

*Full Length Research Paper*

## **Priming of *Urochloa brizantha* cv. Xaraés seeds**

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**Priming is one of the several physiological methods used to increase the performance of seeds. To evaluate the effects of priming, seeds of *Urochloa brizantha* cv. Xaraés were primed under different osmotic potentials ( $\psi_s = 0.0$ ;  $-0.5$ ;  $-1.0$  and  $-1.5$  MPa) and temperatures (15 and 25°C) for 24, 48, 96 and 144 h. The germination percentage and germination speed index were evaluated, in a completely randomized design with four replications. It was verified that priming increases percentage and germination speed index of *U. brizantha* cv. Xaraés seeds cultivar, and these should be primed in water at 25°C ( $\psi_s = 0,0$  MPa) for 85 h.**

**Key words:** Brachiaria grass, germination, forage seeds.

### **INTRODUCTION**

Cultivated pastures represent the basis of Brazilian beef cattle production (Laura et al., 2009; Paniago et al., 2014); the genus *Urochloa* (syn. *Brachiaria*), native from the African tropical savannas, is an important forage input for the country (Masetto et al., 2013; Batista et al., 2016a). According to IBGE (2007), there are approximately 95 million hectares cultivated with *Urochloa* species in Brazil, and occupied by *Urochloa brizantha* (Hochst. Ex A. Rich.) RD Webster (60 million ha), *U. decumbens* (Stapf) RD Webster (25 million ha), *U. humidicola* (Rendle) Morrone and Zuloaga (10 million ha). In this sense, Brazil is the largest seed producer, consumer and exporter of tropical forage species

(Paniago et al., 2014; Batista et al., 2016b), exporting about 6,896.68 tonnes of seeds in 2017/2018 (MDIC, 2018).

For good quality pasture establishment, besides adequate management, it is very important to use seeds with high germinative power and vigor (Cardoso et al., 2014; Cardoso et al., 2015). Species with irregular seedlings emergence lead to delayed pasture establishment, which may favor weeds emergence in newly sown pastures (Cardoso et al., 2014). Among the forages, one of the main obstacles to uniform germination is seed dormancy (Batista et al., 2016b). This occurs in *U. brizantha* (Lacerda et al.,

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2010; Batista et al., 2016a), the most used forage species in Brazil and with the highest export seed volume (Gaspar-Oliveira et al., 2008).

Several studies evaluated the use of dormancy overcoming methods of *U. brizantha*, with emphasis on chemical scarification with sulphuric acid (Garcia and Cícero, 1992; Usberti and Martins, 2007; Gaspar-Oliveira et al., 2008; Cardoso et al., 2014). However, this method may reduce the seeds' physiological potential (Cardoso et al., 2014), as well as presenting risks to workers and the environment (Cardoso et al., 2014), if it is not properly manipulated and disposed. A promising alternative that has not yet been studied to accelerate and standardize the species seed germination and, consequently, pasture stand uniformity, is seeds priming or osmotic conditioning (Batista et al., 2016a).

Priming treatments are directed to phases I and II of seeds imbibition, when the mechanisms of damaged macromolecules and cellular structures are repaired. During these hydration phases, required metabolic processes for seeds germination are activated without allowing the protrusion of the primary root, so, seeds do not reach phase III of imbibition (Contreiras-Rodrigues et al., 2009; Marcos-Filho, 2015). Therefore, priming can provide improvement in the expression of vigor, in addition to activating the physiological processes of germination, without the emission of the primary root (Contreiras-Rodrigues et al., 2009; Cardoso et al., 2015). The aim of this work was to evaluate the effects of priming on seeds germination and vigor of *U. brizantha* cv. Xaraés.

## MATERIALS AND METHODS

This study was carried out at Embrapa Beef Cattle, Campo Grande (MS), Brazil, from February to October 2006. Priming was tested on *U. brizantha* cv. Xaraés seeds, produced in the 2004/2005 harvest. Priming tests were done to select the best treatment, using direct immersion method; the seeds were immersed in aqueous solutions with osmotic potentials ( $\psi_s$ ) of: 0.0 (distilled water), -0.5; -1.0 and -1.5 MPa, obtained with PEG 6,000 solution (polyethylene glycol 6,000), according to Villela et al. (1991), under constant aeration. Five g of seeds of each cultivar was placed into 100 mL of PEG 6,000 solution, in the specific concentration assigned to each treatment. The priming was tested with time exposures of 24, 48, 96 and 144 h and under two temperature regimes: controlled temperature (15°C, in germination chamber) and at room temperature ( $\pm 25^\circ\text{C}$ ). After priming, seeds were washed in running water and put to dry at room ambient temperature for 24 h. As control treatment we used seeds without priming (untreated seeds). After drying, seeds were germinated in four repetitions of 100 seeds per treatment, on germitest paper and moistened with the equivalence of 2.5 times the substrate of distilled water. The seeds were incubated in germination chamber Biochemical Oxygen Demand (BOD) with photoperiod of 8 h and alternating temperature cycles of 20 (for 16 h) and 35°C (for 8 h) for 21 days, according to the Seed Analysis Rules (Brasil, 2009). The variables evaluated were:

Germination (%): Considered as germinated seeds the ones which

presented at least 2.0 mm of seminal root (Juntilla, 1976).

Germination speed index – GSI: determined according to the formula of Maguire (1962),  $GSI = \Sigma(n/t)$

where: n= number of germinated seeds in the computed first, second, ..., and last count; t= number of days from sowing to first, second, ..., and last count.

For each variable, an analysis of variance and polynomial regression was performed, with the significance tested through an F test at a significance level of  $p \leq 0.05$ .

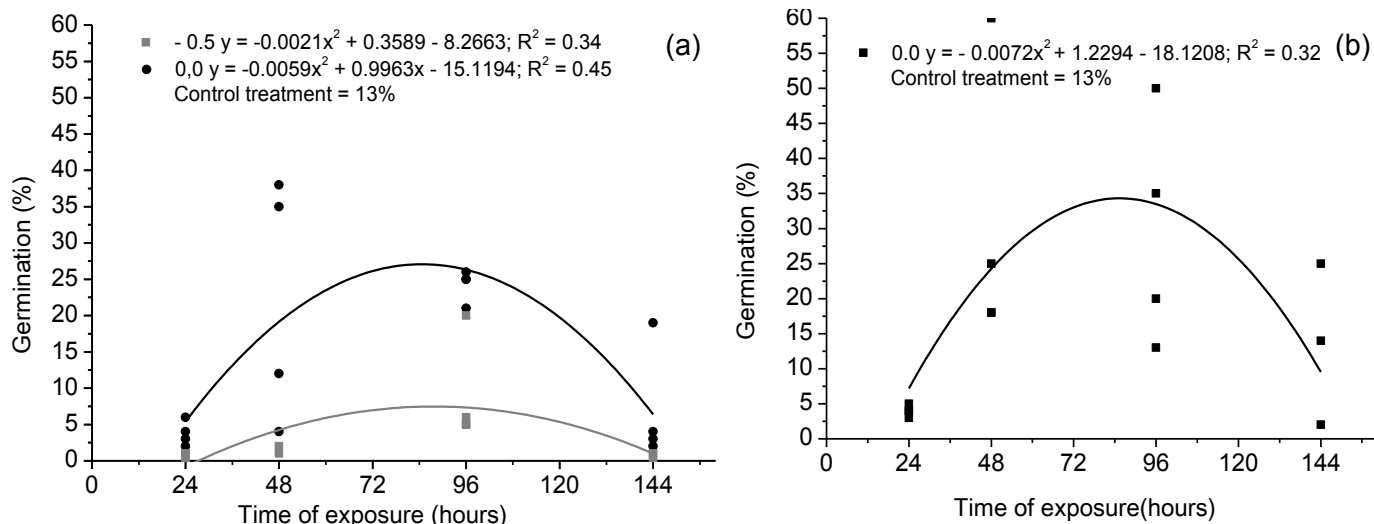
## RESULTS AND DISCUSSION

Germination percentage of *U. brizantha* cv. Xaraés seeds was influenced by the three factors analyzed: temperature, exposure times and osmotic potential (Figure 1). At 15°C priming, significant relationships were found between germination percentage and the exposure times for -0.5 and 0.0 MPa osmotic potentials, being the best result found for conditioning in distilled water for 84 h. In this situation it was obtained the germination of 26.94%, about twice that obtained in the control treatment (untreated seeds) (Figure 1a). At 25°C priming, a significant relationship was obtained only in distilled water priming. At this temperature, highest germination (34.36%) was obtained in priming for 85 h, exceeding both the control treatment and priming in distilled water at 15°C (Figure 1b).

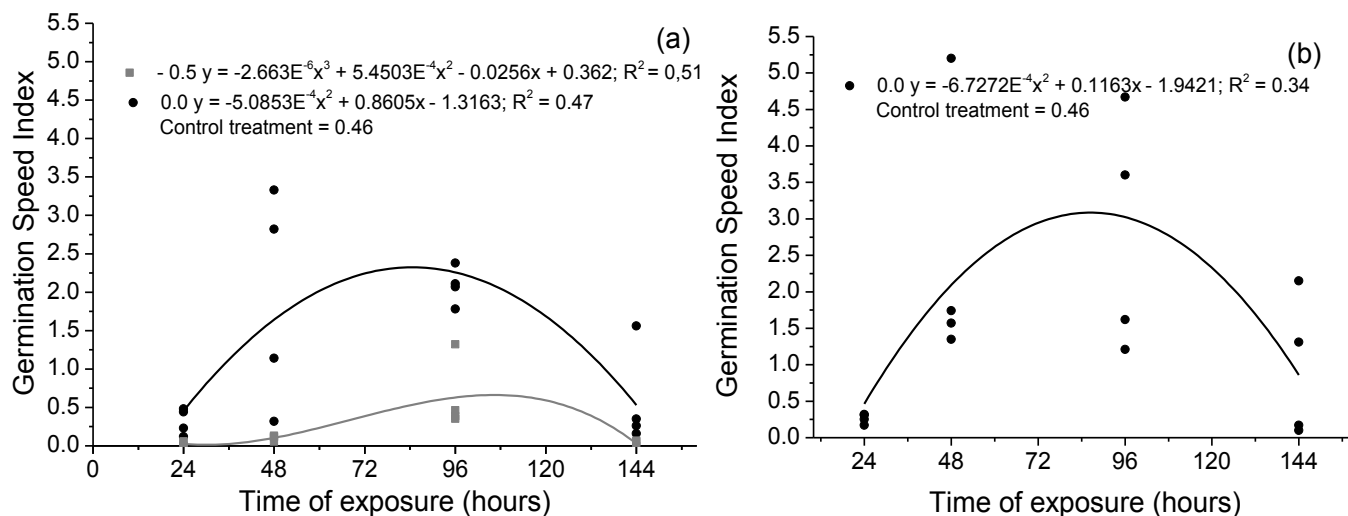
Priming in distilled water at 25°C resulted in an increase of 7.43% in germination compared to the temperature of 15°C. In this way, it is possible to infer that the temperature represented the preponderant factor to germination increase, since the time of exposure of the seeds to obtain the maximum germination was practically the same. Besides that, considering that the priming resulted in germination increase in relation to the control treatment, it is also possible to perceive that it acted as a treatment overcoming dormancy via humid heat. Contrary results were observed by Bonome et al. (2006), who observed that the reduction of the osmotic potential of the conditioning solution resulted in a germination percentage increase of *U. brizantha*. However, these results were lower than those of control treatment using scarified (83.5%) and unscarified (81.5%) seeds, evidencing that the seeds evaluated did not present primary dormancy.

Forage seeds are marketed based on their cultivation value, taking into account their germination percentage and purity (Brasil, 2008). However, germination results obtained in the laboratory do not always reproduce in the field. In this way, it is essential to identify vigor characteristics of the same, as the Germination Speed Index (GSI), since these are variable responses that will be closer to the real seeds performance in the field (Marcos-Filho, 2015).

GSI was influenced by the factors analyzed in a similar way to the percentage of germination (Figure 2). At 15°C



**Figure 1.** Germination percentage of *U. brizantha* primed seeds, Xaraés cultivar, under different osmotic potentials ( $\psi_s = 0.0, -0.5, -1.0$  and  $-1.5$  MPa), exposure times (24, 48, 96 and 144 h), conditioned at 15°C (a) squares represent 0.5 MPa and dots represent 0.0 MPa; and 25°C (b) squares represent 0.0 MPa. Non-significant relationships were not represented.



**Figure 2.** Germination Speed Index of *U. brizantha* primed seeds, Xaraés cultivar, under different osmotic potentials ( $\psi_s = 0.0, -0.5, -1.0$  and  $-1.5$  MPa), by different exposure times (24, 48, 96 and 144 hours), conditioned at 15°C (a) squares represent 0.5 MPa and dots represent 0.0 MPa; and 25°C (b) dots represent 0.0 MPa. Non-significant relationships were not represented.

priming, significant relationships were found between GSI and exposure times for  $-0.5$  and  $0.0$  MPa potentials (Figure 2a). However, the highest GSI (2.32) was obtained for conditioning in distilled water for 85 h, a value that exceeded five times that obtained in the control treatment. At 25°C priming, a significant relationship was obtained only in the distilled water conditioning, with GSI higher value of 3.1, surpassing both the control treatment (by 6.7 times) and the conditioning in distilled water at 15°C (Figure 2b). Analyzing the physiological

quality of *U. brizantha* cv. Xaraés seeds it is confirmed that priming at 25°C again worked as a treatment to overcome seeds dormancy. However, its performance on seed vigor was more expressive than on germination. Thus, the manifestation of priming on seed vigor would be decisive for plants establishment in field, resulting in a stand with faster and more uniform emergence.

Although most of the germination studies of *U. brizantha* recommend chemical scarification to overcome seed dormancy (Garcia and Cícero, 1992; Usberti and

Martins, 2007; Gaspar-Oliveira et al., 2008), the present study demonstrated the possibility of using moist heat treatment for this purpose. Our results demonstrated that the use of this treatment, simpler and environmentally safer, resulted in an increase in both germination and vigor of the evaluated seeds.

## Conclusions

Priming increases percentage and germination speed index of *U. brizantha* cv. Xaraés seeds cultivar and these should be primed in water at 25°C ( $\psi_s = 0.0$  MPa) for 85 h.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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