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Response of Flamboyant seeds (*Delonix regia*) subjected to different dormancy overcoming methods

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Abstract: Flamboyant has great ornamental use, because it has beautiful flowers, having a great use in urban afforestation and park ornamentation. The seeds have a low germination rate because they have dormancy caused by the impermeability of the integument. In this sense, the objective was to determine the most efficient method to overcome dormancy in flamboyant seeds. The experimental design was fully randomized with 4 treatments and 3 replications. The treatments consisted of: 1-Witness (non-scarified seeds); 2- Hot water at 90º C for 5 minutes; 3- Concentrated sulfuric acid 98% for 60 minutes; 4- Mechanical scarification with sandpaper number 80. The characteristics evaluated were: emergency, emergency speed index, seedling height and root length. A significant difference can be observed in the treatments evaluated only for the emergency speed index where the scarification treatment with sandpaper was higher than the others, for the other characteristics evaluated there was no difference
Keywords: *Delonix regia,* breaking dormancy, emergence, silviculture

Introduction

Seed dormancy is a common survival mechanism in a large number of forest species. However, it becomes a disorder when seeds are used in seedling production, because due to the long time necessary for seed germination to occur. The tree species Delonix regia, popularly known as flamboyant, belonging to the Fabaceae family comes from Madagascar, but widely used in Brazil, most likely due to its ornamental value due to its exuberance in flowering (SILVA, 2009), in addition to rapid vegetative development (ARALDI et al., 2011). The propagation of this species is exclusively by seeds (LORENZI et al., 2003).

It has been observed in the seeds of forest species of the Fabaceae family, some difficulties related to seed germination and seedling production. These difficulties have attributed the impermeability of the seed integument to water or oxygen, offering high physical resistance to embryo growth (COSSA et al., 2009). This characteristic of impermeability that causes integumentary numbness is also found in flamboyiant seeds (BOLOGNEZ et al., 2015).

Numbness can be characterized as a phenomenon in which seeds, even viable, take some time to germinate, being a positive evolutionary characteristic and, at the same time, can be considered a negative characteristic when the objective is the production of seedlings (COSTA et al., 2010).

Numbness in seed is considered when the germination process even under favorable conditions such as viable seed, presence of water, adequate temperature and among others does not trigger

germination (BASKIN & BASKIN, 2004; COSTA et al., 2010). Often generating the need to use methods to overcome seed dormancy, these treatments aim to standardize seed germination and seedling emergence, aiming to optimize seedling production (PEREIRA & FERREIRA, 2010). Seeds with dormancy make it difficult to plan and produce seedlings of the species, making it essential to know the mechanism and treatments to overcome dormancy for an optimization in the production of seedlings (SILVA et al., 2011).

Among the treatments used, oss that are more successful in overcoming the integumentary dormancy of forest species, mechanical and chemical scarification stand out, but also the immersion of seeds in hot water. The application and efficiency of these treatments depend on the degree of dormancy, which varies between each forest species, also depending on factors such as origin and harvest time.

Given the above, it is important to establish practical methods of overcoming dormancy in flamboyant seeds for the initial development of seedlings. Thus, the objective of this study was to identify the best method of overcoming dormancy in flamboyant seeds

Materials and Methods

The work was carried out in the laboratory of the State University of Mato Grosso - UNEMAT, Nova Mutum Campus. Seeds of the species Delonix regia (Flamboyant red) were used, benefited by the company Bentec- Seeds, inputs and technology, collected in the municipality of Rio do Sul SC, weighing 100 grams. The seeds were submitted to the following four treatments to overcome dormancy: T1 - mechanical scarification in sandpaper, T2 - immersion in water at 90°C for five minutes, T3 - immersion in sulfuric acid for 5min, T4-control, where each treatment had 3 repetitions, and each repetition had 20 seeds.

After undergoing the treatments, the seeds were sown in plastic trays, with dimensions 33 cm, 23 cm, 45 cm (length, width and height), previously washed and sterilized with 10% bleach. The tray filled and wrapped in germitest paper moistened with distilled water. The test was conducted in a laboratory under shadow and room temperature (mean temperature: 30 °C). The experimental design was completely randomized with four treatments and four replications of 25 seeds each.

In treatment one (T1) mechanical scarification was performed with 80-numbered sandpaper in the region opposite the embryonic axis. The seeds were scarified until the forehead broke and the cotyledon was exposed. In treatment two (T2) 500 ml of water was added to a beaker, which was then heated using a heating plate, monitoring the temperature with the aid of a thermometer. After stabilizing the water temperature at 90°C, 60 seeds were immersed.

In treatment three (T3) 200 ml of concentrated sulfuric acid 98% was placed in a beaker on a shaker, 60 seeds were immersed for 60 minutes, after this step the seeds were separated from the acid and washed in running water at room temperature for approximately 5 minutes in order to remove excess acid and standardize temperatures.

The characteristics evaluated were: seedling emergence, the seeds that emitted the rootlet were considered germinated according to the criterion ordered by the Seed Analysis Rules (Brazil, 1992), the counts began at three days and extended until 17 days after sowing; germination speed index (IVE), daily counts were performed, from three to 17 days, of normal seedlings, and Nn) between sowing and germination, according to the formula of Maguire (1962); plant height and root length, at the end of the emergency test, a sample of 5 normal plants was removed from each repetition, which were measured with the aid of a ruler graduated in centimeters, and the results were expressed in centimeters.

The data obtained were submitted to analysis of variance using the SISVAR statistical program (Ferreira, 2003) and, when the "F" values were significant, the means were contrasted by the Tukey test at the 5% probability level

Results and discussion

Among the characteristics analyzed Table 1, the four dormancy break methods evaluated, only the emergency speed index differed significantly between treatments.

According to the data in table 1, it is observed that the highest percentages of seedling emergencies of flamboyant seeds occurred when the seeds were exposed to the following treatments: T1 - mechanical scarification in sandpaper, T2 - immersion in water at 90º C for five minutes, T3 -immersion in sulfuric acid for 5min, these same tests.

Results similar to Lima et al. (2013) who, working with different methods of breaking dormancy, it was noted that none of the methods tested statistically deferred the control in the seeds species Flamboyant (*Delonix regia*).

Different results were obtained by Ataide et al. (2013) and Missio et al. (2011) in their respective studies obtaining differences in the methods used to break dormancy of the same species studied in this work.

Mechanical scarification in sandpaper promoted a greater increase in the emergency speed index when compared to other treatments. Because with scarification methods, integument rupture occurs, in addition to increasing water permeability, increased sensitivity to light, temperature and gas permeability (JELLER and PEREZ, 1999).

In this sense, mechanical scarification has probably promoted water absorption in seeds and consequent reactivation of metabolic processes, accelerating the speed of seedling emergence. Roversi et al. (2002) also observed that with the scarification method in the test of different methods of overcoming dormancy in black acacia (*Acacia mearnsii*), the highest germination speed values occurred when the seeds were subjected to mechanical scarification. Nascimento et al. (2009) skull seeds (*Parkia platycephala*), obtained the

highest rates of seedling emergence speed from treatments with manual scarification with sandpaper and also those in immersion in concentrated sulfuric acid for 15, 30 and 45 minutes.

In the evaluation of seedling height, the immersion of the seeds in hot water at 90º C for 5 minutes resulted in seedlings with higher height, although this treatment did not differ statistically from the control, mechanical scarification in sandpaper, immersion in sulfuric acid.

Similar results by Oliveira et al. (2018) with 12 different treatments for breaking the dormancy of flamboyant seed did not obtain a difference in seedling height. However, Lima et al. (2013) found that the immersion of flamboyant seeds in water at 80 oC for five minutes promoted a higher seedling height (8.55cm) value close to that obtained in this study.

Despite the efficiency of sulfuric acid treatments, their use has some disadvantages, such as the difficulties in use for larger volumes of seeds, high cost and difficulty in acquiring the product and in relation to the dangers of burns to the technician or worker who performs scarification due to its corrosive action. Therefore, in nurseries, immersion in hot water is a method of overcoming dormancy more used because of the ease of treatment, low cost and small risk to the worker (MARTINS et al., 2008) and because it has little or almost no difference in the results of quality of dormancy breakage when compared to the use of sulfuric acid, but this According to Perez (2004), the use of hot water is a much more practical treatment than sandpaper or puncture of wraps.

In root length analysis, once again scarification in sandpaper showed higher means, however it did not differ from hot water at 90º C for 5 minutes, sulfuric acid and control. Results similar to those of Lima et al. (2013) with 8 treatments did not obtain a difference in the length of the roots in their seedlings, corroborating the results of this study.

However, for Nascimento et al. (2009) and Roversi et al. (2002), they obtained longer root length in skull seedlings (*Parkia platycephala*) and black cacia (*Acacia mearnssii*) respectively when using mechanical scarification in sandpaper in seeds

Table 1. Average emergency percentage values (% Emergency), emergency speed index (IVE), plant height (ATP), root length (CR) as a function of dormancy breakage methods in flamboyant seeds. New Mutum-MT. UNEMAT. 2019.

Treatment	Characteristics analyzed			
	Emergency (%)	IVE	ATP (cm)	CR (cm)
NSS	37,86 a	11,81 c	7,35 ab	3,31 b
MS	44,00 a	41,00 a	8,57 a	4,98 a
HQ	39,27 a	17,41 bc	8,53 a	4,30 ab
EQ	43,20 a	36,11 b	6,89 b	4,35 ab
C.V. (%)	14,52	22,07	7,24	9,79

NSS = Non-scarified seeds; MS = Mechanical scarification; HQ = Hot water at 90º C for 5 min; EQ = Chemical scarification with sulfuric acid. *Media followed by the same lowercase letter in the column does not differ from each other by the Tukey test at the 5% probability level.

Conclusion

Among the treatments for overcoming emergency dormancy (% Emerg), plant height (PA), root length (RC) there was no difference between the treatments. For the emergency speed index (IVE), mechanical scarification in sandpaper promoted a greater increase.

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