS substrates (12.9 cm) and CS + BM + WS (7.2 cm). Regarding the first emergency count and emergence of seedlings, depending on the different substrates, once again stood out the BS substrates (65% and 85%) and CS (68.3% and 98.3%). The CS provided the highest values of viability and vigor in jackfruit seeds, followed by the Substrate BS.

Keywords: Physiological quality; jackfruit; seeds; substrates.

1. INTRODUCTION

The jackfruit (*Artocarpus heterophyllus*), the fruit of the jackfruit, is a tree of the erect size of the family *Moraceae*. It is originally from Asia and can be found in tropical and subtropical regions of the world. It was introduced in Brazil by the portuguese during the 17th century and adapted well to edaphoclimatic factors [1].

The jackfruit is a perennial tree (perennial leaves), with a dense canopy and can reach the height of 25 meters, your robust trunk, up to 1 meter, it has thick shards that sustain the highest edible fruits in the world with the weight of up to 60 kg and length of 90 cm. It's a syncarpous fruit (union of various simple fruits in makes a central axis) oval or elongated format [2], its bark is rough and thick with green and yellowish coloring during maturation. The pulp is creamy and juicy and has a strong smell, is composed of several buds, and there's a lump inside each of them. The consistency of the jackfruit is depending on the variety: the mole is known to have smaller and sweeter fruits, while hard produces larger fruits with firm pulp. They are rich in fiber, calcium, iron, phosphorus and B-complex vitamins [3].

Most existing jackfruit is not in planned orchards, and this species, yet, is the target of extractive activities. Despite being an exotic plant in some regions, the jackfruit is considered an invasive plant due to the following characteristics: allopathic effect, high germination power [4]and the ability to grow to produce a large number of seeds in various edaphoclimatic conditions [5].

The reproduction forms of the jackfruit are vegetative (budding and grafting), mainly used for marketing, and sexual reproduction (Seeds). Seedling production is influenced by internal seed quality factors and external factors, such as water, light, temperature, oxygen, and pathogens, associated with the type of substrate [6]. The use of substrates is a good option and should present some important characteristics, such as availability of acquisition and transportation, absence of pathogens, richness in essential nutrients, suitable pH, texture and structure [7]. However, each species exhibits different behavior on the same substrate, it is necessary to scientifically verify which substrate or combination of these allows obtaining seedlings with higher physiological quality [8, 9].

Jackfruit is a valuable food due to the compounds present in the different parts of this fruit. Second [10], parts of the have pharmacological activities, which are: Antifungal (Leaf and seed); Antiviral (Sed); Antibacterial (Stem and rootbarks, leaf and fruit); Anticancer (Leaves and stem); Antimalarial (Stem and root barks).

This study aimed to evaluate the effect of different substrates on the viability and vigor of jackfruit seeds.

2. MATERIALS AND METHODS

The experiment was conducted in a greenhouse at the Federal Institute of Education, Tocantins Science, and Technology, Gurupi/TO. To do so, jackfruit seeds were used (*Artocarpus heterophyllus)* directly removed from the fruits, that were collected in the same period. The harvested fruits were selected and submitted to pulping for seed removal and treatment, the seeds were disinfected with sodium hypochlorite solution in the proportion of 30 ml in 2 liters of water, then scattered over paper towel remaining in the shade for 12 hours, for the removal of excess water.

The substrates used were: Washed Sand (WS), Black Soil (BS), Humus of Worm (HW) + Washed Sand (WS) + Black Soil (BS), Pinus Powder (PP) + Sawdust + Black Soil (BS), Commercial Substrate (CS) + Bird Manure (BM)

+ Washed Sand (WS) and Commercial Substrate (CS), then 100 seeds were used per treatment (substrate), divided into 4 replicates of 25 seeds. All trays with the substrates already sown were submitted to two irrigations during the first 30 days and irrigated once a day in the remainder of the seedling formation period. After the installation of the experiment, the process of evaluation and data collection began. The following characteristics were evaluated:

2.1 Root Length (CI) and Shoot Length (SI)

Seedlings were removed from trays and with the aid of a ruler graduated in centimeters, measured from apical yolk to the end of the apical root, and measuring from the lap to the apex of the seedling. The results were expressed in cm, according to recommendations for Nakagawa [11].

2.2 Number of Leaves (NL)

After the seedlings were removed, the number of leaves was counted.The results were expressed in units.

2.3 First Emergency Count (FEC)

The first emergency count was performed at 15 days after sowingaccording to the methodology of Silva et al. [12]. The collected data were corresponding to the cumulative percentage of normal seedlings, with recorded values for each substrate.

2.4 Seedling Emergency (SE)

100 seeds were used, distributed in four replicates of 25 seeds. The count of the number of germinated seeds started 15 days after sowing and extended until emergence stabilization in all substrates. The criterion used was that of normal seedlings that presented the perfect essential structures [13] and the results expressed as a percentage.

3. RESULTS AND DISCUSSION

In general, the characteristics evaluated showed sensitivity when indicating differences in the quality of substrates (Table 1), where the highest root length value, was obtained when the seeds were sown on the substrates: BS (13.9 cm), HW + WS + BS (14.6 cm), PP + Sawdust + BS(13.8 cm) and CS (17 cm), intermediate value in WS substrates (11.9 cm) and low on CS + BM + WS (6.6 cm). Notaro et al. [14], working with pine cone graft port also found that the CS was what provided better root development, due to its increased fertility. It was also observed that the highest length value of shoot was obtained in BS substrates (20.7cm), HW + WS + BS (18.2 cm), PP + Sawdust + BS (16.5 cm) and CS (16.4 cm) and low on the WS substrates (12.9 cm) and CS + BM + WS (7.2 cm). Aquino and Loureiro [15] highlight that HW is an excellent fertilizer, able to improve chemical attributes, biological systems of the soil, and should be used for seedling production. Araújo et al. [16] also cite that the HW, for being rich in phosphorus, calcium, and potassium, maybe part of the composition of substrates for seedling production. Regarding the number of leaves, even with small variation (1 the 3 un) the BS substrates (3 un) and the CS (3 un) stand out.

The best performance of the commercial substrate is linked to its higher nutrient input: phosphorus, potassium, nitrogen, calcium and magnesium [17].

The classification ranges of the coefficients of variation analyzed were based on the methodology proposed by Gomes [18]. Data on the first emergency and emergency count of seedlings, depending on the different substrates are in Table 1.

Table 1. Root length (RL), shoot length (SL), number of leaves (NL), first emergency count (%) and seedling emergence (%) of jackfruit seeds on different substrates

Treatments	RL	SL	NF	FEC	SE
WS	11.9b	12.9b	2b	43.3b	86.7b
BS	13.9a	20.7a	3a	65.0a	85.0b
HW + WS + BS	14.6a	18.2a	3a	40.0b	83.3b
PP + Sawdust + BS	13.8a	16.5a	3a	41.7b	83.3b
CS + BM + WS	6.6c	7.2b	1c	11.7c	25.0c
CS	17.0a	16.4a	3a	68.3a	98.3a
CV (%)	9.3	7.9	1.3	13.4	13.7

CV= Coefficient of variation. Means followed by the same letter in the column do not differ from each other by the Tukey test to 5%

Once again stood out the BS substrates (65% and 85%) and CS (68.3% and 98.3%). Intermediate results were obtained on the substrates WS (43.3% and 86.7%), HW+ WS + BS (40% and 83.3%), PP + Sawdust + BS (40.7% and 83.3%) and lower for CS + BM + WS (11.7% and 25%). Godoy et al. [19] highlight that in addition to exercising the function of supporting plants, the substrate should provide adequate water and air supply to the root system, be free of phytopathogens, easy to manage, low cost, high availability and have long durability, characteristics observed in the CS.

4. CONCLUSION

The commercial substrate provided the highest values of viability and vigor in jackfruit seeds, followed by the Black Soil substrate.

The lowest viability and vigor values were obtained by the commercial substrate + poultry manure + washed sand.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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