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VIABILITY OF *CHLOROLEUCON DUMOSUM* (BENTH) (FABACEAE) SEEDS UNDER DIFFERENT STORAGE CONDITIONS

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ABSTRACT

Chloroleucon dumosum (Benth) G.P. Lewis (Leguminosae-Mimosa (Currently Caesalpinioideae) - Ingeae) is a deciduous species, occurring in the Caatinga, in general fields and forests that form corridors along rivers and wetlands. It is usually called arapiraca, mahogany or white jurema. A large part of the projects aimed at the conservation and exploitation of native forest species depend on the formation of seedlings. Thus, the renewal of vegetation and the recovery of degraded areas, as well as the establishment of germplasm banks, are based on the collection and storage techniques of seeds. Based on this, the work aimed to monitor the physiological quality of *C. dumosum* seeds as a function of different packaging and storage conditions. The experiments were conducted at the Plant Propagation Laboratory of the Agricultural Engineering and Sciences Campus (CECA) of the Federal University of Alagoas (UFAL), located in the municipality of Rio Largo, Alagoas, Brazil. The seeds were placed in two types of packaging (permeable and impermeable) where they were stored under different conditions of humidity and temperature (normal environment and dry chamber) for eight months. Seeds placed in glass containers in the dry chamber maintained considerable physiological quality.

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INTRODUCTION

Chloroleucon dumosum (Benth) G.P. Lewis (Leguminosae-Mimosa (Currently Caesalpinioideae) - Ingeae) (APNE/CNIP, 2017) is a deciduous species, occurring in the Caatinga, in general grasslands and forests that form corridors along rivers and wetlands. It is usually called arapiraca, mahogany or white jurema (SOUZA FILHO et al., 2007). It is found in the states of Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe, Distrito Federal, Minas Gerais and Rio de Janeiro (IGANCI, 2015) and is used in restoration projects due to its rapid growth and rusticity. For the production of *C. dumosum* seedlings, researches were carried out in seed technology and growth analysis, however, studies on the storage of its seeds are scarce and, especially, regarding the influence of packaging.

A large part of the projects aimed at the conservation and exploitation of native forest species depend on the formation of seedlings. Thus, the renewal of vegetation and the recovery of degraded areas, as well as the establishment of germplasm banks, are based on the collection and storage techniques of seeds (NERY, 2006). The propagation of forest species occurs mainly through seeds and several studies have been carried out in recent years on the technology of seeds of forest species native to Brazil, due to the growing need for rehabilitation of forest ecosystems and germplasm conservation (GUGÉ et al., 2019). However, given the great diversity of species in the forests of Brazil, information regarding the physiological behavior of these seeds during storage is still deficient. Storage begins at physiological maturity and the biggest challenge is to ensure that the seeds, over time, still have a high physiological potential.

Therefore, the objective is to maintain the quality of seeds during the period in which they are stored, as their improvement is not possible, even under ideal conditions (CARVALHO and NAKAGAWA, 2012, OLVIERA et al. 2012). According to Braga et al. (2021) the longevity of seeds varies according to the genotype, but the period of conservation of the physiological potential depends, to a great extent, on the degree of moisture, temperature and conditions of the storage environment. According to Morais et al. (2009) seed storage is of fundamental importance in the conservation of genetic resources through germplasm banks and has been one of the most important lines of research for the conservation of a large number of species. Therefore, the aim of this work was to monitor the physiological quality of *Chloroleucon dumosum* (Benth) seeds as a function of different packaging and storage conditions.

MATERIAL AND METHODS

The project was carried out at the Plant Propagation Laboratory belonging to the Engineering and Agricultural Sciences Campus of the Federal University of Alagoas. *Chloroleucon dumosum* seeds were collected from mature fruits of trees belonging to small forest fragments located in Alagoas. After harvesting, the seeds were manually extracted from the fruits and cleaned. The determination of the initial moisture content of the seeds was carried out using the oven method at a temperature of 105 ± 3ºC, according to the procedure adopted by the Rules for Seed Analysis (BRASIL, 2009). Before carrying out the germination and vigor tests, the seeds underwent a pre-germinative treatment, which consists of pruning on the opposite side of the micropyle with the aid of a nail clipper (MELO, 2011). Afterwards, asepsis was performed, where they were immersed in a 2% (v/v) sodium hypochlorite solution for 10 minutes and then in 70% alcohol (v/v) for one minute and then washed in distilled water. The newly harvested seeds were placed in two types of packaging (permeable and impermeable) where they were stored in different conditions of humidity and temperature (normal and refrigerated environment). At bimonthly intervals, the stored seeds were intended to determine the moisture content and the following variables:

Percentage (GER) and germination speed index (IVG): The counting of the number of germinated seeds, in all evaluations, was performed daily for fifteen days, duration of the experiment, being considered germinated the seeds that originated normal seedlings with all the perfect essential structures. Therefore, at the end of each test, the percentage (a) and speed (b) of germination were calculated according to Labouriau and Valadares (1976) and Maguire (1962), respectively.

a) G(%) = N/A x 100, where N = Number of germinated seeds and A = total number of seeds placed to germinate.
b) IVG = G1/N1 + G2/N2 + ... + Gn/Nn, where IVG = germination speed index, G1, G2 and Gn = number of germinated seeds computed in the first, second and last count and N1, N2 and Nn = number of days from sowing to the first, second and last count.

First germination count (PCG): The counts were carried out in conjunction with the germination test, computing normal seedlings from the first germination test count performed on the fourth day after the installation of the test. The results were obtained by the arithmetic mean of the four subsamples and expressed as a percentage. Seedling length (COMP): At the end of the germination test, the normal seedlings of each repetition were measured with the aid of a graduated ruler and the results expressed in centimeters per seedling.
Seedling dry mass (DM): After the end of the germination test, the normal seedlings of each repetition were placed in “Kraft” paper bags, then placed in a forced ventilation oven at 80 ºC, for a period of 24 hours. After this time, the samples were placed in desiccators with activated silica gel and weighed on an analytical balance with a precision of 0.0001g, and the result expressed in g/seedlings (NAKAWAGA, 1999).

All statistical analyzes were performed using SISVAR version 5.6 (FERREIRA, 2011). The data obtained were submitted to analysis of variance and polynomial regression, using equations whose coefficients of determination (R^2) were higher.

RESULTS AND DISCUSSION

Chloroleucon dumosum (Benth) seeds were stored with an initial moisture content of 13.27%, however variations in this value were observed throughout the storage period (Figure 1A and B). The packaging of the seeds in glass packaging, in the studied environments, provided less fluctuations in the degree of moisture of the seeds. Probably, because it is a package impermeable to the exchange of water vapor, preventing the establishment of a balance between the moisture of the seed and the environment, the water contents of the stored seeds were close to those of the newly harvested ones (13, 38%) (Figure 1A). However, when C. dumosum seeds were stored in paper bags, fluctuations in the degree of moisture were greater, especially under normal laboratory conditions, where there was no control of air temperature and humidity. In this environment, it was possible to observe a decrease of more than 1.5% in the degree of seed moisture in the second month, and from the fourth month, seed moisture increased from 11.17 to 14.77%. Ending the experiment with 15.20% humidity in the eighth month (Figure 1B). This gain in humidity is probably explained by the beginning of a rainy period, that is, wetter, leading to an increase in the relative humidity of the air.

Melo (2017) and Vilella and Peres (2004) report that a likely explanation for the variations in the degree of moisture of seeds in this environment is the permeability of the packaging combined with the absence of temperature and relative humidity control, which can cause cracks in the seed coat due to moisture fluctuations and excessive drying, affecting the capacity to regulate water exchange in the seed, in addition to facilitating the penetration of microorganisms.
The storage potential of seeds is directly associated with their initial quality and storage conditions, so that increases in the moisture content of seeds above a certain critical percentage accelerates the deterioration process, affecting their longevity (CARVALHO and NAKAGAWA , 2012). For the variables first germination count (%), germination (%) and germination speed index, it was observed that there was a difference between the packages used, in terms of permeability to water vapor exchanges, in the dry and dry chamber environments. uncontrolled conditions, with data fitting to the linear equation model (Figures 2 A, B, C, D, E and F). In these environments, germination values were kept above 72% until the first four months of storage. However, from the fourth month onwards, the germination percentage was reduced until reaching minimum values of 76 (glass) and 68% (paper), when stored in a dry chamber, and 70 (glass) and 60% (paper) in uncontrolled conditions (Figures 2B and E). However, regardless of the packaging used, seed storage under uncontrolled conditions reduced germination percentage when compared to controlled conditions. Melo (2017) working with seeds of *Mimosa bimucronata* (DC) O. Kuntze and Melo Junior (2019) with seeds of *Colubrina glandulosa* Perkins reached similar results using the same conditions. The greatest decreases in germination performance were observed when paper packaging was used under uncontrolled conditions, with germination reduction from 95 to 60% and IVG reduction from 5.98 to 3.01 in the eighth month of storage, while in packaging of glass, the minimum values were 68% and 3.99 for germination and IVG, respectively (Figures 2 E and F). As for *C. dumosum* seeds, Melo (2017) found less vigor reduction during storage of *Mimosa bimucrona* (DC) O. Kuntze seeds kept under controlled conditions, when compared to those previously stored in the laboratory (natural conditions). Borba-Filho and Perez (2009) also verified the loss of seed viability of *Tabebuia roseo-alba* (Ridl.) Sand. and *Tabebuia impetiginosa* (Mart.) Standl stored in a laboratory environment. In view of these results, the seeds of C. *dumosum* stored in a dry chamber, where there is greater control over variations in temperature and relative humidity of the air, preserved the percentage and speed of germination for a longer storage time, probably because

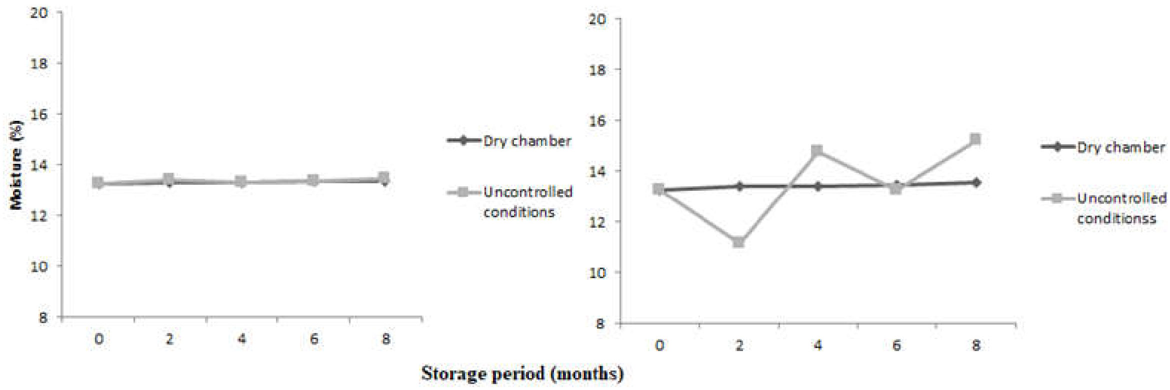

Figure 1. Moisture level (%) of Chloroleucon dumosum (Benth) seeds packed in glass (A) and paper (B) containers and stored in different environments

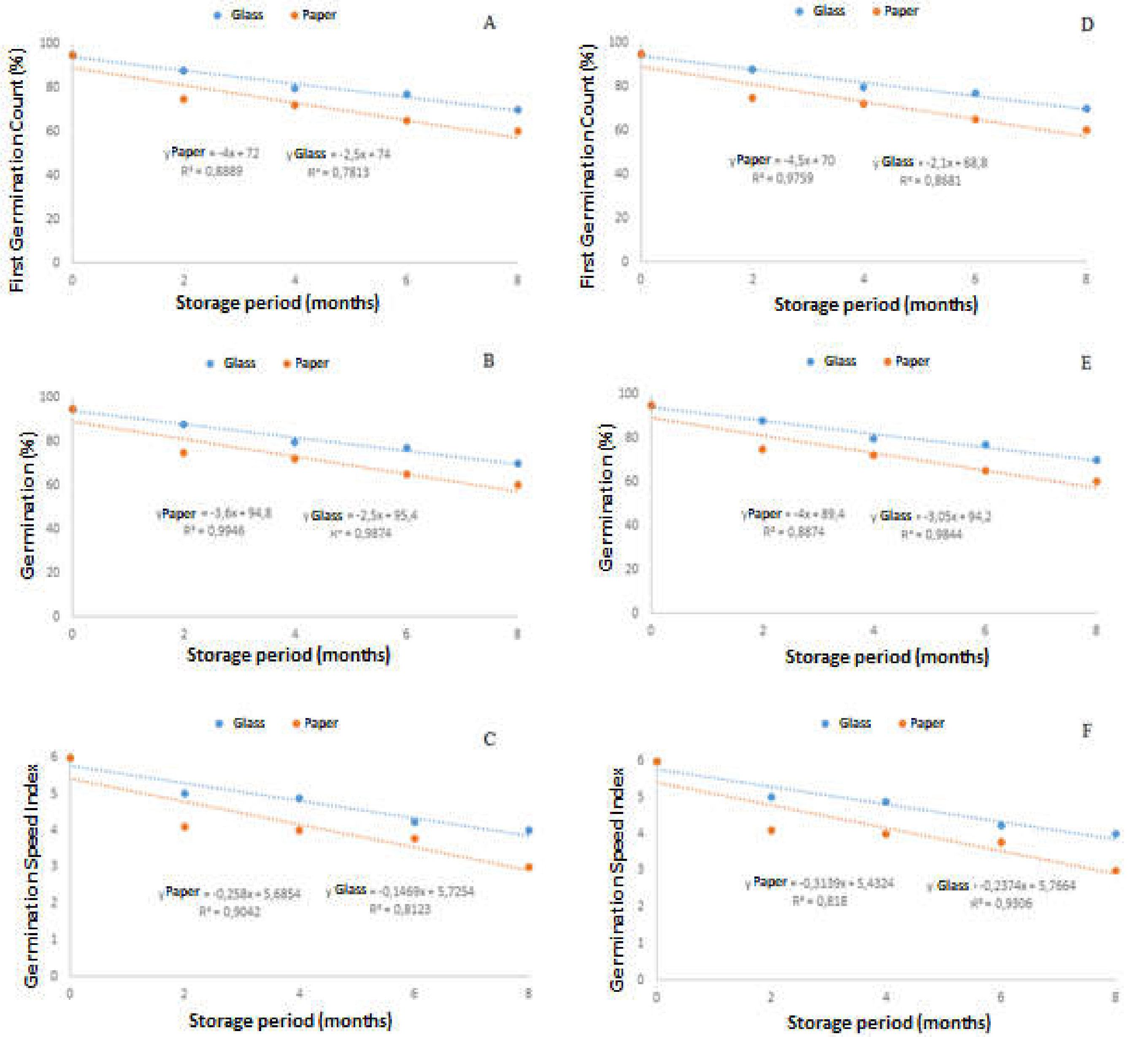

Figure 2. First count (%), germination (%) and germination speed index (IVG) of newly harvested *Chloroleucon dumosum* (Benth) seeds after storage in glass and paper containers, and two environments: dry chamber (A, B and C) and uncontrolled conditions (D, E and F)

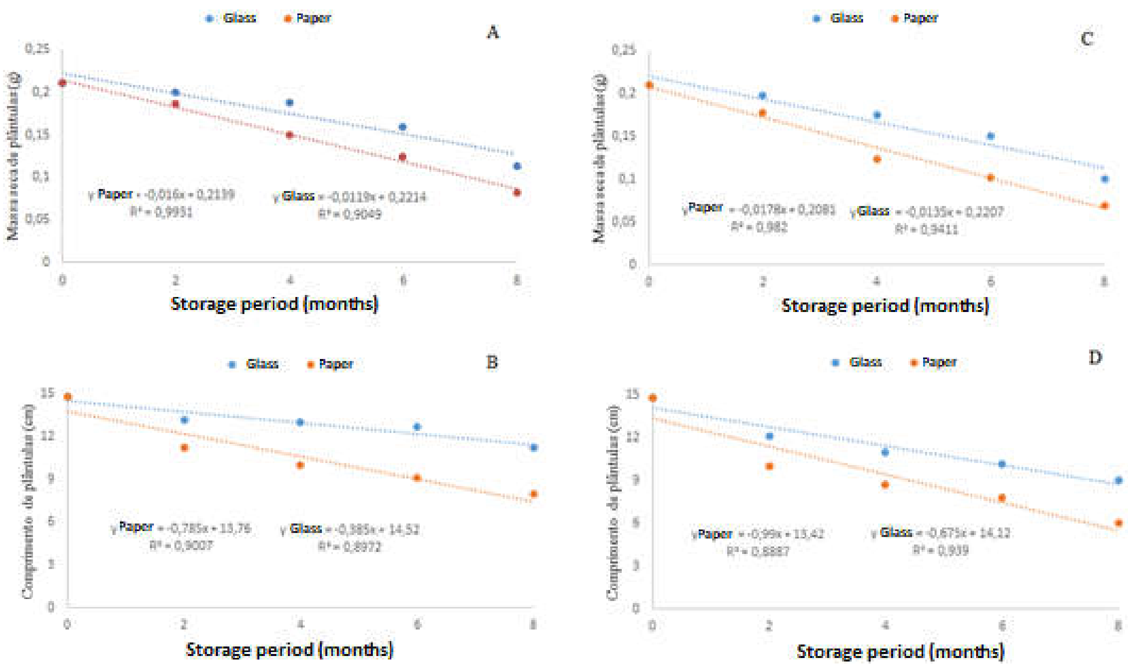

Figure 3. Length (cm) and dry mass of seedlings (g) from newly harvested Chloroleucon dumosum (Benth) seeds and after storage in glass and paper containers, and two environments: dry chamber (A and B) and conditions not controlled (C and D)

in this environment due to a reduction in respiratory activity, leading to a lower consumption of reserves to maintain seed viability. However, when stored in an uncontrolled environment, the seed germination potential decreased as the storage time was prolonged. As for the results of length (cm) and seedling dry mass (g) of C. dumosum, it was possible to observe that seeds stored under controlled conditions (dry chamber) produced more vigorous seedlings during the eight months of storage, when stored in containers of glass (Figures 3 A, B, C and D). More vigorous seeds originate seedlings with a high growth rate, due to their greater capacity to translocate their reserves and their greater assimilation by the embryonic axis (MELO JUNIOR, 2019). As for the germination percentage, the environment under uncontrolled conditions negatively affected the growth of *C. dumosum* seedlings throughout the storage period in both packages, with a linear reduction in length, as well as in dry mass accumulation of the seedlings.

CONCLUSION

Chloroleucon dumosum (Benth) seeds stored in glass containers in the dry chamber maintained considerable physiological quality.

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