Germinative power of oiticica seeds with different sizes of whole fruits and without epicarp

Poder germinativo de sementes de oiticica com diferentes tamanhos de frutos inteiros e sem epicarpa

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ABSTRACT
Oiticica (Licania rigida Benth) is considered an oilseed plant present in several states in northeastern Brazil. Its seeds are rich in good quality oil and performs various functions for the lubricants and textile industry. This work aims to evaluate the germination power of oiticica seeds in different sizes of whole fruits and without epicarp. The study was conducted from February to June 2015 using oiticica seeds from matrices located in the city of Dona Inês, PB. A randomized block design was adopted, with factorial 2 ×2 ×2, corresponding to two evaluation periods, two seed sizes (35 mm and 42 mm), with and without the presence of epicarp. Plant height, stem diameter, total chlorophyll and Dickson quality index (IDQ) were evaluated. Oiticica seeds with 42 mm have a larger kaolin diameter regardless of the presence of epicarp. Chlorophylls are not influenced by fruit length. Dickson's quality index (DQI) is not influenced by fruit length, however, oiticica seedlings with epicarp and length of 42 mm increase their performance in relation to those without epicarp.

Keywords: Germination, Licania rigida Benth, Vigor of seeds.

RESUMO
Oiticica (Licania rigida Benth) é considerada uma planta oleaginosa presente em vários estados do nordeste do Brasil. Suas sementes são ricas em óleo de boa qualidade e desempenham diversas funções para a indústria de lubrificantes e têxtil. Este trabalho tem como objetivo avaliar o poder de germinação de sementes de oiticica em diferentes tamanhos de frutos inteiros e sem epicarpo. O estudo foi realizado no período de fevereiro a junho de 2015 utilizando sementes de oiticica de matrizes localizadas no município de Dona Inês, PB. Adotou-se o delineamento em blocos casualizados, em fatorial 2 × 2 × 2, correspondendo a duas épocas de avaliação, dois tamanhos de sementes (35 mm e 42 mm), com e sem a presença de epicarpo. Foram avaliados a altura da planta, o diâmetro do caule, a clorofila total e o índice de qualidade de Dickson (IDQ). Sementes de Oiticica com 42 mm apresentam maior diâmetro de caulim independente da presença de epicarpo. As clorofilas não são influenciadas pelo comprimento do fruto. O índice de qualidade de Dickson (IQD) não é influenciado pelo comprimento do fruto, entretanto, mudas de oiticica com epicarpo e comprimento de 42 mm aumentam seu desempenho em relação àquelas sem epicarpo.

Palavras-chave: Germinação, Licania rigida Benth, Vigor de sementes.

1 INTRODUCTION

The oiticica *(Licania rigida* Benth) is considered an oilseed plant, characterized by places of riparian forests in the Caatinga do Sertão, seridó, agreste piauiense and on the coasts of Ceará and north-rio-grandense. It is also disseminated in the hydrographic basins of Piauí, Ceará, Rio Grande do Norte and Paraíba, especially in the Sertão, at altitudes ranging from 50 to 300 m, with solar luminosity close to 3,000 hours per year in fluoride neosols, being a native species, which in its habitat competes with other vegetations (DINIZ NETO et al., 2014).

The fruit of oiticica is drupaceous, fusiform or oval, 2 to long with stone wrapped in yellowish mass, grating, unpleasant and fibrous smell. The peel of the fruit is green, even when ripe, but becomes dark yellow when dry (SILVA FILHO, 2008). 7 cm

The seeds produce a high-quality dry oil that can be used in the manufacture of dyes, varnishes and paints. In the past, between the years 1930 and 1980, the Northeastern Sertão produced more than 155,000 tons of oiticica oil per year, mainly exported to automotive paint factories. Today it is replaced by tungue oil, a plant of Chinese origin, being the largest supplier to Brazil, Paraguay (JOHN, 2013). Studies conducted by Melo et al. (2006) showed that oiticica biodiesel may be an alternative for the use of this oilseed contributing to its growth and territorial expansion.

Knowing the behavior of seeds and seedlings of native species regarding ecological factors is essential for understanding the successional process of a forest and, consequently, for the restoration of vegetation in degraded environments, such as in the Caatinga domain, in which riparian vegetation has been the target of frequent negative impacts caused by man (BRASIL,1991). The objective of this work was to evaluate the germination power of oiticica seeds with different sizes of whole fruits and without epicarp.

There is a growing interest in the propagation of native species due to the increasingly focused attention on environmental problems, with a view to producing seedlings to recover and, or enrich degraded areas resulting from the disorderly exploitation of natural resources. However, there is not enough knowledge for the management and analysis of the seeds of most of these species in order to provide data that can characterize their physical and physiological attributes. Therefore, it is necessary to obtain information about the germination, cultivation and potentialities of these native species of the Caatinga (SANTOS et al., 2010).

The production of seedlings with high quality is a strategy to improve productivity and become more competitive in plant production. Currently, the use of seeds is justified in the process of obtaining rootstocks, genetic improvement and maintaining variability (DANNER et al., 2007).

According to Lacerda & Barbosa (2006), when there is greater water availability in the soil of certain habitats of this region, such as banks of watercourses and lagoons, possibly allow the better development of species that behave more like those of forest environment since it allows the development of a more arboreal physiognomy. However, some plants may undergo alterations in metabolism and are induced by factors resulting from various physiological responses, among which are changes in growth, photosynthetic capacity and chlorophyll accumulation by modifying its structure (GRACIANO et al., 2011).

2 MATERIAL AND METHODS

The experiment was conducted in the seedling nursery in a screened environment protected with sombrite (50% luminosity) in the Agriculture Sector of the Center of Human, Social and Agrarian Sciences (CCHSA) of the Federal University of Paraíba (UFPB), Campus III Bananeiras -PB, located in serra da Borborema, region of Brejo paraibano.

The treatments were distributed in a randomized block design, with factorial 2 × 2 × 2, corresponding to two evaluation periods, two seed sizes (35 mm and 42 mm), with the presence and absence of epicarp. Subsequently, the seeds were sowed in washed sand (100 seeds put trays), with four replications (Figure 1).

Figure 1 - Implementation of the experiment using washed sand as substrate (A), beginning of the germination period (B).

h

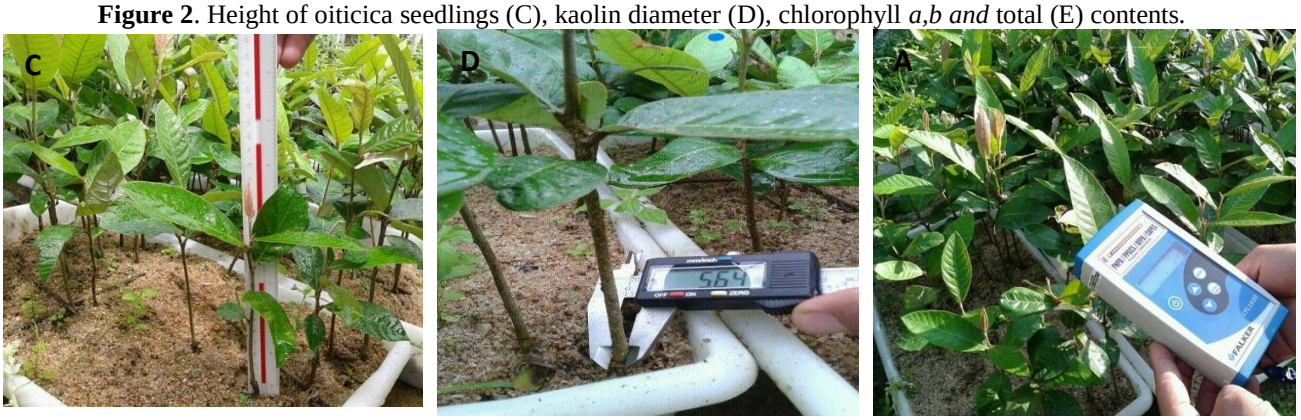
B

The oiticica seeds come from matrices located in the city of Dona Inês, PB, being collected and packed in nylon bags and then transported to the Soil Laboratory of CCHSA/UFPB. During the experiment, seedling height, stem diameter, chlorophyll *Index A, B and* total and Dickson quality index (DQI) were evaluated. The experiment was evaluated for 72 days after emergence, which was started 14 days after seeding without epicarp and the germination process completed after thirty days. The seeds with epicarp started the emergence after 25 days, and the process was completed only at 72 days of experiment.

The measurements were performed in four stages, at 18, 25, 53, 61 days after sowing (DAS) until its complete stabilization. This was due to the seeds without epicarp having emerged first than those with epicarp. From 18 to 24 days of evaluation, seeds without epicarp were analyzed, and after the dates 53-61 days, the seeds with epicarp were analyzed. Plant height was performed at the distance between the neck and the end of the main stem through a ruler graduated in centimeters. The stem diameter was measured by a precision digital caliper in the plant neck 2 cm above the ground.

Chlorophyll indexes were used to measure chlorophyll, according to (Fig. 2). The Dickson Quality Index (DQI) described in Figure 3 measures the quality of seedlings of plant species, according to the methodology recommended by Dickson et al. (1960). Five plants per plot were divided and the roots, shoots and put to dry in an oven with air circulation at 65 C to constant mass Were used for reforestation in areas with signs of environmental degradation.

Figure 2. Height of oiticica seedlings (C), kaolin diameter (D), chlorophyll *a,b and* total (E) contents.



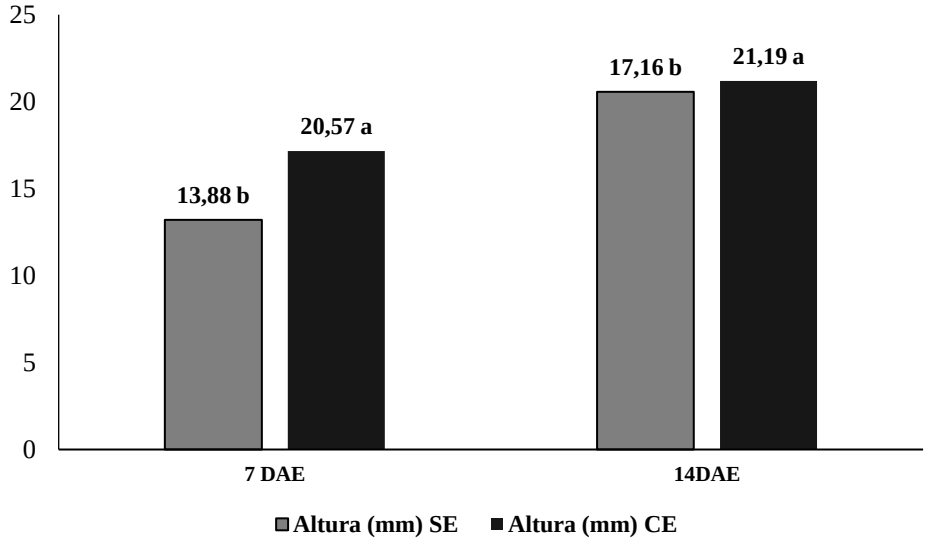
For data analysis, the statistical software ASSISTAT version 7.7 beta was adopted and the means were compared by the Tukey test at 5% probability (SILVA & AZEVEDO, 2002).

3 RESULTS AND DISCUSSION

Seedling height (Figure 3) after emergence with and without epicarp at 14 increased in relation to seven days. This indicates that the substrate derived from sand and abiotic factors such as luminosity, temperature and solar incidence provided favorable conditions for seedling development over the time of the experiment. This work presupposes that of Carvalho et al. (2006) in which working with Licuri plants (*Syagrus coronata* (Mart.) Becc. showed higher growth when submitted to 30% of luminosity intention (Figure 1). We believe that the light intensity favored greater chlorophylactic efficiency allowing higher photosynthetic performance.

The use of oiticica fruits with different sizes with and without epicarp did not influence seedling height growth. Although we expected higher heights in seedlings with longer length (42 mm), in this study fruits with 35 mm length showed to be superior despite no significant difference. Possibly seeds when collected and sanded without going through a long storage period can provide similar seedling vigor. In work carried out by Aguiar et al. (1996), did not find influence of size as a function of seed germination *of Caesalpinia echinata* Lam. The authors report that genetic, climatic and environmental factors interfere in seedling development, but in this study the behavior of the seeds was similar.

Figure 3. Height of seedlings with different lengths of fruits with and without epicarp. Average values of 5 repetitions per 5 seedlings. SE= without epicarp, CE= with epicarp.



The stem diameters of the fruits obtained better results with seeds of 42 mm in length. However, oiticica fruits with epicarp were higher than without epicarp. In the work of Surles et al. (1993), it was verified that larger seeds produce more vigorous seedlings, probably because they have a higher amount of reserve material, higher level of harmonies and higher embryo (Figure 4).

Figure 4. Stem diameter of oiticica seedlings with and without bark with different length of fruits. Average values of 5 repetitions per 5 seedlings. SE= without epicarp, CE= with epicarp.

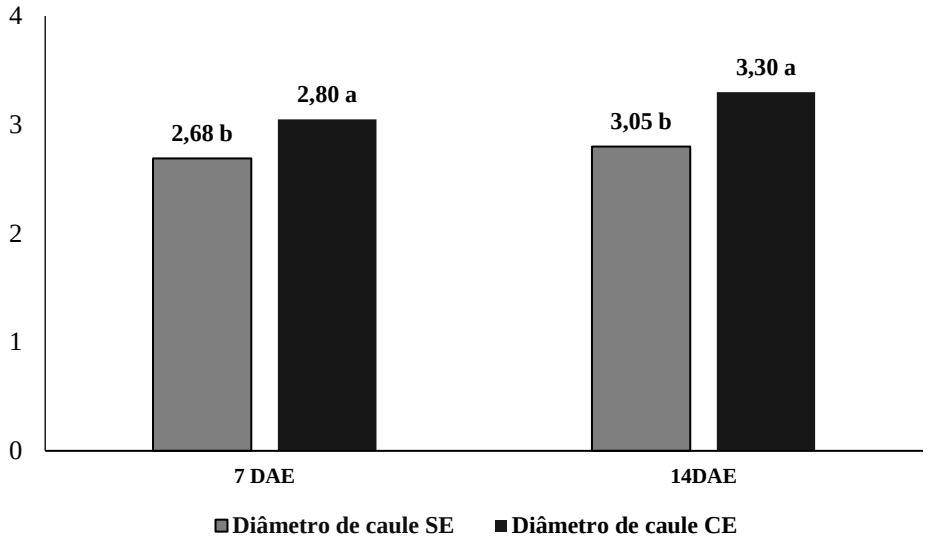


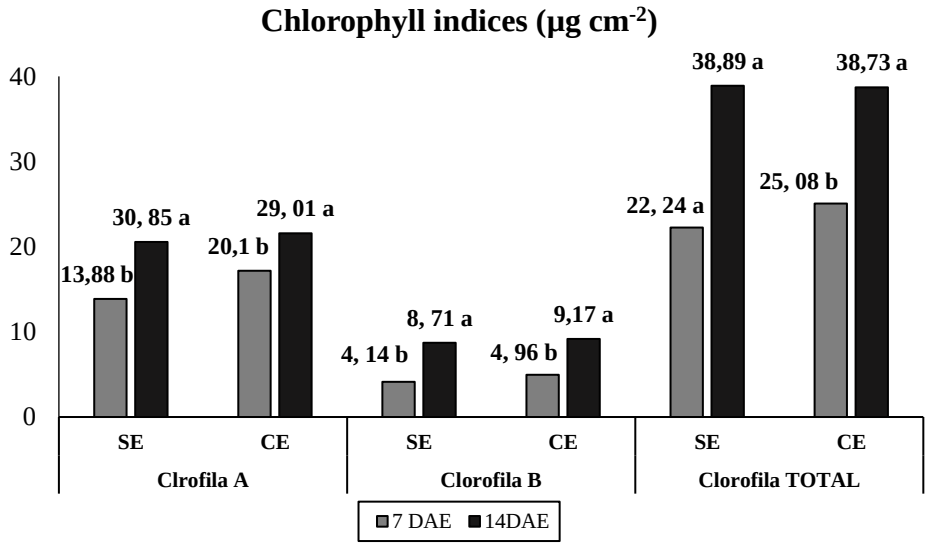
Figure 5 shows the values for chlorophylls *A, B and* total. Chlorophyll *A* indices were increased as DAE increased regardless of the presence or absence of epicarp in seeds. This fact can occur by increasing the portosystemic system as the seedling goes into subsequent stages. Jesus and Marenco (2008) report that chlorophylls have pigments responsible for capturing light, and this light is used in photosynthesis.

As there was an increase in chlorophyll *B indices after* emergence, there was an increase in photosynthetic metabolism and seedling growth and consequently accumulation in the indices of this chlorophyll. Seedlings evaluated at 15 DAE after emergence, regardless of presence or absence of bark obtained an increase in total chlorophyll indices. Chlorophyll levels can be justified by the behavior observed by chlorophylls *A* and *B*, which also observed significant increments at 14 days.

Taiz and Zaiger (2002) report that the main function of chlorophyll is to absorb photons of the light emitted by the Sun thus participating in an electron transport chain that culminates in the hydrolysis of water molecules and the production of ATP, necessary for the dark phase of photosynthesis where carbohydrates are synthesized from carbon dioxide. For this, nitrogen is part of the chlorophyll molecule and, therefore, it is necessary for photosynthesis. Also according to the authors, these chlorophylls are essential in the conversion of light radiation into chemical energy, in the form of ATP and NADPH, increasing the photosynthetic efficiency of plants and, consequently, with their growth and adaptability to different environments. In this study we did not quantify n

contents, but we know that nitrogen is the component of amino acid molecules essential for protein formation and that it is directly to plant growth.

Figure 5. Chlorophyll *A, B and* total indices in oiticica fruits with and without the presence of epicarp. Average values of 5 repetitions per 5 seedlings. SE= without epicarp, CE= with epicarp.



The length of fruits without the presence of the epicarp did not provide difference in Dickson's quality index, however, seedlings with a size of 42 mm with the presence of bark in the seeds obtained better average values in Dickson's quality index, agreeing with Fonseca (1979), working*(Eucalyptus grandis),*found that larger seeds provided higher growth in height and stem diameter, as well as higher dry matter production, leaf area and chlorophyll content (Figure 7).

Figure 7. Dickson quality index (DQI) in oiticica fruits with and without bark with different fruit lengths.

Plants	Length of fruit, peeled		Medium
	35 mm	42 mm	
1	0,06	0,07	0.07 to
2	0,06	0,08	0.07 to
3	0,08	0,07	0.07 to
4	0,08	0,10	0.09 a
5	0,08	0,06	0.07 to
Medium	0.07 A	0.08 A	
Cv	35,13		
Plants	Length of fruit, with peel		Medium
	35 mm	42 mm	
1	0,05	0,07	0.06 a
2	0,05	0,05	0.05 to
3	0,04	0,05	0.05 to
4	0,05	0,07	0.06 a
5	0,04	0,05	0.02 a
Medium	0.05 B	0.06 A	-
Cv	27,20		

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

4 CONCLUSION

Oiticica seeds with 42 mm provides better result in the kaolin diameter of seedlings regardless of the presence of epicarp. Fourteen days after emergence, it is observed that seedlings present superior development, due to the advance in phenological stages of the species.

Chlorophyll indices do not suffer much influence with fruit length, however, total chlorophyll increases at fourteen days after emergence.

Dickson's quality index is not influenced by fruit length. However, oiticica seedlings with epicarp and length of 42 mm improve their performance in relation to those produced without epicarp.

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