# GERMINATION POTENTIAL OF CERRADO NATIVE SPECIES AS AFFECTED BY CULTIVATION ENVIRONMENT

Flávia Marques de Brito[1], Milena Rodrigues Luz[1], Luan dos Santos Silva[2], Séfora Gil Gomes de Farias[2], Rafael de Souza Miranda[2]

## INTRODUCTION

The Cerrado biome has been attracting countless farmers for decades, especially in the state of Piauí, due to the high environmental heterogeneity and richness of endemic species in the fauna and flora. The high conversion rate of the areas covered by native forest to areas of agropastoral production has generated problems related to the environmental impacts resulting from the inappropriate use of the land. In the years from 2002 to 2009, the deforestation rate in the Cerrado of Piauí was 14.49%, mainly due to the advance of agricultural activity in legal reserves, Permanent Preservation Areas (PPAs) and other portions of restricted use (ROCHA et al., 2011).

Reforestation emerges as a determining activity for reestablishing the agroecological system. Specifically, among forest species with potential for reforestation for Brazilian semiarid region, with relative adaptation to the different annual climatic conditions, stand out: *Handroanthus impetiginosus* (Mart. ex DC.) Mattos (ipê-roxo), *Hymenaea courbaril* L. (jatobá), *Parkia platycephala* Benth. (faveira), *Albizia niopoides* (Spruce ex Benth.) Burkart. (angio-branco), among others (AFONSO et al., 2017; OLIVEIRA 2018).

Considering the high mortality of seedlings of native species after transplantation, it is necessary to improve production techniques, in order to facilitate adaptation in the field, providing cost reduction and success in the establishment of seedlings in the restoration areas (BARBOSA, RODRIGUES and COUTO, 2013). In order to mitigate seedling mortality, studies aiming to identify species with rusticity characteristics and with high tolerance to the edaphoclimatic conditions found in the place where the seedlings were established in the field have been increasing (LIMA et al., 2014).

In view of the above, the present study aimed to evaluate the germinative potential of native forest species in south of Piauí in different cultivation environments, to identify and characterize species with high development potential in reforestation areas, especially for the Cerrado Piauiense.

## MATERIAL AND METHODS

The experiments were carried out in a forest nursery with 50% shading and in a germination chamber (Biochemical Oxigen Demand - BOD), both belonging to the Federal University of Piauí, Campus Professora Cinobelina Elvas, in Bom Jesus, Piauí.

The seed lots for the four species were collected between October and November 2020, in the following cities of Brazilian Northeastern: Colônia do Gurguéia - Piauí (Latitude: 8°10'57" South; Longitude: 43°47'32" West; Altitude: 233 m), Bom Jesus - Piauí (Latitude: 9°4'30" South; Longitude: 44°21'26" West; Altitude: 273 m) and Formosa do Rio Preto - Bahia (Latitude: 11° 2'19" South, Longitude: 45°10'43" West, Altitude: 498 m). The seeds were stored in individual packages between 4 and 8 ºC, in order to prevent damage during transportation. The storage of jatobá seeds was carried out in Kraft paper bags; while the seeds of angico-branco, faveira and ipê-roxo were packed in plastic polyethylene bags.

During the sown, all seeds were treated with 2% sodium hypochlorite solution, to overcome the seed coat numbness of angico-branco and faveira, the process of mechanical

[1]Forest Engineering Course, Campus Professora Cinobelina Elvas, Federal University of Piauí, 64.900-000, Bom Jesus - PI, Brazil
[2]Graduate Program in Agricultural Sciences, Campus Professora Cinobelina Elvas, Federal University of Piauí, 64.900-000, Bom Jesus - PI, Brazil

scarification of the seeds was performed with sandpaper number 80 on the side affixed to the micropyle, as described by Freire, Ataíde and Rouws (2016) and Nascimento et al. (2009). The jatobá seeds were submitted to chemical treatment with 50 mL of sulfuric acid diluted in 80% of water for 10 min of immersion.

BOD germination test

In the BOD germination test, the seeds were distributed on sheets of germitest paper moistened with an amount of distilled water equivalent to 2.5 weight of dry paper, totaling 25 seeds with four repetitions, totaling 100 for each species. The seeds of jatobá, faveira and angico-branco were stored in BOD with a photoperiod of 12 h and temperature of 25 °C, as proposed by Souza, Segato (2016), Silva et al. (2017) and Duarte et al. (2015), whereas the ipê-roxo seeds were packaged with a photoperiod of 8 h and a temperature of 30 °C, as recommended by Oliveira et al. (2005).

Germination test in Forest Nursery

In tests involving the forest nursery, sowing was carried out in 120 $cm^3$ tubes. Altogether, 4 trays with a capacity of 176 tubes each were used. In this phase, the tubes were filled with commercial substrate Carolina Soil, moistened according to the manufacturer's recommendations, and one seed per tube was grown at a depth of 1 cm. The trays containing the tubes were placed in the forest nursery, with irrigation four times a day for 30 min.

Parameters analyzed in both cultivation environments

All experiments were daily analyzed, in order to register the germination percentage (%G), speed of germination-aid (SpG), average germination time (AGT) and seedling fracture (SF) were recorded, as described in Carvalho and Carvalho (2009). The first three variables were measured by measuring with a graduated ruler and the last variable was measured by observing the number of seedlings that break.

## RESULTS AND DISCUSSION

From the results obtained in BOD, ipê-roxo plants had the lowest germination percentage values (%G), which was directly associated with the lowest germination speed index (GSI), compared to the other species analyzed (Figures 1). This phenomenon resulted in the highest average germination time (AGT) values (Figure 2A). However, the data suggest that ipê seedlings proved to be more resistant to germination conditions in BOD, as they presented little or no fracture in their constituent organs (leaves or roots) when compared to parkia seedlings, angico-branco and jatobá (Figure 2B).

The %G was similar between the faveira, angico-branco and jatobá species (Figure 1A). Even so, the seedlings of jatobá had the lowest GSI indices and the highest AGT in relation to and angico-branco (Figure 1B and Figure 2A). The last two species stood out for starting germination on the 3rd and 4th day, respectively (Figure 1B). In addition, the species seem to be highly sensitive during seedling establishment in BOD, with the highest fracture records among all studied species (Figure 2B).

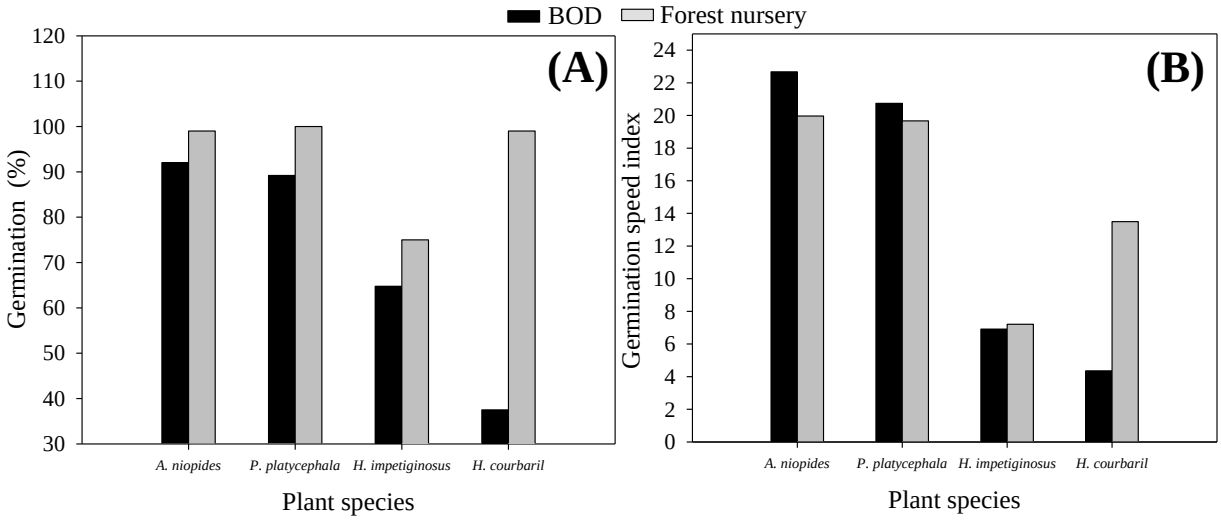


Figure 1 - Germination percentage and germination speed index (GSI) in forest species from the Cerrado under BOD and nursery conditions. *A. niopoides* (angico-branco), *P. platycephala* (faveira), *H. impetiginosus* (ipê-roxo), *H. courbaril* (jatobá).

In relation to the germination test in the nursery, the values of %G and GSI, in decreasing order, were higher in the species angico-branco and faveira, followed by purple ipê-roxo and, finally, jatobá (Figure 1). Such factors can also be a result of the external environmental conditions being even more favorable to these species, providing conditions for the germination of seeds in a satisfactory way. The values were inverted for the AGT, which were more accentuated in the species jatobá and ipê-roxo, respectively, due to the longer time for the germination process (Figure 2A).

By comparing the performance of all species in the different environments, the data clearly evidence that the seedlings germinated in BOD grew faster, most likely due to the etiolation in order to find light intensity. In an uncontrolled external environment, a nursery, there was an abundance of pathogens such as herbivores, in addition to fungi, due to the excess of humidity, especially for jatobá seedlings.

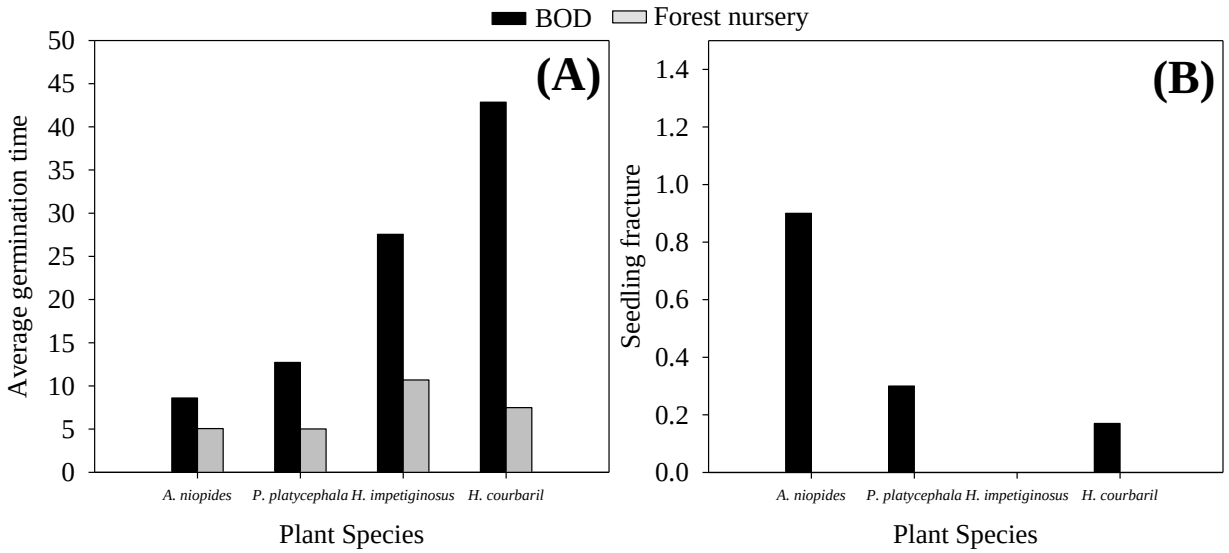


Figure 2 - Average germination time and seedling fracture forest species from the Cerrado under BOD and nursery conditions. *A. niopoides* (angico-branco), *P. platycephala* (faveira), *H. impetiginosus* (ipê-roxo), *H. courbaril* (jatobá).

Regarding the occurrence of seedling fractures, the rate was even more accentuated in BOD, unlike the nursery, due to the position and conditions which were imposed, the substrate (germitest paper), especially for eedlings, making it impossible to continue germination test in BOD after 13 days. Thus, transplanting the seedlings to tubes is even more feasible in an occurrence prior to the 13th day of germination in BOD.

It was also possible to verify that there were marked differences in %G, GSI and AGT indexes in both BOD and nursery, in which the seedlings germinated in BOD obtained the best indexes. When the seedlings were germinated in a nursery, the AGT indices of the jatobá were higher than those of other species, different from what occurred for germination in BOD (Figure 2A). Such delay probably occurred due to the controlled conditions of the laboratory, which allows a faster germination, unlike the environmental conditions of the nursery with uncontrolled conditions.

## CONCLUSION

- BOD germination chamber allows greater germination potential for faveira, angico-branco, ipê-roxo and jatobá species, with a greater %G and GSI of germinated seeds;
- Germination potential of the jatobá is reduced under nursery environment;
- Ipê-roxo seeds display low germinative potential as compared to other studied species, for all investigated environments.

## REFERENCES

AFONSO, M.; MARTINAZZO, E.G.; AUMONDE, T.Z.; VILLELA, F.A. Parâmetros fisiológicos de mudas de *Albizia niopoides* produzidas em diferentes composições de substrato. **Revista Ciência Florestal**, v. 27, n. 4, p. 1395-1402, 2017.

BARBOSA, T.C.; RODRIGUES, R.R.; COUTO, H.T.Z. Tamanhos de recipientes e o uso de hidrogel no estabelecimento de mudas de espécies florestais nativas. **Hoehnea**, [S.l.], v. 40, n. 3, p. 537-556, 2013.

CARVALHO, R.I.N.; CARVALHO, D.B. Qualidade fisiológica de sementes de guanxuma em influência do envelhecimento acelerado e da luz. **Acta Scientiarum. Agronomy**, [S.l.], v. 31, n. 3, p. 489-494, 25 jun. 2009.

DUARTE, M.M; MILANI, J.E.D.F.; BLUM, C.T., NOGUEIRA, A.C. Germinação e morfologia de sementes e plântulas de *Albizia edwallii* (Hoehne) Barneby & J. W. Grimes. **Revista Caatinga**, v. 28, n. 3, p. 166-173, 2015.

FREIRE, J.M; ATAÍDE, D.H. dos Santos; ROUWS, J.R.C. Superação de Dormência de Sementes de Albizia pedicellaris (DC.) L. Rico. **Floresta e Ambiente**, [S.l.], v. 23, n. 2, p. 251-257, 1 abr. 2016

LIMA, P.R.; HORBACH, M.A.; DRANSKI, J.A.L.; ECCO, M.; MALAVASI, M.D.M.; MALAVASI, U.C. Avaliação Morfofisiológica em Mudas de *Handroanthus impetiginosus* (Mart. ex DC.) Mattos Durante a Rustificação. **Floresta e Ambiente**, Marechal Candido Rondon, v. 3, n. 23, p. 316-326, 2014.

NASCIMENTO, I.L.D.; ALVES, E.U., BRUNO, R.D.L.A.; GONÇALVES, E.P.; COLARES, P.N.Q.; MEDEIROS, M.S.D. Superação da dormência em sementes de faveira (*Parkia platycephala* benth). **Revista Árvore**, Viçosa MG, v.33, n.1, p.35-45, 2009.

OLIVEIRA, E. Desenvolvimento inicial de mudas de *Handroanthus impetiginosus* (mart. ex d.c.) mattos) (ipê roxo), em diferentes substratos. **Dissertação** de mestrado. Universidade Federal do Acre, 2018.

OLIVEIRA, L.M.D., CARVALHO, M.L.M.D.; SILVA, T.T.D.A.; BORGES, D.I. Temperatura e regime de luz na germinação de sementes de *Tabebuia impetiginosa* (Martius ex A. P. de Candolle) Standley e *T. serratifolia* Vahl Nich. - Bignoniaceae. **Ciência e Agrotecnologia**, [S.l.], v. 29, n. 3, p. 642-648, 2005.

ROCHA, G.F.; FERREIRA, L.G.; FERREIRA, N.C.; FERREIRA, M.E. Detecção de desmatamentos no bioma cerrado entre 2002 e 2009: Padrões, tendências e impactos. **Revista Brasileira de Cartografia**, v. 63, n. 3, p. 341-349, 2011.

SILVA, R.B.; MATOS, V.P.; FARIAS, S.G.G.D.; SENA, L.H.D.M.; SILVA, D.Y.B.D.O. Germinação e vigor de plântulas de *Parkia platycephala* Benth. em diferentes substratos e temperaturas. **Revista Ciência Agronômica**, v. 48, n. 1, p. 142-150, 2017.

SOUZA, V.M.S; SEGATO, S.V. Dormancy Break in Jatoba (Hymenaea courbaril L.) SEEDS. **Nucleus**, [S.l.], v. 13, n. 1, p. 71-80, 30 abr. 2016.

SILVA, R.B.; MATOS, V.P.; FARIAS, S.G.G.D.; SENA, L.H.D.M.; SILVA, D.Y.B.D.O. Germinação e vigor de plântulas de Parkia platycephala Benth. em diferentes substratos e temperaturas. **Revista Ciência Agronômica**, v. 48, n. 1, p. 142-150, 2017.

DUARTE, M.M; MILANI, J.E.D.F.; BLUM, C.T., NOGUEIRA, A.C. Germinação e morfologia de sementes e plântulas de *Albizia edwallii* (Hoehne) Barneby & J. W. Grimes. **Revista Caatinga**, v. 28, n. 3, p. 166-173, 2015.