



Vigor of Java Plum Seedlings, in the Presence and Absence of Mucilage Submitted to Different Substrates

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Authors' contributions

This work was performed in collaboration among all authors. Authors JPC and HVN designed the study and performed the statistical analysis. Authors DIB and EAR wrote the protocol and wrote the first draft of the manuscript. Authors JHSL, LGBGR and PVGS managed the study analyzes. Finally, authors RAL and BHNN managed the bibliographic searches. All authors read and approved the final manuscript.

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ABSTRACT

Java plum (*Syzygium cumini* L. Skeels) originates from Asia and has adapted very well to soil conditions and climate in Brazil, becoming spontaneous in the Northeast region. Still, there is no large commercial production in the country, since information related to planting, plant management, post-harvest management, and fruit processing is limited and vague. The production of quality seedlings depends on several factors, and the composition of the substrates is a factor of great importance, because the germination of the seeds, the beginning of the roots and the rooting are directly linked to the constitution of the substrate. The experiment was conducted in a greenhouse at the Federal Institute of Education, Science and Technology of the Tocantins, at a

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city of Gurupi/TO. For this, Java plum seeds were used directly removed from the fruits, which were collected in the same period. The substrates used were: Washed Sand; Black Soil; Black Soil + Worm Humus + Commercial Substrate and Commercial Substrate + Washed Sand + Pine Bark, in the presence and absence of mucilage. The highest values of root length and length of shoot, in the presence and absence of mucilage, were obtained in the substrates of BS (10 and 13 cm) (8.7 and 9.3 cm), BS + WH + CS (9.3 and 12.4 cm) (8.2 and 9.5 cm) and CS + WS + PB (9 and 11 cm) (8.6 and 10.6 cm), respectively. Regarding the first emergency count and seedling emergence, once again the CS + WS + PB (20 and 56.2%) (51.2 and 90%), in the presence and absence of mucilage, respectively. It was concluded that the removal of the mucilage in Java plum seeds provided better performance in all substratum and the commercial substrate + washed sand + pine bark provided greater viability and vigor.

Keywords: Viability; vigor; java plum; substrates; seeds.

1. INTRODUCTION

Java plum (*Syzygium cumini* L. Skeels) belonging to the botanical family Myrtaceae, which also includes species of other tropical fruits widely consumed in Brazil such as guava (*Psidium guajava* L.) and Surinam cherry (*Eugenia uniflora* L.) can reach 10 meters in height. It has simple leaves, coriaceous, aromatics and 8 to 14 cm long, hermaphrodite flowers, white or yellowish, with long and numerous stamens. Its fruit is 3 to 4 cm long and presents dark purple coloration and fleshy pulp that surrounds the seed [1]. The tree is ornamental, due to its beauty and edible fruits; however, it is not suitable for public spaces, as it has great potential to cause stains.

It is a species originating in Asia and has adapted very well to the soil and climate conditions of Brazil, becoming spontaneous in the Northeast region. Still, there is no large commercial production in the country, since information related to planting, plant management, post-harvest management and fruit processing is limited and vague [2].

According to [3], the fruit pulp of *S. cumini* is a source of phenolic compounds such as flavonoids and phenolic acids. It also contains hydrolysable tannins, which may be the main phenolic compounds responsible for the astringence of edible parts. Anthocyanins are also present: 3,5-diglucoside of delphinidin, petunidin, and malvidin that are responsible for fruit pigment and contain antioxidant and anticancer bioactivity. So, the consumption of these fruits is described as a strategy to prevent cardiovascular diseases, cancer and neurodegenerative diseases [4].

Its seeds are also important because they are rich in flavonoids, an antioxidant that represents

the elimination of free radicals and a protective effect on antioxidant enzymes. Contains alkaloid and glycoside that serves for diastatic conversion of starch into sugar and seed extract reduces blood pressure [5].

Because it presents important functional and medicinal characteristics, the production and consumption of Java plum should be encouraged, in the same way as studies in relation to their cultivation [6].

For this, it is necessary to produce quality seedlings and the composition of the substrates is a factor of great importance, because seed germination, root initiation and roots growth are directly linked to the chemical, physical and biological substrate characteristics [7]. The substrate should present important characteristics, such as availability of acquisition and transport, absence of pathogens, richness in essential nutrients, adequate pH, corresponding texture and structure [8].

However, each species presents different behavior on the same substrate and it is necessary to verify which substrate or combination of these allows obtaining seedlings with higher physiological quality [9,10].

This study aimed to evaluate the effect of different substrates on the emergence and morphological quality of Java plum seedlings.

2. MATERIALS AND METHODS

The experiment was conducted in a greenhouse at the Federal Institute of Education, Science and Technology of Tocantins, Gurupi/TO city in Brazil, from December 5, 2017, to January 15, 2018. For this, Java plum seeds (*Syzygium cumini*) were used directly removed

from the fruits. The harvested fruits were selected and submitted to pulping for seed removal and treatment (presence and absence of mucilage). The seeds were disinfected with sodium hypochlorite solution in the proportion of 2 tablespoons (soup) shallow in 2 liters of water, then scattered on paper towel remaining in the shade for 12 hours, for the removal of excess water.

The experimental design was completely randomized in a 2x4 factorial scheme, the first factor being the presence and absence of mucilage and the second the substrates used: Washed Sand (WS); Black Soil (BS); Black Soil + Worm Humus + Commercial Substrate (BS+WH+CS) and Commercial Substrate + Washed Sand + Pine Bark (CS+WS+PB). Then, 100 seeds per treatment were used, divided into 4 replicates of 25 seeds. All trays with the substrates already sown were submitted to two irrigations per day during the first 30 days and 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:

- **Root length (RL) and shoot length (SL):** 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 [11].
- **The number of leaves (NL):** After seedling removal, the number of leaves was counted. The results were expressed in the unit.
- **First emergency count (FEC):** The first emergence count was performed at 15 days after sowing. The collected data were corresponding to the cumulative percentage of normal seedlings, with values recorded for each substrate.
- **Seedling emergence (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 [12], and the results expressed as a percentage.

2.1 Statistical Analysis

The data were submitted to variance analysis (ANOVA) and the means grouped by the Tukey test at 5% probability using the Software Sisvar[®] 3.6.

3. RESULTS AND DISCUSSION

In general, the characteristics evaluated showed sensitivity when indicating differences in substrate qualities, both in the presence and absence of mucilage (Table 1). All evaluated characteristics, in the presence of mucilage, presented lower behavior in relation to the removal of the mucilage. According to [13] working with mangos teen seeds, sugar-rich material favors the proliferation of pathogens, which interfere with germination. Martins et al. [14] found in yellow passion fruit seeds that the presence of a gelatinous constitution cover contains inhibitory and reducing substances of germination.

The highest values of root length and length of shoot, in the presence and absence of mucilage were obtained in the substrates of Black Soil (10 and 13 cm) (8.7 and 9.3 cm), BS + HW + CS (9.3 and 12.4 cm) (8.2 and 9.5 cm) and CS + WS + PB (9 and 11 cm) (8.6 and 10.6 cm), respectively. Notaro et al. [15], working with pine cone root port also verified that the CS was the one that provided better root development, due to its higher fertility [16]. Highlight that worm humus is an excellent fertilizer, capable of improving chemical, physical and biological attributes of the soil, and should be used for seedling production. Araújo-Neto et al. [17] also mention that worm humus, because it is rich in phosphorus, calcium and potassium, can be part of the composition of substrates for seedlings production.

Regarding the number of leaves, even with small variation (6.1 to 8.3 un), both in the presence and absence of mucilage, the CS + WS + PB stood out (8.4 and 8.3 un, respectively).

Data on the first seedling emergency and emergency count are in Table 1. Once again stood out the CS + WS + PB (20 and 56.2%) (51.2 and 90%), in the presence and absence of mucilage, respectively. Intermediate results were obtained in the substrate BS + WH + CS (10 and 31.2%) (17.5 and 71.2%, respectively). Godoy et al. [18] highlight that in addition to exercising plant support function, the substrate should provide adequate water and air supply to the root system, be free of phytopathogens, easy

Table 1. Root length (cm), shoot length (cm), number of leaves (un), first emergency count (FEC) (%) and seedling emergence (SE) (%) of Java Plum seedlings, in the presence and absence of mucilage, in different substrates

| Presence of mucilage | | | | | |
|----------------------|--------|--------|-------|--------|--------|
| Treatments | RL | SL | NL | FEC | SE |
| WS | 6.9Bb | 5.1Bb | 6.1Bb | 0Bd | 15.0Bb |
| BS | 10.0Ba | 8.7Ba | 6.2Bb | 2.5Bc | 15.0Bb |
| BS + HW + CS | 9.3Ba | 8.2Ba | 6.0Bb | 10.0Bb | 17.5Bb |
| CS + BS + PB | 9.0Ba | 8.6Ba | 8.4Aa | 20.0Ba | 51.2Ba |
| Absence of mucilage | | | | | |
| WS | 11.1Aa | 9.3Aa | 7.5Ab | 35.0Ab | 85.0Ab |
| BS | 13.0Aa | 9.3Aa | 7.1Ab | 8.7Ac | 50.0Ac |
| BS + HW + CS | 12.4Aa | 9.5Aa | 6.7Ab | 31.2Ab | 71.2Ab |
| CS + BS + PB | 11.1Aa | 10.6Aa | 8.3Aa | 56.2Aa | 90.0Aa |
| CV (%) | 7.7 | 5.1 | 2.1 | 15.6 | 15.1 |

CV= Coefficient of variation.

Average followed by the same lowercase letter and uppercase, in the column do not differ from each other by the Tukey test at 5% probability

management, low cost, high availability and have a long durability, characteristics observed in CS + WS + PB.

4. CONCLUSION

The removal of the mucilage in Java Plum seeds provided better seedlings performance in all substrates.

The Commercial Substrate + Washed Sand + Pine Bark provided greater seedlings viability and vigor.

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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