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CIÊNCIA e NATURA

ISSN 2179-460X
OPEN ACCESS

Ci. e Nat., Santa Maria, e86813, v. 47, 2025 • https://doi.org/10.5902/2179460X86813
Submitted: 24/02/2024 • Approved: 10/04/2025 • Published: 29/04/2025

Biology-Botany

Emergence of *Mouriri guianensis* Aubl as a function of different pre-germination treatments

Emergência de *Mouriri guianensis* Aubl em função de diferentes tratamentos pré-germinativos

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ABSTRACT

Mouriri guianensis Aubl., of the Melastomataceae family, occurs in a wide variety of vegetation types in Brazil. In the Pantanal, it is known as Roncador and has medicinal and food importance. We aim is to evaluate different types of treatments for breaking dormancy. The seeds were divided into six treatments for the germination tests: removal of the seed coat (T1), scarification of the seeds (T2), immersion in water for 12 hours (T3), immersion in water for 48 hours (T4), immersion in water for 288 hours (T5), and control (T6). The percentage of emergency (%E) and mean emergency time (MET) were evaluated. Of the treatments that obtained the highest percentage of emergency was T1 with 63%, T5 with 44% followed by T6, T3, T4, and T2 with (35%, 29%, 27% and 24%), respectively. The treatment that achieved the highest percentage of emergency was the one in which the seeds had their tegument removed, thus allowing for greater water soaking and gas exchange, thus enabling the highest rate of seedling emergence in a shorter period of time. In recent decades, the Pantanal biome has suffered different types of pressure, both natural and anthropogenic. Conservation measures such as increasing forest areas are therefore necessary, with the planting of seedlings using species from the region. The use of treatments that induce the germination of dormant plants is a viable way of producing seedlings that can propagate quickly and reforest strategic locations in this biome.

Keywords: Wetlands; Restoration, Native species; Seed dormancy

RESUMO

Mouriri guianensis Aubl, da família Melastomataceae, ocorre nos mais diversos tipos de vegetação no Brasil. No Pantanal é conhecido como Roncador e possui importância medicinal e alimentícia. Temos como objetivo avaliar diferentes tipos de tratamentos para quebra de dormência. As sementes foram divididas para os testes germinativos em seis tratamentos, sendo retirada do tegumento (T1), escarificação das sementes (T2), imersão em água por 12 horas (T3), imersão em água por 48 horas (T4), imersão em água por 288 horas (T5) e controle (T6). Avaliou-se a porcentagem de emergência (% E) e o tempo médio de emergência (TME). Dos tratamentos que obteve maior porcentagem de emergência foi o T1 com 63%, T5 com 44% seguido por T6, T3, T4 e T2 com (35%, 29%, 27% e 24%) respectivamente. O tratamento que obteve o maior percentual de emergência foi o que as sementes tiveram o tegumento retirado, permitindo assim maior embebição por água e realizando as trocas gasosas possibilitando desta forma a maior taxa de emergência das plântulas em um período menor de tempo. Nas últimas décadas o bioma Pantanal tem sofrido diferentes tipos de pressões sejam de ordem naturais ou antrópicas, desta maneira medida de conservação como aumento das áreas florestais torna-se necessário com plantio de mudas usando espécies da região, com isso o uso de tratamentos que induz a germinação de plantas que aprestam dormência é uma saída viável para produção de mudas e que possam propagar rapidamente, podendo reflorestar locais estratégicos nesse bioma.

Palavras-chave: Áreas úmidas; Restauração; Espécies nativas; Dormência de sementes

1 INTRODUCTION

Among the various Pantanal species that need attention in Ecological Restoration, *Mouriri guianensis* Aubl, also known in the Pantanal region as Roncador, belongs to the Melastomataceae family, and is characteristic of flooded environments, Pott and Pott (1994) describe the presence of *M. guianensis*. In the Amazon, it occurs in flooded forests and the Atlantic coast in dunes and sandbanks from Amapá to Rio de Janeiro (Lorenzi, 2009). popularly known in the Pantanal region as Roncador and in other regions as Gurguri, Murriri, Ururi, Goiabarana.

It is a medium-sized native tree species, 4-9 m high, with a rounded, dense and low canopy almost touching the branches to the ground, its trunk covered in suberect, longitudinally fissured brownish bark and simple, opposite leaves with a very short petiole, flowering phenology between September and February and its fruit ripening from December to April. The species' fruiting peaks during the dry and flood seasons, with yellowish berries when ripe. (Macedo, Ferreira & Da Silva, 2000; Lorenzi, 2009).

The fruit has little flesh, but is edible and has twice as much vitamin C as the lemon, (*Citrus limon*), or the orange (*Citrus sinensis*). From an ecological point of view, it is food for birds and fish. Morais and Da Silva (2010) list Roncador among the plants most used by Pantanal fishermen for fishing. Roncador is considered to have medicinal uses among local traditional peoples and communities, for ulcers, postpartum baths and vaginal infections (Pott & Pott, 1994; Oliveira, Santos & Gomes, 2018).

Germination is considered to be the phenomenon in which, under favorable conditions, the embryonic axis continues its germinative development, beginning with soaking and the consequent resumption of metabolic activities paralyzed at the moment of physiological maturity, which had been suspended in orthodox seeds due to physiological maturation (Marcos, 2015). According to Vidal et al. (2000), germination consists of the resumption of the embryo development process and the consequent emergence of the seedling from inside the seed.

Barbosa and Ferreira (2021) state that *M. guianensis* seeds show orthodox behavior, since they withstood desiccation up to a humidity level of 5.3% and storage at this humidity level for three months at a temperature of -18 ºC, remaining viable.

Some plant species have a dormancy mechanism, which is a physiological condition that restricts their germination even under favorable environmental conditions (Kerbauy, 2004; Gianinetti, 2023). The purpose of this dormancy is to guarantee reproductive success, in which germination will only occur under favorable conditions, allowing the species to propagate so that there is no risk of extinction (Santos et al., 2015; Fonseca & Abrel, 2017). Thus, we can classify natural dormancy as primary when the seeds are connected to the plant, and secondary dormancy when the seeds are induced into dormancy even after losing primary dormancy controlled by external conditions and when these become favorable, the seeds begin to germinate (Carvalho & Nakagawa, 2000; Mehalaine; Menasria & Chenchouni, 2023).

Considering that there are few references in the literature about the germination physiology of *M. guianensis*, and because it is a species adapted to the flood and drought periods of the Pantanal region, it is important in the landscape as it is widely distributed in this biome (Ikeda-Castrillon et al. 2011).

In semi-deciduous forests, the species *M. guianensis* showed greater abundance in terms of density, frequency and relative dominance (Morais et al., 2013). In the phytosociological analysis of species in the Pantanal in the region of the Rio Mutum - Baía Sinhá gradient, *M. guianensis* showed the highest importance index, being the dominant species in relation to the other species studied at the site. It was also found in the floristic survey carried out in areas of polyspecific forests at the Taiamã Ecological Station (Fernandes & Da Silva, 2012; Silva, et al., 2020; Martins et al., 2020).

Considering that *M. guianensis* is an important species for the ecological restoration of degraded areas in the Pantanal, it is essential to know more about the processes related to breaking dormancy and seed germination. The objective of this research was to evaluate the different types of treatments used to break dormancy in the studied species.

2 METHODOLOGY

2.1 Study area

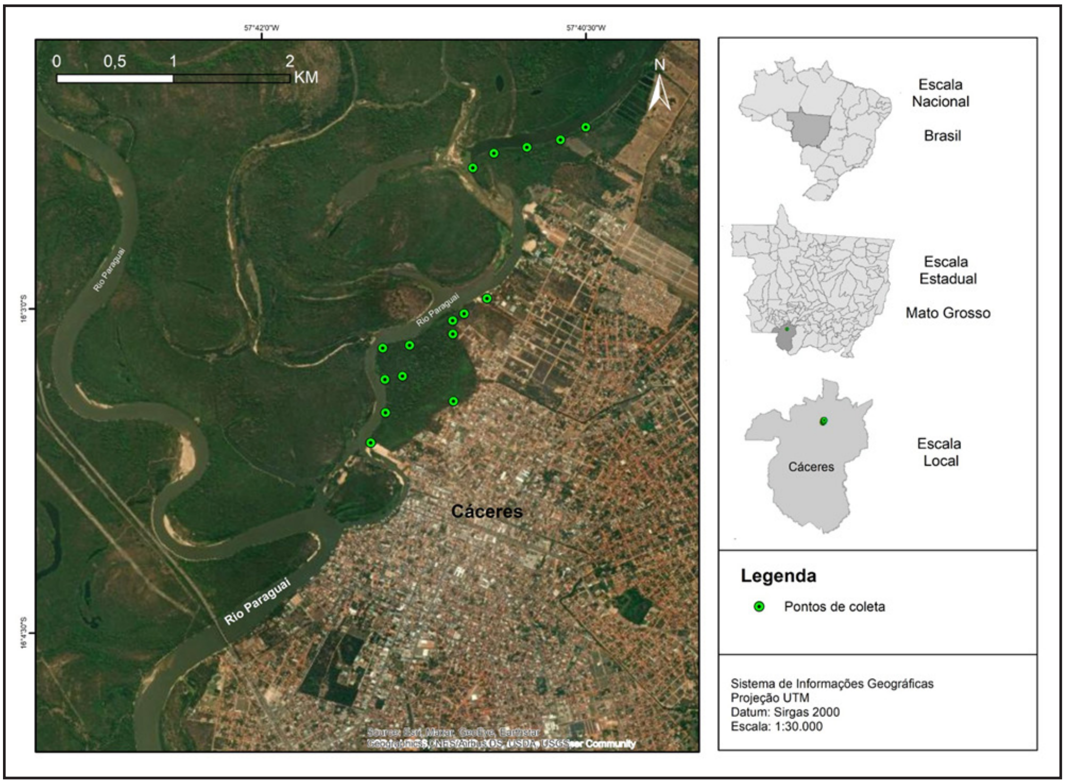
The fruits of *M. guianensis* were collected from different matrices in the forest near the bays (16º03'04.27"S and 57º41'05.22"O) on the urban perimeter of Cáceres-MT (Figure 1). It belongs to the Cáceres Pantanal, which makes up the Pantanal of Mato Grosso, and constitutes one of the sub-regions, which corresponds to approximately 9% of its territorial area, being located in the Upper Paraguay Basin (BAP) in the southwestern region of the state of Mato Grosso (Neves et al., 2009; Galvanin et al., 2018).

The biodiversity of the Pantanal represents a diverse and complex landscape (Miranda et al., 2018). It has pioneer vegetation, which is influenced by the flooding of rivers and bays, forming flooded fields and swamps. And it appears to be a flat savannah, interrupted by gallery forests, swamps, and swamp shrubs (Da Silva & Girard, 2004; Silva, Adon & Pott, 2007).

The fruit was harvested by hand and stored in kraft paper and plastic bags, each mother tree at least 100 meters apart, for a total of 16 mother trees. Nogueira; Medeiros (2007) suggest selecting 1-2 populations and choosing 10-20 mother trees at random in each population, also at least 100 meters apart to avoid kinship. In large populations, genetic diversity is greater than in small ones, because there are more individuals (Basey, Fant & Kramer, 2015).

After the fruit was collected, it was pulped and passed through a sieve with running water to remove the seeds, which were then sorted by hand to ensure homogeneity of size, color and ideal storage conditions.

Figure 1 – *M. guianensis* fruit collection area in the municipality of Cáceres-MT



Source: SIRGAS Datum (2000), adapted by the author

2.2 Method of study

For this study, 600 seeds were used and subjected to six different treatments to break dormancy. 100 seeds were used for each treatment, divided into four replicates of 25 seeds per treatment: the first treatment (T1), consisted of removing the integument, the second treatment (T2), the seeds were scarified, using sandpaper removing the mesocarp until the embryo was visible, the third treatment (T3), the seeds were placed in distilled water for 12 hours, for the fourth treatment (T4), immersed in distilled water for 48 hours, and in the fifth treatment (T5), they also remained immersed in distilled water for 288 hours. Finally, in the sixth treatment (T6), no treatment was applied and this was referred to as the control.

To produce the seedlings, the experiment took place in the Educator nursery of the EDUCARE Laboratory - Education, Ecological Restoration and Agroecology of the State University of Mato Grosso - UNEMAT in Cidade Universitária - Cáceres-MT.

After applying the treatments, the seeds were sown in a sand bed with a depth of 0.05 cm on April 9, 2022. The experiments were irrigated daily by the nursery's automated method, and every two days the experiment was evaluated by observing emergency, which was observed for a period of 214 days.

The percentage of emergency (%E) and mean time to emergency (TME) were evaluated using Excel 2019, and the analysis of variance (ANOVA) and Tukey test were used to compare the means using the BioEstat program.

3 RESULTS AND DISCUSSION

The emergency of *M. guianensis* seedlings was influenced by the pre-germination treatments, where a significant difference ($p<0.05$) was observed according to the Tukey test in the emergency of seeds from treatment T1 (removal of the tegument = 63% emergency) compared to treatment T2 (scarification of the seeds = 24% emergency) according to the Tukey test (figure 2). This result is due to the fact that when the tegument is removed, the seed used absorbs water more quickly, speeding up the process of breaking dormancy compared to that which is scarified.

Evidence also indicated that in the other treatments, there was no significant difference in the percentage of emergency, with T2 (seed scarification) 24%, T3 (water 12 hours) 29%, T4 (water 48 hours) 27%, T5 (immersion in water 288 h) 44% emergency and T6 (control) 35% showing a high degree of dormancy, T6 (control) had a high degree of dormancy, due to the rigid tegument, which, without pre-germination treatment, led to germination of around 35%. However, the reduction was due to the effect of the tegument on the absorption of water by the seeds (Figure 2).

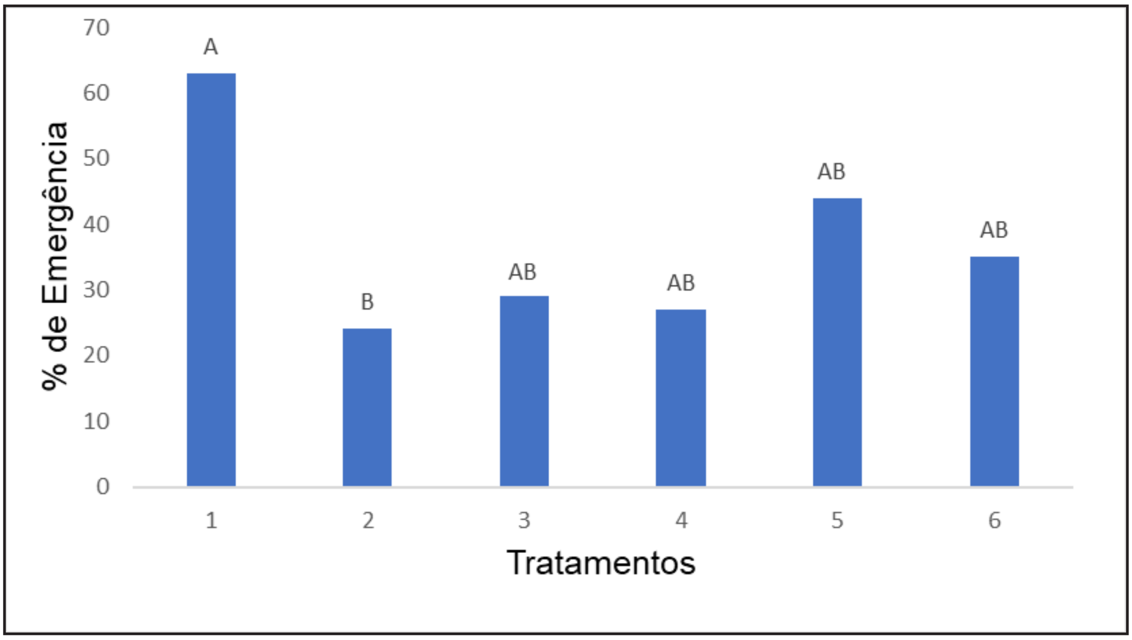
The values obtained with the removal of the seed coat (T1) result in a better percentage of emergency (figure 2) and a shorter average time, which is because the seed already starts the germination process when it absorbs the water (figure 3), as can also be seen in the work of Silva, et al. (2021) with *Pterodon pubescens*, in which the removal of the seed coat and washing in detergent resulted in an emergency rate of 24%. This may be related to the breakdown of the impermeability barrier of the tissues, which is considered one of the most common forms of dormancy in seeds (Cardoso, 2004), so when the tegument is removed there is an increase in water soaking and gas diffusion by the embryo, since the physical barrier that prevented or hindered these processes was removed (Dias; Freire, 2017).

The 288 h water immersion treatment (T5) had the second highest percentage of emergency but no statistically significant difference in relation to the other treatments (figure 2), thus corroborating the results of Vasconcelos, et al. (2010), who obtained germination rates of between 63.25% and 76.75% in seeds pre-soaked in distilled water for 24 and 48 hours from the crown-of-thorns tree (*Mouriri elliptica*), and with Macedo, et al. (2020) from the buriti tree (*Mauritia flexuosa*), with its seeds immersed in water for 7 days, which obtained results of 85% emergency in relation to the other treatments.

This influence of immersing the seeds in water for long periods of time, increasing the emergency rate, can be seen in the work of Fava, Figueiredo and Albuquerque (2011), carried out with *Copernicia alba,* showing that the time the seeds were immersed in running water influenced the percentage and the Emergency Speed Index of the seedlings. Certainly, some substances that inhibited germination were eliminated during the time the seeds were immersed in running water for 24 and 48 hours.

In another study with Copernicia alba, using water immersion for 48 and 72 hours, they obtained a result of 100% emergency in the freshly harvested seeds, compared to the control treatment, thus providing faster germination. (Soares et al., 2022).

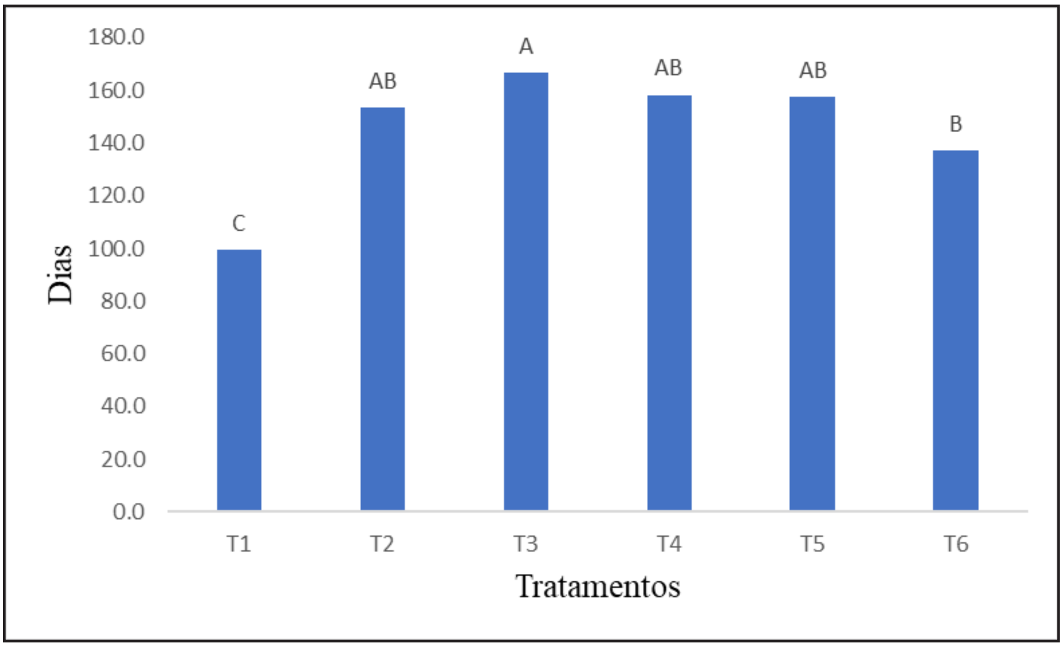
Figure 2 – Percentage emergency of *M. guianensis*



* Averages followed by the same letter in the columns do not differ statistically by the Tukey test ($p<0.05$)
Source: Prepared by the authors (2024)

The average emergency time of the treatments shown in figure 3 is different, with T1 having the lowest value, followed by T6, T2, T4, T5 and T3. The research carried out by De Souza & De Oliveira Gentil (2012) with bacurizinho (*Rheedia brasiliensis*) shows that seeds without a seed coat had the shortest average emergency time (32.7 days) compared to the other treatments in the species studied. Thus, according to Porto et al., (2018), lower values are preferable for evaluating the average seed time, which shows greater uniformity in germination. Since dormancy is greater in newly harvested seeds, even if they are mature, it tends to gradually decrease as they age (Marcos, 2005).

Figure 3 – Average emergency time of *M. guianensis* seeds

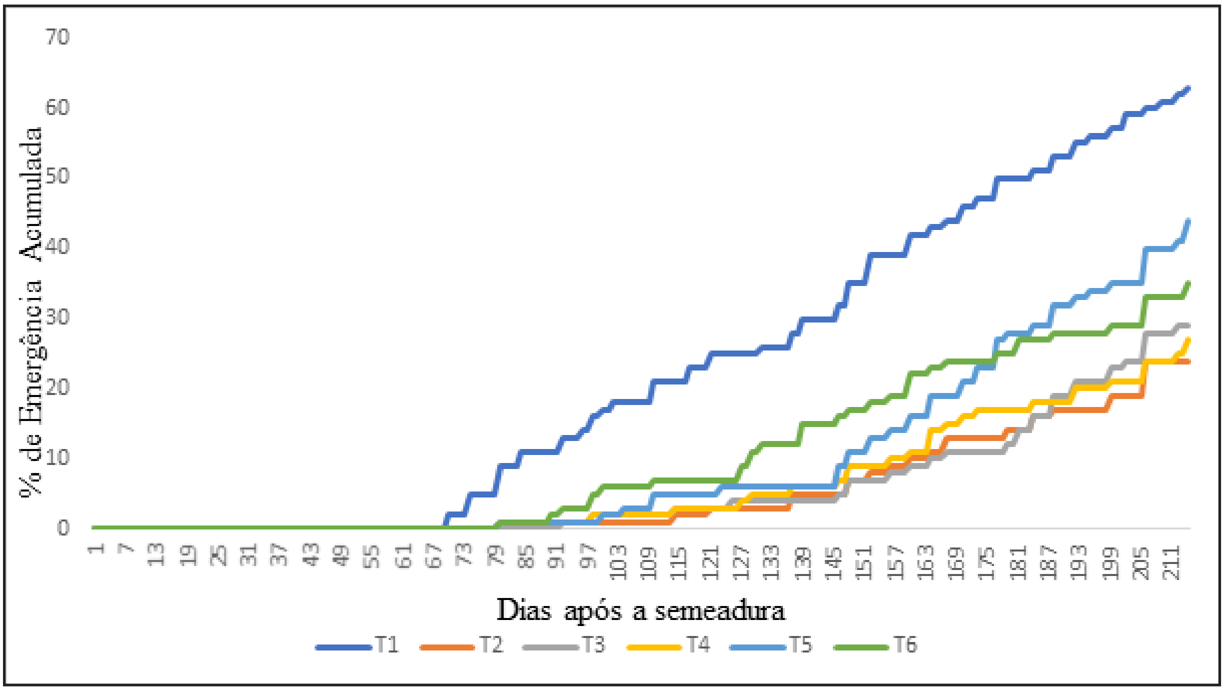


* Averages followed by the same letter in the columns do not differ statistically by the Tukey test ($p<0.05$)
Source: Prepared by the authors (2024)

In the accumulated emergency (figure 4), it can be seen that treatment T1 (removal of the tegument) started at 70 days and obtained the best result, as emergency was established throughout the observation period (dark blue line).

The work done by Rocha et al (2018) with *Garcinia gardneriana* seeds whose pre-germination treatment was the removal of the tegument, the emergency values were 92% in an average of 78 days, contributing to the idea that the removal of the tegument increases the percentage of emergency in less time, because the impermeability of water absorption by the seed is what prevents hydration from starting and consequently restricts the physical processes and basic metabolic reactions of germination (Fowler & Bianchetti, 2000).

Figure 4 – Accumulated emergency of *M. guianensis* submitted to different types of dormancy-breaking treatments



Source: Prepared by the authors (2024)

4 CONCLUSIONS

The emergency of *Mouriri guianensis* Aubl. is influenced by seed dormancy and it is important to apply pre-germination treatments to obtain seedlings.

The removal of the seed coat (treatment T1) showed the best results in seed emergency for the species studied.

The production of seedlings for the recovery of degraded areas, as well as promoting the improvement of local environmental quality by contributing to the dynamics of the Pantanal and its biodiversity, has become increasingly necessary due to the loss of its natural habitat caused by human action.

This study is designed to add to the body of knowledge about the physiological characteristics of Pantanal plant species, as well as contributing to scientific knowledge about conservation and ecological restoration, using local native species with important evolutionary characteristics in the regeneration process.

ACKNOWLEDGMENTS

To the Brazilian Biodiversity Fund.

The GEF Terrestrial - Conservation, Restoration and Management Strategies for the Biodiversity of the Caatinga, Pampa and Pantanal Project.

The Biodiversity Restoration, Water Conservation and Fire Prevention Project for the Pantanal Wetlands - Taiamã Ecological Station.

To the National Council for Scientific and Technological Development (CNPq) for the Junior Post-Doctoral Fellowship (PDJ) awarded to the sixth author.

To the Coordination for the Improvement of Higher Education Personnel (CAPES), awarded to the first author.

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How to quote this article

Silva, E. F., Nunes, J. R. S., Fernandez, J. R. C., Leite, I. L., Morais, F. F., Arruda, J. C., & Castrillon, S. K. I. (2025). Emergence of *Mouriri guianensis* Aubl as a function of different pre-germination treatments. *Ciencia e Natura*, 47, e86813. doi: 10.5902/2179460X86813. Available in: https://doi.org/10.5902/2179460X86813