IMPACTO CIENTÍFICO EDITORA

MECHANICAL TECHNIQUE FOR OVERCOMING DORMANCY IN BARU SEEDS (Dipteryx alata Vog.)

TÉCNICA MECÂNICA PARA SUPERAÇÃO DE DORMÊNCIA EM SEMENTES DE BARU (Dipteryx alata Vog.)

TÉCNICA MECÁNICA PARA SUPERAR LA LATENCIA EN SEMILLAS DE BARU (Dipteryx alata Vog.)

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ABSTRACT

Baru (*Dipteryx alata Vog*.) is a species native to the Cerrado biome and is highly versatile in its exploitation methods, both for its products and services. This species can be used for food, forage, timber, medicinal, and industrial purposes, in addition to contributing to ecological services in the recovery of degraded areas. This study aimed to obtain basic information on the influence of baru seed isolation and the use of a germination chamber on the germination process of the species. This work was developed at the Federal Institute of Education, Science, and Technology of Goiás - Posse Campus. The methodology adopted was baru seed isolation through mechanical scarification with a vise, seed asepsis, and sowing in polyethylene trays containing washed sand with a 2 mm particle size as a substrate. The germination process was conducted in a germination chamber at a temperature of 26°C and a 16-hour photoperiod. Emergence began six days after sowing, with 76.44% of the seeds germinated, and ended on the thirteenth day with 91.05% germination, equivalent to 234

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seeds. Thus, seed isolation and the use of the germination chamber proved effective in overcoming the physical dormancy of baru seeds due to integumentary rigidity.

Keywords: Cerrado. Germination. Tegument.

RESUMO

O Baru (*Dipteryx alata Vog.)* é uma espécie de ocorrência natural do bioma Cerrado e possui alta versatilidade quanto às suas formas de exploração, no que diz respeito aos seus produtos e serviços. Esta espécie pode ser utilizada para fins alimentícios, forrageiro, madeireiro, medicinal e industrial, além de contribuir para serviços ecológicos na recuperação de áreas degradadas. O presente estudo visou à obtenção de informações básicas quanto à influência do isolamento da semente de baru e o uso da câmara de germinação no processo germinativo da espécie. Este trabalho foi desenvolvido no Instituto Federal de Educação, Ciência e Tecnologia Goiano - Campus Posse. Foi adotado como metodologia o isolamento das sementes de baru através da escarificação mecânica com uma morsa, assepsia das sementes e semeadura em bandejas de polietileno contendo como substrato areia lavada a uma granulometria de 2 mm. O processo de germinação foi conduzido em câmara de germinação a uma temperatura de 26°C e um fotoperíodo de 16 horas. A emergência iniciou-se decorridos seis dias após a semeadura, com 76,44 % das sementes germinadas e finalizou-se no décimo terceiro dia com 91,05 % de germinação, o equivalente a 234 sementes. Assim, o isolamento das sementes e o uso da câmara de germinação mostrou-se eficiente para superação da dormência física das sementes de baru em decorrência da rigidez tegumentar.

Palavras-chave: Cerrado. Germinação. Tegumento.

RESUMEN

El barú (*Dipteryx alata Vog*.) es una especie presente de forma natural en el bioma del Cerrado y presenta gran versatilidad en cuanto a sus formas de explotación, en lo que respecta a sus productos y servicios. Esta especie puede ser utilizada con fines alimenticios, forrajeros, maderables, medicinales e industriales, además de contribuir a los servicios ecológicos en la recuperación de áreas degradadas. El presente estudio tuvo como objetivo obtener información básica sobre la influencia del aislamiento de semillas de baru y el uso de la cámara de germinación en el proceso de germinación de la especie. Este trabajo se desarrolló en el Instituto Federal de Educación, Ciencia y Tecnología Goiano – Campus Posse. La metodología adoptada fue el aislamiento de las semillas de barú mediante escarificación mecánica con prensa, asepsia de las semillas y siembra en bandejas de polietileno conteniendo arena lavada de tamaño de partícula de 2 mm como sustrato. El proceso de germinación se realizó en una cámara de germinación a una temperatura de 26°C y un fotoperiodo de 16 horas. La emergencia se inició seis días después de la siembra, con 76,44% de las semillas germinadas y finalizó al decimotercer día con 91,05% de germinación, equivalente a 234 semillas. Así, el aislamiento de las semillas y el uso de la cámara de germinación demostraron ser eficientes para superar la latencia física de las semillas de baru debido a la rigidez tegumentaria.

Palabras clave: Cerrado. Germinación. Integumento.

1 INTRODUCTION

The baru (Dipteryx alata Vog.), as it is popularly known, belongs to the Leguminosae family. This naturally occurring tree of the Cerrado biome also receives other names that vary according to the location, such as camaru, cumbaru, barujó and tonka beans, abroad. This species has high versatility in terms of its forms of exploitation, with regard to its products and services, with emphasis on food (pulp and almond), forage, timber, medicinal and industrial use. In addition, it contributes to ecological services, such as landscaping and recovery of degraded areas (Sano; Brook; Brito, 2004).

In the Cerrado, the density of individuals varies according to the phytophysiognomy, with 23 to 143 individuals per hectare and an average height of 11 meters, which can reach 25 meters in height (Brito, 2004; Oliveira-Filho; Martins, 1991). Its elongated crown has a diameter ranging from 6 to 11 meters, and has compound, pinnate and imparipinate leaves. As for reproductive aspects, the baru has a panicle-type inflorescence, with hermaphroditic flowers, which vary in a number of 200 to 1000 flowers (Almeida et al, 1998). After fertilization, the flower's ovary develops into a drupe-type fruit, measuring between 1.5 and 5 cm in length, in addition to having a woody endocarp with a single seed per fruit (Melhem, 1974).

The presence of a rigid endocarp, which delays the imbibition of baru seeds, directly influences the germination process. However, this factor can be overcome through seed isolation (Salomão et al., 1997). When not removed from the fruit, the seed needs, on average, 40 to 60 days to germinate, but if isolated, this number reduces significantly, and emergence can be observed in the first two weeks (Filgueiras; Silva, 1975).

Overcoming numbness due to integumentary stiffness can occur through various treatments. Among them, heat treatment is used with the immersion of the fruit in water for a specific period of time, as well as temperature, in addition to the mechanical scarification of seeds and fruits, with the help of sandpaper or a blade blade vise (Medeiros et al., 2018).

Within this context, the present study aimed to obtain basic information about the influence of baru seed isolation and the use of the germination chamber on the germination process of the species D. alata Vog.

2 METHODOLOGY

The experiment was carried out at the Multiuser Laboratory of Natural Sciences (LMCN) of the Federal Institute of Goiás, in the city of Posse-GO, whose geographic coordinates are 14° 06' 30" S and 46° 19' 38" W. In the locality, the Aw climate classification predominates, characterized by being a tropical climate with a dry winter, according to the Koppen classification (Alvares et al., 2013). The baru fruits were collected in the municipality

of Simolândia-GO, at the Três Rios farm, in December 2018. After collection, the seeds were mechanically removed with the aid of a vise with cutting blades (Figure 1a), later stored in plastic bags inside a refrigerator (7 ±3ºC; 75% RH) until sowing.

Prior to sowing, the seed asepsis process was carried out according to Fanti and Perez (1999), with washing in running water and immersion in a 2% sodium hypochlorite (NaClO) solution for 10 minutes, and triple washing in distilled water (Figure 1b). In the sowing process, 257 seeds were used, arranged in six polyethylene trays, filled with washed sand substrate and sieved at a grain size of 1.2 mm (Figure 1c) and autoclaved at 121°C for thirty-five minutes (Figure 1d).

Sowing was carried out at a depth of one centimeter in the polyethylene trays and covered with a second layer of the same thickness (Figure 1e). Soon after, the experiment was conducted in a germination chamber at a constant temperature of 26°C, with an alternating photoperiod of 16 hours, using daylight fluorescent lamps (4x20 W) (Figure 1f).

Germination evaluations were carried out on the sixth, ninth and thirteenth days after sowing, counting the number of normal seedlings emerged, i.e., those that had primary root, hypocotyl and cotyledons without damage. After the ninth day, readings of seedlings discarded by external agents were carried out, extending to the tenth day. The germination percentage was calculated from the sum of normal seedlings, obtained during the counts according to the protocol established by the Seed Analysis Rule (RAS) (BRASIL, 2009).

Transplanting was carried out in plastic bags containing sand substrate (1.2 mm) and cattle manure tanned and sifted in a 2 mm mesh. The seedlings went through the process of acclimatization in the laboratory before being taken to the nursery.

2.1 METHODOLOGY FOR THE EXECUTION OF THE BARU SEEDLING PRODUCTION PROCESS (D. ALATA VOG.)

Figure 1

Mechanical extraction of Baru (D. alata Vog.) seed (a); Seed asepsis process (b); Sieve shaker used to sieve sand (c); Autoclaved sand (d); Sowing process on sand substrate (e); Trays are conducted in a germination chamber (f).



3 RESULTS

Seedling emergence began on the sixth day after sowing with 76.44% of the seeds germinated, a period that is equivalent to approximately one week. By the thirteenth day, 234 seeds of D. alata Vog. germinated (Figure 1a) the equivalent of 91.05% of the total, as shown in Table 1. This metric indicates that the temperature of 26°C and the sand substrate used were satisfactory for seed germination.

Table 1

Average germination of baru seeds (Dipteryx alata Vog.) in sand substrate at a temperature of 26°C - Posse, GO, 2019.

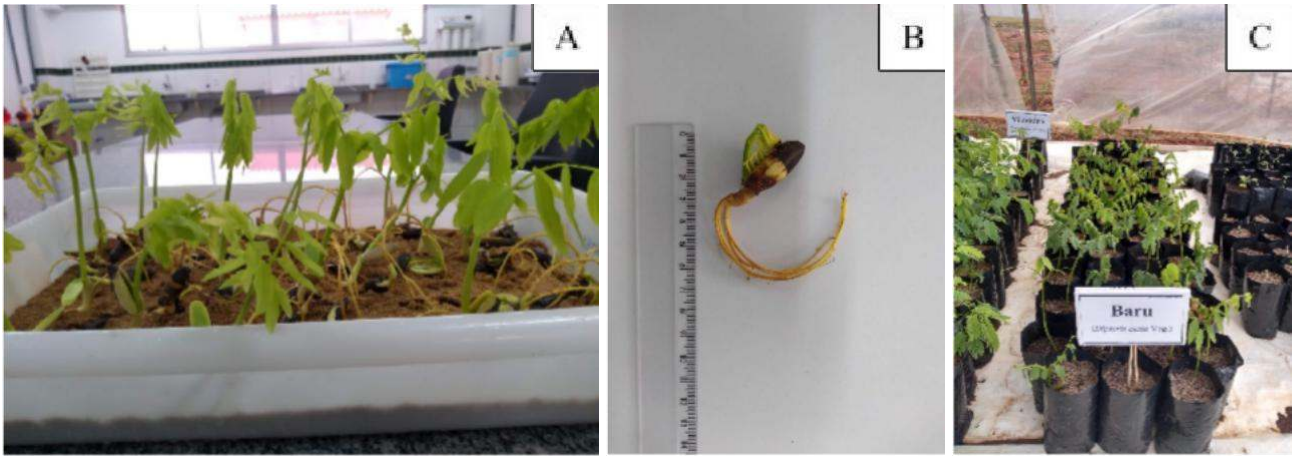
Days	Total - 257 seeds	
	Germination (%)	No. of seeds
Sixth	76,44	196
Ninth	82,34	211
Thirteenth	91,05	234

Source: Neves, D. G; Souza, R. F. R; Olive tree. D. G; Lorenzoni, M. Z; 2019.

Nine abnormal seedlings were discarded because they were unable to develop leaf primordia and/or presented anomalies in the formation of radicles (Figure 2b) and the remaining 14 seeds did not germinate. On the thirteenth day, the readings were stopped and transplanting to plastic bags containing sand substrate plus tanned cattle manure with a particle size of 2 mm was started. After transplanting, the seedlings remained for a period of one week in the reception and drying laboratory to acclimatize to the conditions of the environment and, soon after, they were taken to the nursery (Figure 2c). Processes during and after germination of D. alata Vog seeds and malformation of the aerial part (b); Seedlings formed after transplanting (c).

Figure 2

Baru seedlings (D. alata Vog.) in the thirteenth after sowing (a); Seedling with radicle anomaly



4 DISCUSSION

The observed germination rate of 91% was very similar to that found by Pagliarini et al (2012) in an experiment carried out with the scarification of baru seeds, which achieved a

result of 92% at 36 days after sowing. This demonstrates that the isolation of the seed allowed greater permeability to start the imbibition process. In addition, the use of the germination chamber positively influenced the Germination Speed Index (IVG), reducing the seed emergence process to approximately one week.

According to Souza et al (2009), the presence of abnormal seedlings with malformation of the shoot and root system may be related to the scarification process, since when mechanical damage is caused near the radicle and plumule regions, it implies a reduction in the germination rate and vigor of the seeds.

The 16-hour photoperiod may have helped to reduce the germination time and seed emergence. In an experiment carried out by Previero and Campelo (2023), the luminosity rate influences IVG, which was observed in the treatment conducted in full sun with a higher germination peak and in a shorter time, about 4-5 days, when compared to natural shade and 50% shade.

5 CONCLUSION

The mechanical extraction of the baru (D. alata Vog.) seed proved to be efficient in overcoming the physical dormancy of the seeds of this species, a fact that can be justified by the high percentage of germination, exceeding 90 %.

Regarding the use of the germination chamber, it is possible to infer that this equipment allows the production of Baru seedlings on a large scale and in a reduced time, compared to the germination of non-isolated seeds, which does not have control of the variables temperature and relative humidity (RH) and photoperiod.

In summary, further studies in this line of research are necessary in order to produce technical-scientific data on the edaphoclimatic conditions for the production of seedlings of this native species of the Cerrado.

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