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Research Paper

OVERCOMING SEED DORMANCY OF *Erythrina velutina* Willd. – FABACEAE

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Abstract

The *Erythrina velutina* is a tree that has great potential medicinal, ornamental and craft. The seed dormancyaffectsthe production ofseedlingsofspecies. The aim of this study was evaluate methods of dormancy overcoming. We applied the following pre-germination treatments: T1 - seeds intact (without any pre-treatment), T2 – cut of the seed coat on theembryonicaxis, T3 – cut of the seed coat contraryto the embryonic axis, T4 - seeds immersed in water at 70°C, T5 - seeds immersed in water at 80°C, T6 - seeds immersed in water at 100°C. The following variables: the speed of emergence index and the final percentage of seedling emergence, length of shoot and root, the dry mass of shoot and root. The highest percentage of emergence, speed of emergence index, length and dry weight of aerial part occurred in T2.The lengthof root androot dry masswere higher inT2and T3. Mechanical scarification through cut of the seed coat on theembryonicaxis (T2) is the most effective treatment to overcoming dormancy of seeds of the *Erythrina velutina* tree.

Key words: *propagation, thermal treatment, mechanical scarification*.

INTRODUCTION

Erythrina velutina Willd. (Fabaceae) isfrequently used as ornamental plant and in projects to restore degraded areas [1]. It is a tree with medium sized, branched, can reach 15 m in height, is of great drought resistance and rapid growth[2] thus it is very important in semiarid region of Brazil and Africa.

Stem bark and fruits of *Erythrina velutina* are used in folk medicine as expectorant, soothing, sedative for coughs and bronchitis, as well as fortreatment ofwormsand hemorrhoids[2]. Brazilian laboratorieshave demonstratedin preclinicalstudies, anxiolyticactivities[3], sedativeand analgesic[4] in extracts of *Erythrina* spp.

Erythrina velutina presents cutaneous numbness, which was also observed in other species of the genus *Erythrina*[5]. Thecutaneousnumbnessiscommon occurrencein many species

oflegumesand constitutesone of thecrucialfactors forthe persistenceof the speciesin the field,under conditions ofadverse weather[6].
The rupture of the integument through scarification method, increases water permeability, can induce increased sensitivity to light and temperature, gas permeability, removal of inhibitors and promoters and the possibility of injury to the tissues, thus having a significant influence on metabolism of the seeds and hence dormancy [6]. Hot water is widely used and has proven effective in overcoming dormancy of *Acacia mangium*Willd. [7]and *Guazuma ulmifolia* Lam[8].
Some studies have been developed with the aim of breaking dormancy in *Erythrina velutina*. It was used chemical and mechanical scarification and found that the use of sandpaper in one or both ends without soaking the seed in water was the most effective treatment to overcome dormancy[5]. It was used mechanical scarification, chemical scarification and thermal treatment and found that treatment with sandpaper No. 10 on the opposite end of the hilum was more efficient (88 % germination), while the thermal and chemical treatments do not show satisfactory results reaching index maximum of 48 % compared to control which was 32 %[9] .
The process of scarification with sandpaper despite being effective in breaking dormancy of *Erythrina velutina* is very laborious. Thus, knowledge of new, more efficient, more economical and practical methods for overcoming seed dormancy in *Erythrina velutina* can lead to obtaining large amount of germinated seeds to the rapid establishment of this species in the field and for the production of seedlings. Therefore, the aim of this study was to evaluate the dormancy breaking treatments seeking method that results in higher percentage of seedling emergence and early growth *Erythrina velutina*.

MATERIALS AND METHODS

The seeds used were obtained in November 2011 in seven plants on the campus of the Federal Rural University of the Semi - Arid (UFERSA) Mossoró - RN, and remained packed in plastic bags in cold camera (18 °C ± 3 °C) in the Laboratory of seeds UFERSA yet being used. The experiment was conducted in the greenhouse of the Department of Plant Sciences UFERSA.
The experimental design was randomized blocks with six treatments. The treatments were: T1 - seeds intact (without any pre-treatment), T2 – cut of the seed coat on theembryonicaxis, T3 – cut of the seed coat contraryto the embryonic axis, T4 - seeds immersed in water at 70 °C for one minute, T5 - seeds immersed in water at 80 °C for one minute, T6 - seeds immersed in water at 100 °Cfor one minute, and each treatment consisted of four replicates of 25 seeds. After each pretreatment, seeds were sown in plastic trays containing washed sand 30x40x10 cm, previously sterilized, moistened to 60 % capacity retention. The humidity was maintained throughout the experiment by daily irrigations, by nebulization in a greenhouse.
The experiment lasted 30 days and the following characteristics were observed, percentage of seedling emergence, IVE (Speed Emergency Index), aerial part length and root lenght, dry weight of aerial part and root. To determine the speed of emergence index (IVE), from the day when the first seedling emerged, was recorded daily the number of emerged seedlings until stabilization of the emergence process [10].The length of shoot and root was measured with graduated scale in cm. To determine the dry mass, plant parts (roots and shoots) were placed in separate paper bags and placed in greenhousecirculationofair at a temperature of 65 °C. The dry weight of roots and shoots was determined separately in analytical balance (0.001 g) when reached three constants measurements.
Data were subjected to analysis of variance by F test and the means were compared by Scott Knott test at 5 % probability using the statistical program SISVAR[11].

RESULTS AND DISCUSSION

The highest values of IVE were obtained by seeds subjected to blunt on the embryonic axis followed by blunts contrary to the embryonic axis (Table 1). The other treatments did not differ significantly and the values were very low, indicating that the process of emergence was slow.

TABLE 1.Speed of emergence index (IVE) and emergence percentage (E %) of *Erythrina velutina*in six treatments of scarification. UFERSA, Mossoró, RN, 2011.

Treatments	IVE	E (%)
T1– intact seeds, witness	0,36 c	11,0 b
T2– cut of the seed coat on theembryonicaxis	5,16 a	87,0 a
T3– cut of the seed coat contraryto the embryonic axis	3,53 b	82,0 a
T4– seeds immersed in water at 70°C	0,87 c	28,0 b
T5– seeds immersed in water at 80°C	0,61 c	17,0 b
T6– seeds immersed in water at 100°C	1,06 c	29,0 b
CV	21,80	28,69

Means followed by the same letter do not differ significantly by the Skott Knott test at 5 % probability.

Working with chemical scarification (sulfuric acid) and mechanical (80 in sandpaper and gravel), [12]found that the rate of speed of emergence, of scarified seeds with sandpaper at the end opposite the micropyle and both ends were better than soaking of seeds of *Erythrina velutina* in water.

The highest seedling emergence was obtained in seeds subjected to mechanical scarification by pruning shear. The other treatments showed very low levels and showed no difference as compared to control. Similar results were obtained by [9] in to treatments to overcome dormancy *Erythrina velutina* using mechanical scarification with sandpaper No. 10, at the opposite end to the hilum , which was achieved percentage of emergence of 88 %. These researchers also found that heat treatment showed maximum rate of 48 % germination compared to the control which was 32 %. Mechanical scarification with sandpaper Water Nº 80 or not followed by immersion was the most effective treatment to break the seed coat from the seeds of *Erythrina velutina*[12].

Work developed in other species also proved the efficiency of methods that break seeds coats in overcoming dormancy. The puncture the integument opposite the radicle protrusion and abrasion with sandpaper region were responsible for the highest percentage of germination of *Pterogynenitens* Tul. [13]. In studies of *Caesalpinia ferrea*[14]found that mechanical scarification on the opposite to the hilum, or near the end of this region, provides break dormancy in seeds

Immersion in water at temperatures of 70, 80 and 100 °C were not effective in overcoming dormancy in seeds of *Erythrina velutina*. Probably the permanency time at these temperatures was not enough, because the seeds were only one minute. Thus studies of different times of immersion are needed regarding temperatures.

Although the method of overcoming dormancy in hot water immersion were widely used in legume species and considered advantageous and of low cost, inhibited the seed germination of *Mimosa caesalpiniaefolia* Benth[15](Martins *et al*. 1992) and *Stryphnodendronpulcherrimum* (Willd.) Hochr.[16]. On the other hand, other studies have shown good results with the use of hot water, such as [17]. Oliveira *et al*. (2003) with *Peltophorumdubium* (Spreng.) Taubert. and [18]. Smiderle*et al*. (2005) with *Acacia mangium*Willd.

With respect to the early development of the plant it was found that higher aerial part length occurred with treatment T2 and root length in the T2 and T3, proving its efficiency also in increase vigor of the seed (Table 2).

TABLE 2. Mean values of shoot length (CPA), root length (CR), aerial part dry mass (MSPA) and root (MSR) of seedlings of *Erythrina velutina* of six treatments of scarification. UFERSA, Mossoró, RN, 2011.

Tratamentos	CPA (cm)	CR (cm)	MSPA (g)	MSR (mg)
T1– intact seeds, witness	1,75 d	2,08 c	0,123 c	0,033 b
T2– cut of the seed coat on theembryonicaxis	13,18 a	9,58 a	0,310 a	0,055 a
T3–cut of the seed coat contraryto the embryonic axis	9,81 b	8,25 a	0,245 b	0,060 a
T4– seeds immersed in water at 70°C	2,17 d	2,10 c	0,145 c	0,028 b
T5– seeds immersed in water at 80°C	3,29 c	3,61 b	0,148 c	0,050 a
T6– seeds immersed in water at 100°C	4,38 c	4,92 b	0,248 b	0,080 a
CV	17,85	23,56	18,95	31,62

Means followed by the same letter do not differ significantly by the Skott Knott test at 5 % probability.

It was found greater length of the main root for *Erythrina velutina* with mechanical scarification with sandpaper at the end opposite the micropyle without soaking and when the seeds were subjected to scarification at the end opposite the micropyle and both ends without soaking, originated with greater seedling shoot length[12]. Unlike what occurs in *Erythrina velutina*, the length of seedlings (roots and shoots) was not an effective test to distinguish the effect of seeds subjected to different treatments to overcome dormancy in *Bauhinia divaricata*[19] and *Caesalpiniapyramidalis*[20].
As for the dry mass of aerial part and roots of seedlings of *Erythrina velutina* higher dry matter content of shoots was obtained with seedlings derived from seeds in T2 and dry mass of root of witness and T4 treatment showed very low values. In work carried out by [20]with *Erythrina velutina*seeds subjected to mechanical scarification with sandpaper on both ends and seed soaking in water for 12 hours yielded seedlings with higher dry matter of the roots.
Considering the results obtained for the percentage of emergence, speed of emergence index, and vigor, mechanical scarification by cut of the seed coat on the embryonic axis is the most effective treatment to overcome dormancy of seeds of *Erythrina velutina*.

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