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# Dormancy Breaking and Germination of *Enterolobium contortisiliquum* (Vell.) Morong seed

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## ABSTRACT

*Enterolobium contortisiliquum (Vell.) Morong. is a Mimosaceae tropical tree species recommended for heterogeneous reforestation of degraded tropical areas. "Timburi" seeds present low germination due to the high degree of seed dormancy. Different methods to overcome seed dormancy was compared: sanding, sanding followed by 24 hours water (25ºC) soaking, imbibition in boiling water followed by exposure to water at room temperature (28ºC), and concentrated sulfuric acid (5, 15, 30, 60, 120 or 180 minutes) followed by washing with tap water. All seeds were germinated in rolled towels at 25ºC and 12 hours photoperiod. Total germination, first count of germination test and germination velocity index were recorded. Mechanical scarification (sanding), chemical scarification (treatment with acid for 30, 60, 120 or 180 minutes) and mechanical scarification followed by cold water imbibition were efficient in promoting germination. For practical purposes, mechanical scarification is highly recommended for forest nurseries.*

**Key words**: Dormancy, forest nursery, germination, seed

## INTRODUCTION

*Enterolobium contortisiliquum* (Vell.) Morong, well known as "timburi", is used in reforestation of degraded areas and mixed plantations, mainly for its fast initial growth (Lorenzi, 1992). Seeds have a high degree of dormancy probably caused by seed coat impermeability to water (Carvalho, 1994). Impermeable seed coats to water or oxygen, mechanical restrictions or combinations of these with presence of chemical inhibitors are often found in tropical tree seeds (Malavasi, 1988). Although it is an efficient mechanism to guarantee the survival and perpetuation of the species, seed dormancy is an important limiting factor for plant propagation in nurseries. Tropical tree seeds with hard seed coats have delayed and non-uniformed germination, causing a 40% loss of genetic resources if a non-effective dormancy suppression treatment is employed (Carneiro, 1995).

The objective of this investigation was to identify the best pre-sowing seed treatment to break seed dormancy and to promote germination of "timburi" seeds.

## MATERIALS AND METHODS

Seeds of *E. contortisiliquum* were collected from a biological reserve in the nearby county of Santa Helena, Parana. Characterization of the seed lots included weight of a thousand seeds and water content according to the Official Rules for Seed Analysis (Brasil, 1992). The water uptake curves of control and

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scarified seeds were determined by fresh weight increase among four replications of five seeds each. Seeds were immersed in distilled water under ambient condition (28°C) and weighed every 6 hours for the first 24 hours. Thereafter, seeds were weighed every 12 hours for 108 hours. Excess water was removed with filter paper before weighing. Results were expressed as percent of fresh weight increase.

Treatments to break seed dormancy included: 1- untreated seed (control); 2- mechanical scarification (the seed coat was sanded with a # 80 wood sandpaper at an area opposite from the embryo until the cotyledon was exposed); 3- mechanical scarification followed by soaking in water at 25°C for 24 hours; 4- intact seeds imbibed in boiling water followed by exposure to room temperature (28°C) and water for 24 hours; 5- chemical scarification of intact seeds with concentrated sulfuric acid for 5, 15, 30, 60, 120 or 180 minutes. Afterwards, seeds of treatment 5 were washed with tap water for 10 minutes. Germination tests immediately followed treatments to overcome seed dormancy. Seeds were placed in rolled paper towels at 25°C constant temperature and a 12-hour photoperiod. First count of germination (Nakagawa, 1992) and germination speed index (Maguire, 1962) were used to quantify seed vigor. The evaluations started the third day after seeding. Radicle emergence was used as a reference to consider a seed germinated. The analysis followed a complete randomized design followed by Tukey's test at 5 % for mean comparisons.

## RESULTS AND DISCUSSION

The weight of a thousand seeds was 221 g and the mean water content of the control was 7%. Fresh weight increase of control seeds was negligible compared to that of scarified seeds, indicating coat impermeability (Fig. 1).

The results of germination tests with untreated seeds and seeds soaked in water for 24 hours correlated with the water uptake data. Total germination did not reach over 16 % and was slow and irregular. According to Eira et al. (1993), water soaking of seeds of *E. contortisiliquum* for 24 hours was not effective to overcome seed dormancy. Because of unsatisfactory results, the use of boiling water was not recommended by Bianchetti and Ramos (1981) for *Peltophorum dubium*, and by Candido et al. (1982) for *Enterolobium contortisiliquum*. Mechanical scarification, chemical scarification (30, 60, 120 or 180 minutes) and mechanical scarification followed by water soaking at room temperature for 24 h yielded significantly higher total germination percentages (higher first counts and higher speed of germination) than the other treatments involved (Table 1).

In this trial, as well as in other studies, no statistical differences were shown between treatments with immersion periods of 30-180 minutes (Eira et al., 1993; Ledo, 1977; and Alcalay and Amaral, 1982). However, mechanical scarification turned out to be an excellent treatment to overcome seed dormancy. This agrees with results from several authors (Carvalho et al., 1980 for *Erythrina speciosa*; Bianchetti and Ramos, 1981 for *Peltophorum dubium*; Candido et al., 1982 for *Enterolobium contortisiliquum*; Nassif and Perez, 1997 for *Pterogyne nitens*; and Jeller and Perez, 1999 for *Cassia excelsa*; Lopes et al., 1998 for *Caesalpinea ferrea*, *Cassia grandis* and *Samanea saman*). Seed treatments involving water soaking and sulfuric acid for 5 or 15 minutes were inefficient to break dormancy of *E. contortisiliquum* seeds. The best recorded results of total germination, first count of germination test and speed of germination index were obtained with mechanical scarification, chemical scarification (30, 60, 120 or 180 minutes) and mechanical scarification followed by water soaking at room temperature. Mechanical scarification should be considered the best treatment to overcome "timburi" seed dormancy if practical aspects are important as in forest nurseries of tropical countries.

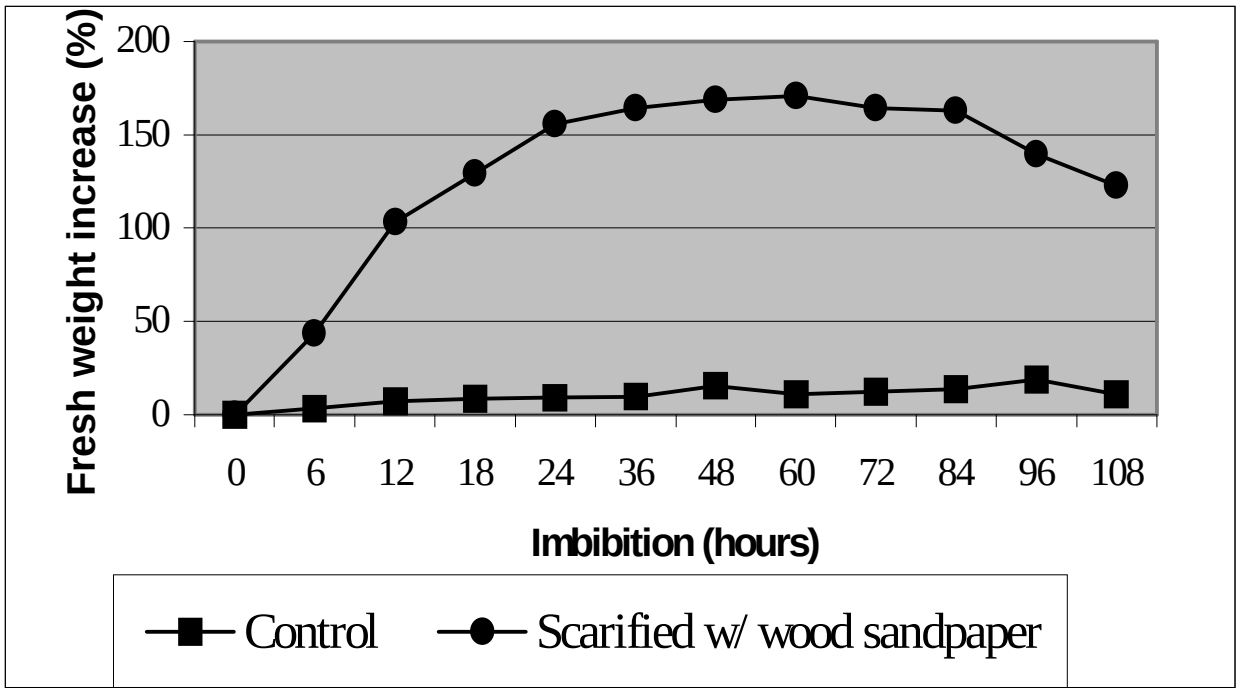


**Figure 1 -** Water uptake curves for control and scarified (with wood sandpaper) seeds of *Enterolobium contortisiliquum* (Vell.) Morong.

**Table 1 -** Mean percentage values of total germination, first count of germination test, and speed of germination index (SGI) of seeds subjected to different treatments to break seed dormancy.

| Treatments | First count | Germination | Sgi |
|---|---|---|---|
| Control | 1.0 d[(1)] | 2.0 b | 0.6 d |
| Soaking in tap $H_2O$ | 0.0 d | 1.0 b | 0.2 d |
| Soaking in boiling $H_2O$ | 7.0 d | 16.0 b | 4.0 d |
| Mechanical scarification and $H_2O$ | 75.0 a | 80.0 a | 26.0 abc |
| Mechanical scarification | 70.0 ab | 92.0 a | 28.0 abc |
| Chemical scarification for 5 min. | 43.0 c | 90.0 a | 22.0 c |
| Chemical scarification for 15 min. | 48.0 bc | 82.0 a | 23.0 bc |
| Chemical scarification for 30 min. | 78.0 a | 90.0 a | 29.0 ab |
| Chemical scarification for 60 min. | 85.0 a | 89.0 a | 29.0 a |
| Chemical scarification for 120 min. | 85.0 a | 87.0 a | 29.0 a |
| Chemical scarification for 180 min. | 92.0 a | 93.0 a | 31.0 a |

[(1)] Means in the column followed by the same letter do not differ by test of Tukey at 5 %.


## RESUMO

*Enterolobium contortisiliquum* (Vell.) Morong. é uma espécie arbórea tropical recomendada para reflorestamentos heterogêneos de áreas degradadas. Sementes de timburi apresentam baixa germinação causada pela dormência das sementes. Diferentes métodos de superação da dormência das sementes foram comparados: lixa, lixa seguida por embebição em água (25ºC) por 24 horas, embebição em água fervente seguida por embebição em água a temperatura ambiente (28ºC), e ácido sulfúrico concentrado (5, 15, 30, 60, 120 ou 180 minutos) seguido de lavagem com água corrente. Todas as sementes forma germinadas em rolos de papel a 25ºC e fotoperíodo de 12 horas. Germinação total, primeira

contagem do teste de germinação e índice de velocidade de germinação foram anotados. Escarificação mecânica (lixa), escarificação química (tratamento com ácido por 30, 60, 120 ou 180 minutos) e escarificação mecânica seguida de embebição em água fria foram eficientes em promover a germinação. Por razões práticas, escarificação mecânica é altamente recomendável para viveiros florestais.

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