Scientific Electronic Archives
Issue ID: Sci. Elec. Arch. Vol. 12 (6)
December 2019
DOI: http://dx.doi.org/10.36560/1262019898
Article link
http://www.seasinop.com.br/revista/index.php?journal=SEA&page=article&op=view&path%5B%5D=898&path%5B%5D=pdf
Included in DOAJ, AGRIS, Latindex, Journal TOCs, CORE, Discoursio Open Science, Science Gate, GFAR, CIARDRING, Academic Journals Database and NTHRYS Technologies, Portal de Periódicos CAPES.
ISSN 2316-9281

Seed dormance breack of *Araucária angustifolia* (Bert.) O. Ktze

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Abstract. The purpose of this study was to evaluate the breaking of dormancy of seeds of araucaria in different treatments, to elucidate what is the best germination condition for the species. The experiment was conducted in a laboratory, without control of incidence of light or temperature, leaving it to the maximum possible under natural conditions. The treatments consisted in four treatments and four replications, where each repetition, was composed of 5 sub-repetitions, totaling 20 units per treatment. The sowing was performed with one seed per glass. The characteristics evaluated were the percentage of germination and germination speed index (GSI). It was concluded that the best processes of breaking of seed dormancy of *Araucaria angustifolia* were through the permanence of the seeds in water for 24 hours (T3), followed by soaking in water for 12 hours (T2) and cutting the skin on the bottom of the seed (T4). Already the process considered unfavorable was without any treatment (T1).
Keywords: Germination, IVG, dormancy.

Introduction

Araucária angustifolia (Bertol.) Kuntze (1898) is the dominant arboreal species of the mixed ombrophilous forest, occurring in the southern region of Brazil, standing out due to the wood, which brings together the largest variety of applications, in buildings and even in the field of papermaking, presents great importance in ecological projects and in recovery of degraded areas (Carvalho, 2003).

It is a tall tree with a chalice-shaped crown. Araucaria or Brazilian pine stands out from the other Brazilian species, mainly due to its original shape, which gives to the landscapes of the South a special characteristic (Filho, 1985).

In spite of occupying extensive areas, its indiscriminate exploitation placed it in the official list of the Brazilian flora species threatened with extinction. Excessive exploitation, without proper replacement, has been pointed out as the main reason for this threat. Of the 20 million hectares originally covered by the Araucaria Forest, there are currently 2% of this area (Brasil, 1992).

Araucaria, although popular, is not completely known by science. Several studies have been done recently to better understand the ecology and biology of this tree; are also needed to guide the urgent protective measures that still need to be taken to ensure the survival of this sensitive and highly specialized species in an environment that is rapidly being invaded and destroyed by man but many uncertainties and contradictions persist in many respects. However, scholars are unanimous in declaring the need for their salvation, both because of their economic and ecological importance as well as landscape and cultural (Moreira-Souza, 2002).

Due to the complexity that is caused by the environmental factors, this species presents great adaptive conditions, however, it presents unevenness and slowness in its germination, being from one hundred to one hundred and twenty days, without the need of post-germinative treatment (Pinheiro; Paiva, 1990). In addition, many data on germination of native species lack basic information regarding optimal germination conditions (Figliolia et al. 2013).

However, another important cause of the likely extinction is usually ignored: the lack of knowledge of the behavior and silvicultural requirements of the species (Scheeren et al. 1999).

The aim of this study was to verify the germination of *Araucaria angustifolia* seeds under different dormancy breaking methods.

Methods

The experiment was developed in the Laboratory of Multiuso I of the dependencies of

FACC - Faculdade Concórdia / SC. Seeds of *Araucária Angustifolia* harvested directly from pine trees located in the city of Concórdia / SC were used as plant material. Afterwards, they were submitted to vigor test, according to Jankauskis (1970), being placed 200 seeds in a container with water, for two minutes and the seeds that were supernatant were eliminated, since they will present low vigor. The sowing was done manually, where it was buried, in vertical position in plastic cups containing as substrate forest land. The substrates that were used in the experiment and all the planting and dormancy breaking processes were prepared manually.

The experiment was carried out with four treatments and four replicates, each repetition being composed of 05 sub-repetitions, totaling 20 plastic cups per treatment. The germination percentage and the germination speed index (IVG) of the araucaria seeds were observed during 65 days.

The general scheme of the work was as follows:

I. The seeds were soaked in water for 2 minutes, and the supernatants were eliminated because of low vigor.
II. 20 seeds were soaked in water for 12 hours under ambient conditions.
III. 20 seeds were soaked in water for 24 hours under ambient conditions.
IV. 20 seeds were cut at the bottom to eliminate the physical barrier of the integument and facilitate the absorption of moisture (Eira et al. 1994; Souza & Cardoso, 2003).
V. 20 seeds have not undergone a process.
VI. The seeds were sown, one seed per plastic cup.
VII. They were exposed to the sun, and irrigated daily for 65 days, thus counting the seeds germinated daily at the same time.

Data were submitted to analysis of variance ANOVA and means were compared by the Tukey test, at 5% probability. The analyzes were performed by ASSISTAT 7.6 BETA program (Silva & Azevedo, 2009) at a significance level of 5% probability ($p < 0.05$).

Results and discussion

According to Figure 1, we can observe the percent germination in percentage% that was obtained, among the analyzed treatments there was a significant difference ($p < 0.05$). The seeds that were soaked by water with 24 hours were the ones that presented greater statistical difference, 80% in relation to the other treatments. It was verified that the treatment in which the seed was soaked in water for 12 hours showed a percentage of germination of 70%, while the treatment in which the tegument was cut in the lower part of the seed presented 60% of germination, and the treatment control (no treatment) achieved 55% efficacy.

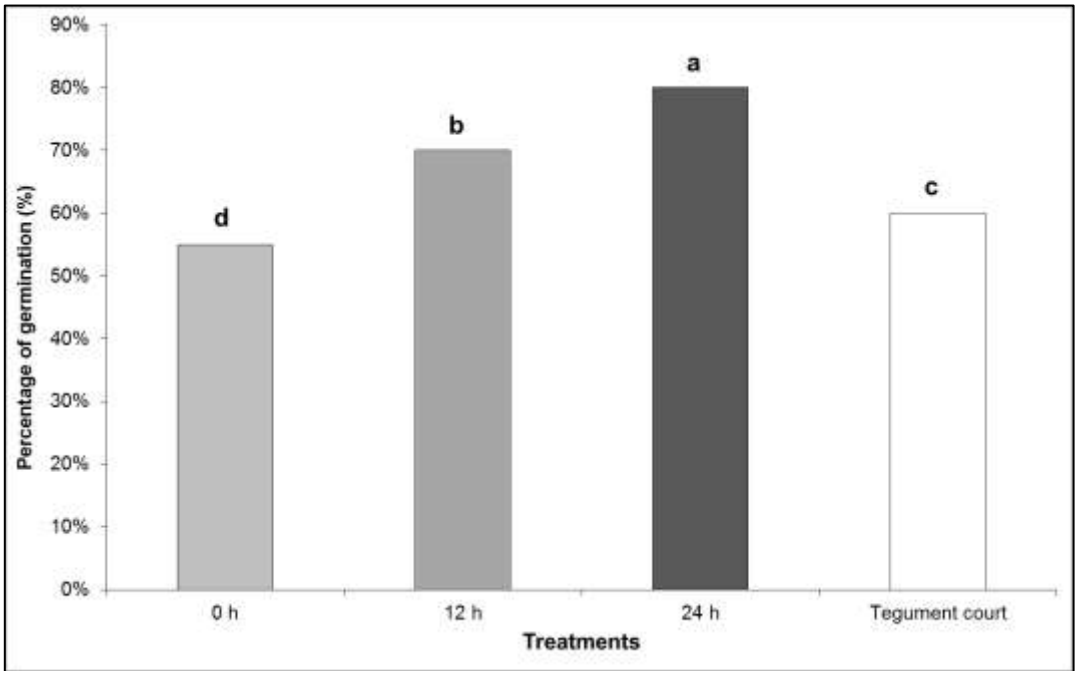

Figure 1: Percentage (%) of Germination of Araucaria Angustifolia seeds at 63 days of culture.
The averages followed by the same letter do not differ statistically from each other. The Tukey test was applied at a 5% probability level.

Angeli & Stape et al. (2003) verified that seeds of Araucaria angustifolia had the dormancy overcome, leaving the pine nuts immersed in water at room temperature for 24 hours, causing their imbibitions, which facilitates the rupture of the external integument of the seeds.

The treatment with the highest percentage of germination was the treatment consisting of leaving

the seed soaked in water for 24 hours T (3), followed by the treatment for 12 hours T (2).

According to Floriano et al. (2004), water is the most influential factor on the germination process. With the absorption of water, by imbibitions, rehydration of the tissues occurs and, consequently, the intensification of breathing and all other metabolic activities, which result in the supply of energy and nutrients necessary, for the resumption of growth by the axis embryonic.

On the other hand, the treatment referring to the cut of the integument of the lower part, despite presenting an inferior result, was also satisfactory. Seed scarification may favor germination and initial seedling development of Araucaria angustifolia (Caçola et al., 2006), since the treatment that was not satisfactory consisted of no type of treatment, which serves as a control in relation to the others and proves the importance of methods of breaking dormancy.

The germination was observed from the 35th day after planting, according to the data of Carvalho (1994), which explains that Araucaria angustifolia seedlings are cryptohyphogean, that is, they initiate germination with a certain ease and uniformity, on average, germination of up to 90%.

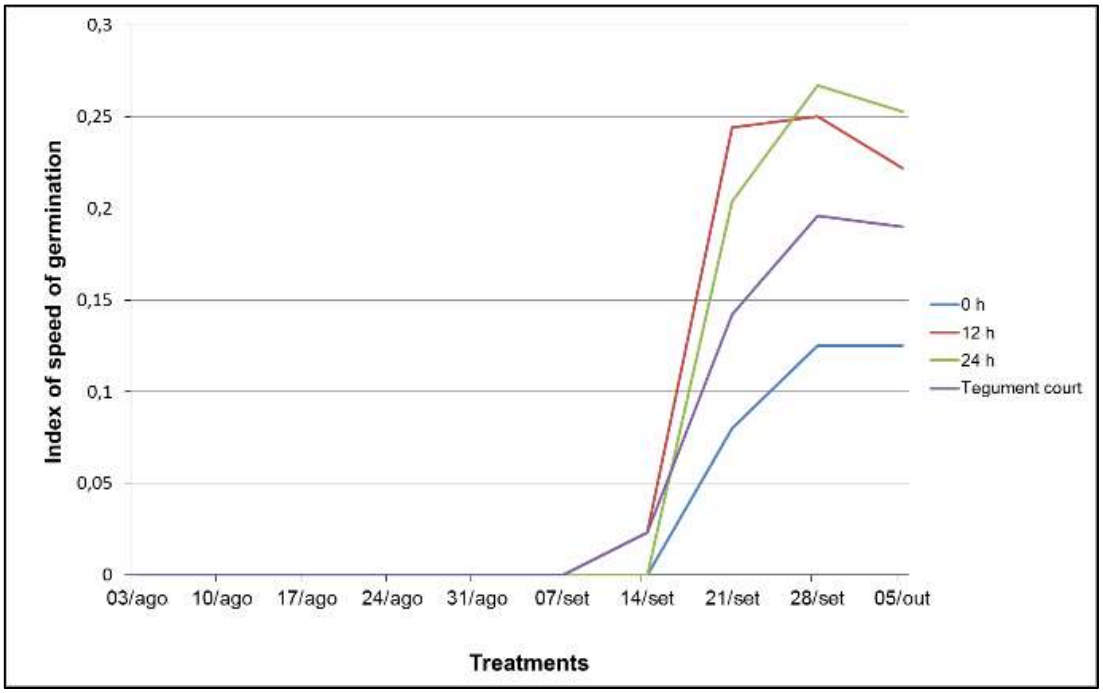

Figure 2: Germination Speed Index (IVG) of Araucaria Angustifolia seeds at 63 days of cultivation. The averages followed by the same letter do not differ statistically from each other. The Tukey test was applied at a 5% probability level.

The first seeds of *Araucária Angustifolia* began to germinate 35 days after the implantation of the experiment and ended at 63 days, when the germination process was definitively stopped.

The treatment that presented the highest IVG was the treatment that consisted of leaving the seed soaked in water for 24 hours (T3), followed by the seed soaked in water for 12 hours (T2), which presented a lower but satisfactory result, those that presented lower IVG were the cut of the tegument (T4) and the treatment without any type of break of dormancy, (T1) (Figure 2).

The data obtained do not corroborate with the results found by Caçola et al. (2006), which shows that mechanical scarification caused a significant reduction in the time needed for the emergency. However, it contradicts when compared to the final percentage of germination, where for the same author there was no difference between treatments with and without scarification.

The treatments in which the seeds were soaked in water for 24 hours (T3) and soaked in water for 12 hours (T2), showed higher IVG values, due to the fact that the seed imbibition facilitates the the external integument of the seeds, thus facilitating its germination.

Regarding the treatment in which the tegument was cut in the lower part (T4), the latter, despite not being so prominent in relation to the others, presented moderate IVG, which is explained by the ease of germination, since the bark becomes a physical impediment of germination. The treatment without any type of dormancy break (T1) showed low IVG, which shows the need for dormancy breaking, where without it the percentage of germination and IVG are drastically reduced.

Conclusion

According to the results, it can be concluded that:

1- The best processes to break dormancy of the Araucaria Anustifolia seed were through the stay of the seeds in water for 24 hours (T3), followed by imbibition in water for 12 hours (T2) and tegument cutting in the lower part of the seed (T4);
2- The process considered unfavorable was the one with no treatment (T1).

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