

## INFLUENCE OF DISINFESTATION AND OSMOTIC CONDITIONING ON THE GERMINATING BEHAVIOR OF AUSTRALIAN ROYAL PALM (*Archontophoenix alexandrae*) SEEDS <sup>1</sup>

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**ABSTRACT** - The technique of Osmotic Conditioning, which consists of partial and controlled hydration of the seeds, has obtained success with various species of seeds, increasing the germinating span and tolerance to the adverse conditions of the environment, and has also reduced the time elapsed between sowing and the emergence of the plants. Associated to ideal storage conditions, the treatment has increased the performance of the seeds of tropical wood species. Aiming at studying the germinating environment and the effect of osmotic conditioning on the germination of seeds of the Australian Royal Palm tree, two experiments were performed. The first one evaluated the effect of disinfection of the seeds of the Australian Royal Palm tree with NaClO. The treatments applied were: 0.5% sodium hypochlorite, exposure periods of 5, 15, 30, 45, 60, 90, 120 and 240 minutes, and the fungicide Captan, as control. The treatments with NaClO did not differ in relation to the final percentage of germination and to the germination speed index, and did not differ from the treatment control. The second test evaluated solutions with the following osmotic potentials: 0.0MPa (pure water), -0.4MPa, -0.6MPa and -0.8MPa, exposed for the periods of 10 and 20 days. The final percentage of germination did not differ among the treatments. The seeds hydrated in pure water for a period of 20 days showed a germination speed index significantly superior to the other treatments, and they did not show significant differences among themselves.

Index terms: germination, sodium hypochlorite, polyethylene glycol

### INFLUÊNCIA DA DESINFESTAÇÃO E DO CONDICIONAMENTO OSMÓTICO SOBRE O COMPORTAMENTO GERMINATIVO DE SEMENTES DE PALMEIRA REAL AUSTRALIANA (*Archontophoenix alexandrae*).

**RESUMO** - A técnica de condicionamento osmótico, que consiste na hidratação parcial e controlada das sementes, tem obtido êxito com diversas espécies de sementes, aumentando a capacidade germinativa e a tolerância às condições adversas do ambiente, e, também, tem reduzido o período entre a semeadura e a emergência das plântulas. Associado às condições ideais de armazenamento, o tratamento tem melhorado a performance de sementes de espécies arbóreas tropicais. Objetivando estudar o comportamento germinativo e o efeito do condicionamento osmótico sobre a germinação de sementes de palmeira Real Australiana, foram realizados 2 experimentos. O primeiro experimento avaliou o efeito da desinfestação de sementes de palmeira Real Australiana com o NaClO. Os tratamentos empregados foram: hipoclorito de sódio a 0,5 %, v/v, períodos de exposição de 5, 15, 30, 45, 60, 90, 120 e 240 minutos, e fungicida Captan<sup>®</sup> como controle. Os tratamentos com NaClO não diferiram entre si, quanto à porcentagem final de germinação e ao índice de velocidade de germinação, não diferindo do tratamento controle. O segundo teste analisou o efeito de diferentes potenciais de soluções osmóticas: 0,0 MPa (água pura), -0,4 MPa, -0,6 MPa e -0,8 MPa, expostos pelos períodos de 10 e 20 dias. A porcentagem final de germinação não diferiu entre os tratamentos. As sementes hidratadas em água pura pelo período de 20 dias, apresentaram índice de velocidade

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de germinação, significativamente superior aos demais tratamentos, e estes não apresentaram diferenças significativas entre si.

Termos para indexação: germinação, hipoclorito de sódio, polietileno glicol.

## INTRODUCTION

Brazil is the main producer and exporter of preserved palm heart, retaining 95% of the world market (Bovi, 1998, 2002). The exports of that industrialized product have been increasing considerably, with an annual medium income of thirty million dollars (CACEX, 1990).

In agreement with IBGE, the annual production of palm heart has been around sixteen thousand tons, with 92% of it coming from the state of Pará. Due to the extractive nature of that exploration, it has been hard to get the raw product standardized, what would be possible by using cultivated palm hearts, what would allow the widening of the exports with a product of good quality (Technical Bulletin, IAC, 1998). According to data from Abrapalm - Brazilian Association of the Cultivated Palm Heart Producers - Brazil extracts four hundred million palm trees a year, from which only 3% occur of areas of sustainable management (Migliano, 2002).

The duration of the germinating process of the Australian Real Palm tree seeds (*Archontophoenix alexandrae*) ranges from 30 to 90 days, with more than 80% of the seeds germinating. The mean percentage of total germination ranges from 90 to 100% (Bovi, 1998).

Studies have been developed with the objective of increasing the germinating capacity and the tolerance of the seeds to adverse environmental conditions, as well as to reduce the time period elapsed between the sowing and the emergency of the plants (Carvalho et al., 2000). In this sense, a treatment that has itself shown to be a promising alternative is the osmotic conditioning, that consists of a controlled hydration of seeds, until reaching a certain degree of humidity of the tissues that induces the initial phases of germination, but not the protrusion of the embryonic root (Carvalho et al., 2000). This technique, associated to the ideal conditions of storage and to the seed disinfestation, can improve the use of the seeds of tropical arboreal species (Borges et al., 1994).

The use of sodium hypochlorite is one among several alternatives proposed for seed disinfestation. Such an alternative has been tested in this research, being the sodium hypochlorite used in different concentrations and different periods of immersion of the propagulum (Teixeira e Teixeira, 2004).

The objective of this work was to establish the best treatment of osmotic conditioning and of disinfestation of *Archontophoenix alexandrae* seeds, in order to establish a more efficient germination procedure.

## MATERIAL AND METHODS

The *Archontophoenix alexandrae* fruits were collected directly from trees growing at the Universidade Federal de Viçosa campus, Viçosa, MG State, when showing a red color and being completely ripe. The experiments were performed at Lab seed of Crop Science Department of Universidade Estadual do Norte Fluminense Darcy Ribeiro in Campos dos Goytacazes, RJ State

### Experiment I

The trial comprised a control treatment with the fungicide Captan (0,3g.100mL<sup>-1</sup>) and immersion of the seeds in 0.5% sodium hypochlorite solution for 5, 15, 30, 45, 60, 90, 120 and 240 minutes. The seeds of the control treatment were immersed in the fungicide solution for some seconds. The sodium hypochlorite treatments consisted in submerging the seeds for the periods of time described before, following the assembly of the germination tests.

The seeds were disposed in rolls effected with germ-test paper, stored for 45 days in a BOD- type germinating chamber, under temperatures of 30-20°C (day/night) and light/dark (8/16 hours).

Due to the high index of infestation of the seeds, detected in preliminary tests, it was necessary to establish an efficient disinfesting method.

The experimental design was entirely at random, with 9 treatments, 6 repetitions and 180 seeds per experimental unit. The data were submitted to analysis of variance and the means were compared by the test of Tukey at 5% of probability.

### Experiment II

Fresh seeds were submitted to the osmotic conditioning in solutions of PEG 6000 (polyethylene glycol), corresponding to the osmotic potentials of zero (distilled water); -0.4; -0.6 and -0.8 Mpa. The exposition periods comprised 10 and 20 days, and the solution concentrations for obtaining the osmotic

potentials, were chosen according to the table developed by Villela et al. (1991). The initial water content of the seeds was determined by the method of the stove at 105°C for 24 hours (Brasil, 1992).

The solutions of polyethylene glycol 6000 were added of 0.2% of the fungicide Captan®.

The gerbox-type seed boxes were put in a BOD-type germination chamber, at 25°C, for the established periods.

At the end of the soaking periods, the seeds were washed in running water, for one minute, and immediately submitted to the germination tests (Braccini et al., 1997).

The evaluations were accomplished each 3 days, taking into consideration the seeds with at least 5mm-long roots.

The experimental design was a 4 x 2 factorial, entirely at random, with 4 repetitions and seeds per experimental unit. The data were submitted to the Analysis of Variance and the means compared by the test of Tukey at 5% of probability.

## RESULTS AND DISCUSSION

### Experiment I

The results, according to the Figure 1, showed that the seeds for the control treatment (0.3% Captan) and the ones immersed in solution of 0.5% sodium hypochlorite for 5, 10, 15, 30, 45, 60, 120 and 240 minutes, started germinating on the 15<sup>o</sup> day after the beginning of the tests, and the seeds immersed for 90 minutes started germinating on the 18<sup>o</sup> day.

The analysis of variance showed that treatments with NaClO didn't differ among themselves as for the final percentage of germination and for the index of germination speed (Figures 1 and 2), not differing from the treatment

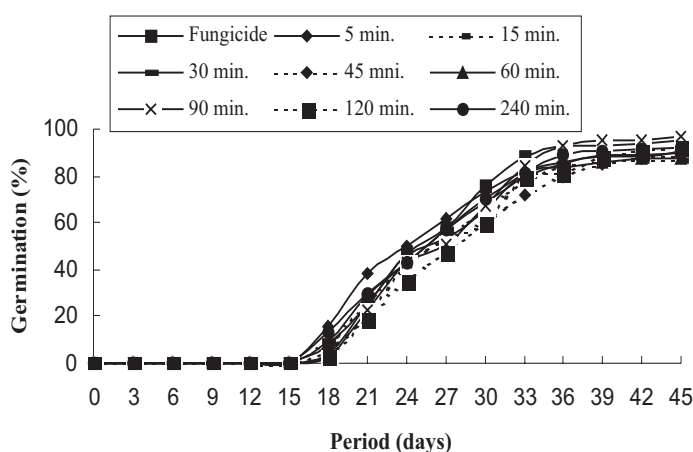


FIGURE 1. Germination (%) of Australian Real palm tree (*Archontophoenix alexandrae*) seeds, as affected by the duration of the immersion in 0.5% NaClO solution.

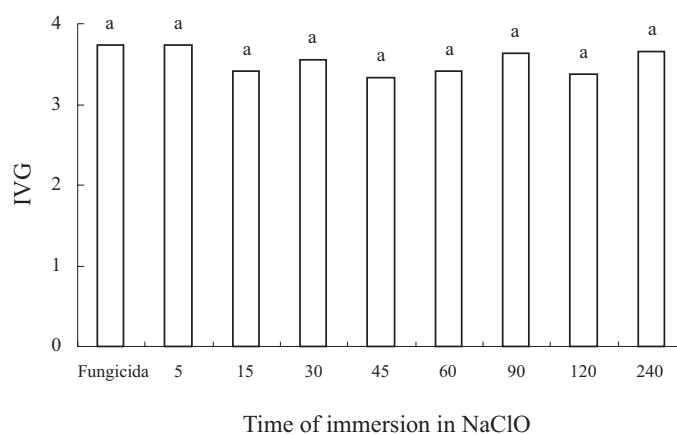


FIGURE 2. Index of Germination Speed of Australian Real palm tree (*Archontophoenix alexandrae*) seeds as affected by the duration of the immersion in 0.5% NaClO solution.

with 0.3% Captan. The high germination percentages and the high IVG, are clear evidences of the NaClO not being poisonous to the seeds.

The reported results allow the conclusion that sodium hypochlorite is efficient for the Australian real palm tree seed disinfection. So, it should be recommended for this purpose, because besides not being poisonous to the seeds and to the operator, it is also of easy handling and obtaining, being of low cost as well.

### Experiment II

The data of the Figure 3 shows that the seeds undergoing hydration with pure water, for the period of 10 days, showed

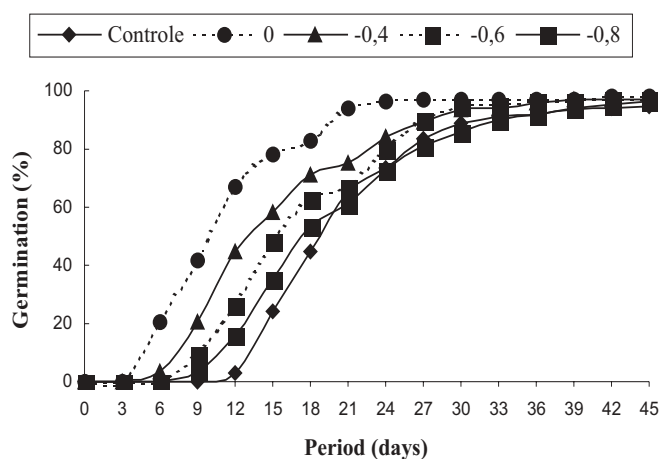


FIGURE 3. Germination (%) of Australian Real palm tree (*Archontophoenix alexandrae*) seeds as affected by the osmotic potentials (MPa) for the period of 10 days.

initial germination in the (3<sup>rd</sup>) day after the beginning of the tests, accelerating the germination ever since. The seeds immersed in PEG 6000 solution, in the potential of -0.4 MPa, began germinating on the 6<sup>th</sup> day, and, in the osmotic potentials of -0.6MPa and -0.8MPa, on the 9<sup>th</sup> day, followed by the control treatment, on the 12<sup>th</sup> day.

It is observed (Figure 4) that the seeds hydrated in pure water and in the potentials of -0.4MPa, -0.6MPa and -0.8MPa, for the duration of 20 days, began germinating soon after the installation of the tests. The control treatment seeds (pure water or zero MPa) started germinating on the 12<sup>th</sup> day; however, the germination was accelerated, when the seeds were pre-soaked for 20 days, as compared to 10 days.

As shown by the analysis of variance at 5% of probability, and considering the effect of the osmotic potentials in the range of the studied periods, there were not statistical differences amongst treatments, as for the final percentage of germination of the seeds.

The Figure 5 shows that the values of the index of germination speed increased, when the exposition period of the seeds to the osmotic solutions ranged between 10 and 20 days. Concerning the influence of the exposition periods, inside of the established osmotic potentials, it was noted that the seeds hydrated in pure water for 20 days showed IVG significantly higher than the IVG of the other treatments, and that these ones didn't show significant differences among themselves. When the seeds were hydrated for 10 days, significant differences were not observed among the treatments.

The seeds of the Real Australian Palm tree didn't show

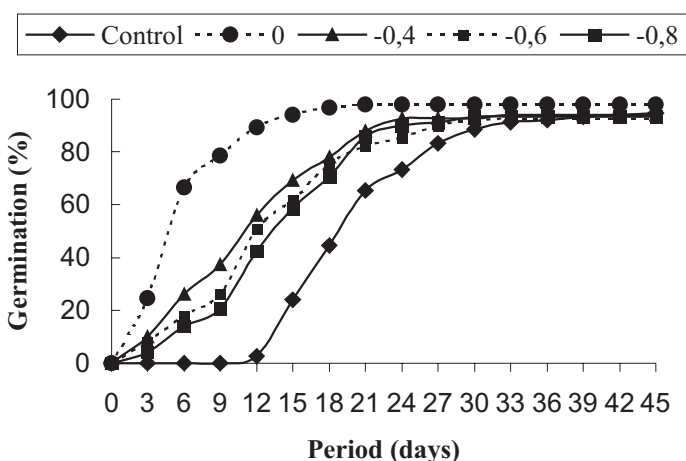


Figure 4. Germination (%) of Australian Real palm tree (*Archontophoenix alexandrae*) seeds as affected by the osmotic potentials (MPa) for the period of 20 days.

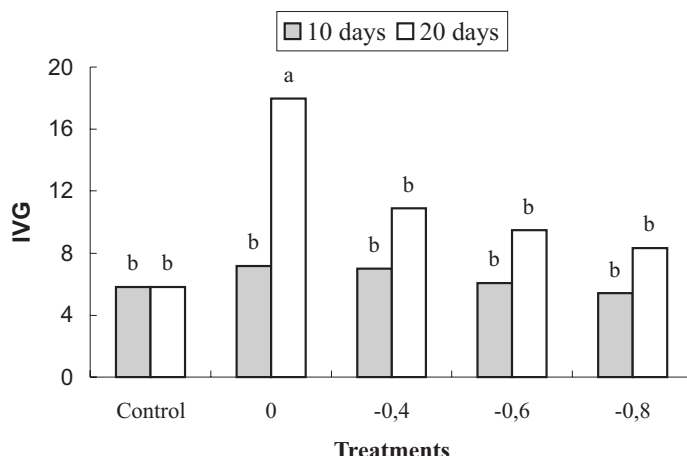


FIGURE 5. Index of Germination Speed of Australian Real palm tree (*Archontophoenix alexandrae*) seeds as affected by the osmotic potentials (MPa) for the periods of 10 and 20 days.

radicle protrusion when submitted to the different osmotic potentials and different exposition times; however, the seeds showed a small opening of the operculum, when exposed for 20 days. The submerged seeds showed larger opening of the operculum in osmotic potentials of -0.4MPa and -0.6MPa, than in the -0.8MPa. The control treatment didn't show opening of the operculum.

The Figure 4 shows that treatment in pure water (zero MPa), for 20 days, induced greater germination uniformity, agreeing with Fernandes et al. (1994) results with bean seeds.

The results here reported show that the immersion of Australian Real Palm tree seeds in pure water (zero MPa) is the best treatment to stimulate the germination uniformity of freshly - harvested seeds.

CONCLUSIONS

NaClO solution at 0.5%, v/v, is efficient for disinfection of Australian Real palm tree seeds, without affecting germination.

The pre-soak treatment of the seeds in pure water (zero MPa), for 20 days, promotes a higher final percentage of germination and a higher germination speed index of the seeds as well.

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