



Viability and Vigor of Cerrado Cashew Seeds (*Anacardium humile*) on Different Substrates

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Authors' contributions

This work was carried out in collaboration among all authors. Authors HVN and DIB designed the study and performed the statistical analysis. Authors ASS and IRPC wrote the protocol and wrote the first draft of the manuscript. Authors MSQ and RAL managed the study analyzes. Finally, authors LEMB, PVGS, HDS and BHNN managed the bibliographic searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/EJMP/2021/v32i1130427

Editor(s):

- (1) Dr. Paola Angelini, University of Perugia, Italy.
- (2) Prof. Marcello Iriti, Milan State University, Italy.

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 - (2) Shahid Niaz Khan, Kohat University of Science and Technology, Pakistan.
- Complete Peer review History: <https://www.sdiarticle4.com/review-history/76959>

Original Research Article

Received 05 September 2021
Accepted 10 November 2021
Published 18 November 2021

ABSTRACT

The little cashew from the Cerrado (*Anacardium humile*) is a kind of family anacardiáceas, a shrubby plant of great incidence in the Brazilian Cerrado. It is a small pseudofruit, of acidic and juicy flavor, which is known to have colors ranging from yellow to red. It can be consumed naturally or in juices, drinks, sweets. However, its true fruit is the chestnut. Seed germination is influenced by factors such as the substrate, which can be improved in order to improve germination, resulting in the acquisition of more vigorous seedlings. The experiment was conducted in a greenhouse at the Federal Institute of Education, Science and Technology of Tocantins, city of Gurupi/TO, from 26 October 2017 to 15 February 2018. Seeds were collected directly from the pseudofruits. The highest root length value was obtained for seedlings of the following substrates: bs + ws + pb (7.1

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cm and 12.5 cm) and ws (6.7 cm and 10.7 cm), intermediate values: or + rs + vl (6.3 cm and 10.0 cm) and hw + vl + sawdust + cp + ws (5.5 cm and 9.5 cm), and lower values on substrates: bs (5.7 cm and 8.0 cm) and bs + rs + sawdust (6,6 cm e 9,0 cm). It was also observed that the highest value referring to the first emergency count and seedling emergence once again stood out the substrates bs + ws + pb (61.0 % and 87.5 %) and ws (56.2% and 86.2 %). Intermediate results were obtained from hw substrates + vl + sawdust + cp + ws(44.0 % and 81.0 %) and or + rs + vl (48.4 % and 81.2 %) and lower for bs substrates (37.5% and 72.0 %) and bs + rs + sawdust (45.3% and 77.0 %). The substrates: bs + ws + pb and washed sand provided the highest values of viability and vigor in cashew seeds.

Keywords: *Physiological quality; seeds; germination.*

1. INTRODUCTION

The plants of *Anacardium humile* also known as Cerrado cashew, is a native species and has a high incidence in the Cerrado, is a species that occurs in dirty and Cerrado field, in the states of Goiás, Minas Gerais, Rondônia, Bahia, Mato Grosso, Mato Grosso do Sul, Paraná, São Paulo and the federal district [1]. However, with the increasing deforestation of this biome, it risks disappearing even before further studies on the species can be done [2].

The fruits of *A. humile* consists of the chestnut (true fruit) and the peduncle, which develops in pseudofruit and has varied form, with coloring going from yellow to red [3]. Produces an annually moderate amount of viable seeds, disseminated by birds [4]. Each kilogram contains about 770 seeds [5].

For a long time, it was consumed only by the native populations of these regions. In recent years, cashew began to enter the Haute Gastronomy (mainly in Federal District) and became better known in the cities. The peduncle of Cerrado cashew can be consumed in nature, such as juice, sweets, sauces, among others [6]. Its balanced sweetness and acidity make the small cashew of the Cerrado a great gastronomic attraction [3]

Due to its importance in the economic context, commercial cultivation of Cerrado cashew has become a common practice in many areas of the northeast region of Brazil, however, for the production of seedlings for commercial purposes of—a culture with economic potential basic information is needed, ranging from the use of healthy seeds, sowing position and depth, fertilization management, nutritional balance and to substrates with adequate composition and volumes [7,8,9]

The substrate used for seed germination has a great influence on seedling emergence and subsequent seedling formation. In the seedling production process, the study of an adequate substrate that provides favorable conditions for seedling development is necessary, because the quality of the seedling is fundamental in the implantation of a productive orchard. The best substrates for the formation of seedlings must have some important characteristics, availability for acquisition and transport, absence of pathogens, richness in essential nutrients, adequate pH, texture and structure.

For seedling production, substrates are usually prepared by producers themselves who use various pure materials or mixtures, taking into account, mainly, regional availability [10].

Therefore, this study aimed to evaluate the effect of different substrates on the viability and vigor of Cerrado cashew seeds.

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 from October 26, 2017, to February 15, 2018. Cashew fruits (*A. humile*) They were harvested in the morning, in a pasture area, located in the municipality of Gurupi. Seeds were selected and detached from the ripe and healthy pseudofruits. The substrates used were: black soil, rice straw, sawdust (bs + rs + sawdust); black soil (bs); organic residue, rice straw, vegetable land (or + rs + vl); humus worn, vegetable land, sawdust, coconut peel, washed sand (hw + vl + sawdust + cp + ws); washed sand (ws); black soil (bs) + washed sand (ws) + pinus bark (pb).

Then after the acquisition and preparation of the substrates, the trays were divided into 4 replications, in which 100 seeds per treatment

(substrate) were used, 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 (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].

2.2 Number of Sheets (NS)

After removing the seedlings, the number of leaves was counted and the results were expressed in whole and positive numbers

2.3 First Emergency Count (FEC)

The first emergency 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.

2.4 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 emergency stabilization in all substrates. The criterion used was that of normal seedlings that presented the perfect essential structures [12], and the results were expressed as a percentage.

3. RESULTS AND DISCUSSION

In general, the characteristics evaluated showed sensitivity when indicating differences in substrate quality (Table 1), where the highest values of root length and shoot of Cerrado cashew seedlings were obtained when the seeds were sown in substrates: bs + ws + pb (7.1 cm and 12.5 cm) and ws (6.7 cm and 10.7 cm), intermediate values: or + rs + vl (6.3 cm and 10.0 cm) and hw + vl + sawdust + cp + ws (5.5 cm and 9.5 cm), and lower values in the substrates: bs (5.7 cm and 8.0 cm) and bs + rs + sawdust (6.6 cm and 9.0 cm). [13], reports that Plantmax® is the commercial substrate (cs) that can be used in seedling formation, as it is prepared with expanded vermiculite and organic materials of plant origin, free of pests, microorganisms, and seeds of invaders. However, hardly a material alone will present all desirable characteristics for seedling formation. In this sense, according to [14], it is preferable to mix two or more materials for obtaining a substrate suitable for a particular species. Regarding the number of leaves, even with small variation (6 to 8 un) the substrates bs + ws + pb (8 un) and ws (8 un) stood out. Data on the first seedling emergency and emergency count, depending on the different substrates are in Table 1. Once again the substrates stood out bs + ws + pb (61.0 % and 87.5 %) and ws (56.2% and 86.2 %). Intermediate results were obtained in substrates of hw + vl + sawdust + cp + ws (44.0 % and 81.0 %) and or + rs + vl (48.4 % and 81.2 %) lower for bs substrates (37.5% and 72.0 %) and bs + rs + sawdust (45.3 % and 77.0%). The substrate to be used exerts great influence on the emergence of plants and the formation of good quality seedlings. The substrate can be formed from the raw material of mineral, organic or synthetic origin, of a single material or of various materials in mixtures, some of which do not have desirable characteristics of quality [15].

Table 1. Root length (cm), shoot length (cm), number of leaves (un), first emergency count (%) and seedling emergence (%) Cerrado cashew seeds on different substrates

Treatments	RL	SL	NS	FEC	SE
bs + rs + sawdust	5.8 b	9.0 ab	7 ab	45.3 ab	77.0 b
bs	5.7 b	8.0 b	6 b	37.5 b	72.0 b
or + rs + vl	6.3 ab	10 a	7 ab	48.4 ab	81.2 a
hw + vl + sawdust + cp + ws	5.5 c	9.5 b	7 ab	44.0 ab	81.0 a
ws	6.7 ab	10.7 a	8 a	56.2 a	86.2 a
bs + ws + bp	7.1 a	12.5 a	8 a	61.0 a	87.5 a
C.V (%)	1.59	4.7	1.1	20.9	10.9

CV- Coefficient of variation

[16] 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.

Averages followed by the same letter in the column, for each experiment, do not differ from each other by the Tukey test at 5 %.

4. CONCLUSIONS

The substrates black soil + washed sand + bark pinus powder and washed sand provided the highest values of viability and vigor in Cerrado cashew seeds.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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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Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/76959>