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BIOMETRY AND GERMINATION OF *Tabebuia caraiba* SEEDS AT DIFFERENT TEMPERATURES AND SUBSTRATES

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ABSTRACT

The aim of this work was to evaluate the seeds biometry and the adequate temperature and substratum to germination and vigor test of *T. caraiba* seeds. In the biometric evaluation were estimated the length with wing, length without wing, width, thickness and weight without wing from 30 random seeds. Were evaluate the germination percentage and the seeding performance through the first count, average time of germination and seedling dry weight in paper (paper roll), sand, sand + vermiculite (1:1) substrates, in three temperatures, 25, 30 and 35 ºC, under 12 hours of photoperiod. The seedling dry weight was evaluated only in the paper substratum. It concludes that *T. caraiba* seeds have, in average, length with wing, length without wing, width, thickness and weight without wing of 54.00, 19.88, 15.29, 2.58 mm and 0,18 g, respectively. The germination test and vigor evaluation of *T. caraiba* seeds should be done in paper substratum at 30 ºC.

Keywords: forest species, germination, seed analysis,yellowipe, ipeparatudo, viability.

INTRODUCTION

Tabebuia caraiba (Mart.) Bureau, known as yellow ipê or caraibeira, is an arboreal specie, belonging to Bignoniaceae family. In Brazil, can be find in different regions however, the indiscriminate exploitation has led to the population decline (Silva et al., 2011). The specie

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has potential for use in restoration of degraded areas, gardens and parks ornamentation, construction, (Lorenzi, 2002) and pharmaceutics industry.

In the view of species conservation and restoration of degraded areas, the seedlings production is the first step and to succeed in this process, the knowledge about germination of each specie is essential. According to Garcia et al. (2012) the basics information's about *T. caraiba*are incipient, difficulting the seed analysis and seedlings production.

Among the procedures for seed testing, the germination test is use to determine the proportion of alive seeds that are able to produce normal plants under favorable conditions (Popinigins, 1985). As the seeds have variation on physiological response at different temperatures and substrates, is recommend to study the influence of these components on the germination of each species of interest, providing support for their analysis (Stockman et al., 2007).

The ideal substrate should maintain a proper ratio of water availability and aeration and supply the light requirement for the specie, facilitating the seedling evaluation. Besides the substrate, the temperature is an important factor in germination test. An appropriate temperature must be used to allow a maximum germination in a minimum period of time (Popinigins, 1985).

Among of *Tabebuia* species, different temperatures and substrates for germination are indicated: *T. aurea*is recommended 35 °C (Cabral et al., 2003) or 30 and 35 °C (Pachecoet al., 2008); *T. cassinoide* is indicated germination in sand at 30 °C (Bianchetti et al., 1995); *T. rosea*is suggested the range between 20-35 °C (Socolowski & Takaki, 2007); *T. roseo-alba* is indicated 30 °C in roll paper substrate (Stockman et al., 2007); and *T. chrysotricha, T. roseo-alba* and *T. serratifolia*is recommended between 20 and 30 °C (Santos et al., 2005).Keeping all in this view, this study accomplished to evaluate the seed biometry, the suitable temperature and substrate for the germination and vigor test of *Tabebuia caraiba* seeds.

MATERIAL AND METHODS

The research was performed with *Tabebuia caraiba* (Mart.) Bureau seeds, collected in October 2014, in Cuiaba - Mato Grosso, when the fruits were already-opened. In sequence, the seeds were removed from the fruits and the sample was homogenized for subsequent water content determination at 105 °C for 24 hours (Brasil, 2009).Then, the biometrics evaluations were done using a digital caliper (0.01 mm) and a semi-analytical balance (0.0001 g) estimating the total length, length without wing, width, thickness and fresh weight without wing, using 30 seeds separated at random.

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The different substrates was evaluated with four repetitions of 25 seeds, using paper (paper roll with four sheets of germitest paper), on sand and sand + vermiculite (at 1:1 ratio), sown in transparent plastic boxes (30 x 21 x 10 cm). The germitest paper was imbibed in distilled water at a proportion of three times the paper weight. After sowing the rolls were packaged in plastic bags to avoid water exchange with the environment. The sand and sand + vermiculite substrates were moistened to 60% of field capacity being conducted a daily water replacement for moisture maintenance. The containers were placed in BOD chambers at 25, 30 and 35 °C temperatures with 12 hours photoperiod.

Seeds were daily evaluated during 14 days, assuming as germinated the seed that had root protrusion of at least two millimeters. The fifth day after sowing was considered the first count of germination and germination percentage was obtained at the 14^{TH} day after sowing. At the end the mean germination time was calculated according to the equation proposed by Labouriau (1983).

The seedling dry matter was evaluate following the recommendation of germination test being performed only on paper substrate for better differentiation of the temperature effect on the seedling initial growth. On the 11^{TH} day after sowing the cotyledons of normal seedlings were removed and these were dried on air forced circulation stove at 80 °C for 24 hours (Nakagawa, 1999).

The research was conducted in a completely randomized design in a factorial 3 x 3 (three substrates x three temperatures) with four replications. The data were submitted to variance analysis and when significant the Tukey test was realized (α 0,05).

RESULTS AND DISCUSSION

The average of seeds water content in the collection period was 6.97%. In table 1 is presented the biometrics of *T. caraiba* seeds. The average of total length was 54.00 mm and after remove the wings the length average decrease to 19.88 mm. The width average of the seeds was 15.29 mm, thickness of 2.58 mm and the fresh weight 0.18 g without wings.

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Table 1: Minimum, maximum, average, standard deviation (SD) and coefficient of variation (CV), relative to the biometric characterization of *Tabebuia caraiba* seeds.

	Total length (mm)	Length without wing (mm)	Width (mm)	Thickness (mm)	Fresh weight (g)
Minimum	48.00	17.68	13.05	1.90	0.16
Maximum	61.00	22.27	16.91	3.19	0.20
Average	54.00	19.88	15.29	2.58	0.18
SD	3.66	1.11	0.85	0.30	0.01
CV (%)	6.77	5.59	5.55	11.81	7.20

Seeds of *T. chrysotricha* measure averaged 27.8 x 7.2 x 3.0 mm (with wings) and 6.4 x 4.7 x 3.0 mm (without wings), with 0.31 g of mass without wings(Oliveira et al., 2008). *T. aurea* seeds, have average dimensions of 57.8 x 20.6 x 3.1 mm (with wings) and 17.3 x 13.3 x 1.7 mm (without wings), with average mass of 0, 23 g (without wings) (Oliveiraet al., 2006). Thus, seeds of *T. chrysotricha*are biometrically smaller while *T.aurea* seeds are larger when compared to *T. caraiba* seeds.

Evaluating the coefficient of variation, the characteristic with highest variation was the thickness wherein the length without wings and the width of the seed showed the smallest values. Santos et al. (2009) obtained low coefficient of variation values for length, width and fresh weight data of *T. chrysotricha* stating that for these characters the environmental influences is lower.

Features such as mass and size allow seeds differentiation, enabling emergency standardization and improvement, the seed vigor and the obtaining of similar size or seedling vigor; thus, biometric characterization may be used in the formation of homogeneous lots (Carvalho & Nakagawa, 2012).

As to germination percentage, the substrates sand and sand + vermiculite were betterthat germitest paper, however, regardless of the substrate, the *T. caraiba* seeds germination percentage was over 90% (Table 2).

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Table 2: Percentage, first count and mean time of germination of *Tabebuia caraiba* (Mart.) Bureau seeds on different substrates and temperatures.

Temperature	Paper	Sand	Sand + Vermiculite	Average	CV (%)
		Germinationpercentage (%)			
25ºC	91*	97	98	95 b	3,38
30ºC	99	100	100	100 a	
35ºC	93	100	98	97 ab	
Average	94 B	99 A	99 A		
		Germination first count (%)			
25ºC	91 aA	13 bB	3 bB	39 b	8,60
30ºC	99 aA	66 aB	56 aC	74 a	
35ºC	93 aA	68 aB	51 aC	73 a	
Average	94 A	49 B	36 C		
		Mean germination time(days)			
25ºC	2,22 aA	6,26 bB	7,67 bC	5,38 b	5,50
30 ºC	2,10 aA	5,18 aB	5,59 aB	4,29 a	
35ºC	2,17 aA	5,13 aB	5,74 aC	4,35 a	
Average	2,17 A	5,52 B	6,33 C		

* Average followed by the same letter, lowercase on the column and uppercase on the line, do not differ statistically by Tukey test at 5% significance level. CV: coefficient of variation.

Martins et al.(2008) evaluating *T. chrysotricha* seeds affirm that sand substrate is the most favorable for germination test and seedling growth. According to Pacheco et al. (2008) paper and sand substrates favor seeds germination and early development of *T. aurea* seedlings.

In this research, the sand and sand + vermiculite sowing was carried out superficially without physical impediment to seedling emergence, simulating the natural situation of ecosystem seed germination, however, this substrates increases the mean germination time.

According to Stockman et al.(2007) depth sowing can restrict the emergence of *T. roseo-alba* seedlings once the Bignoniaceae family seeds are widely dispersed by wind being deposited on soil surface.

Evaluating the vigor parameters, germination first count and mean germination time (Table 2), the paper substrate was statistically higher than the others, independent of the

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temperature. The seeds sowed in moistened paper roll, probably had higher surface contact for the water absorption compared to the sand or sand + vermiculite substratum, raising the imbibition and germination speed.

The seed contact area to the moistened substrate is important and can be critical for total germination and for germination speed (Petersonand Cooper, 1979). Substrates that provide less surface contact with the seed may difficult water imbibition (Guedes & Alves, 2011; Popinigis1985), thus the greater seed contact with the moist substrate, shorter time will be required for reach the total germination (Carneiro & Guedes, 1992).

The substrates isolated evaluation indicate that sowing on sand and sand + vermiculite in temperature of 25 ºC decrease the *T. caraiba* seeds vigor (Table 2), difference not obtained in germitest paper roll. Bianchetti et al. (1995) affirm that *T. cassinoide* germination optimum temperature vary in function of the used substratum.

For evaluate *T. caraiba* seeds viability and vigor, the germitest paper substrate seems to be more viable due to acquisition and manipulation easiness, even with lowest germination average.

Regarding the temperature, the higher germination percentage, germination first count and germination mean time occurred at 30 and 35 °C.For the vigor characteristics, evaluated through the germination first count, mean germination time (Table 2) and seedlings dry mass (Figure 1), the temperature of 25 °C increased the mean time of germination, reduced the first count and seedling dry mass significantly (Table 2), showing that *T. caraiba* seeds do not express all your vigor in this condition.

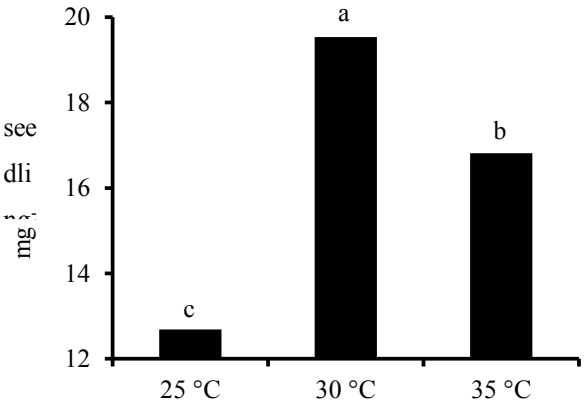

Figure 1: *Tabebuia caraiba* seedling dry mass at different temperatures for germination.

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Average followed by same letter do not differ by Tukey test at 5% significance level. Coefficient of variation: 5.89%

The temperature of 30 °C favors the seedlings biomass accumulation (Figure 1) been considered the optimum temperature for *T. caraiba* seeds germination and vigor. According to Nakagawa (1999) during the germination test the difference of 1 °C in temperature probably has negligible effect on germination percentage, however, this difference can provide a considerable effect on seedling growth by changing the length and/or the dry mass.

By raising the germination environment temperature, the energy of the water rises as well as the metabolic activities of the seed. Within certain limits, the speed of the seed water imbibition increase with the temperature increasing, decreasing, in consequence, the mean germination time (Popinigis, 1985).

Studying *T. roseo-alba* seeds, Stockman et al. (2007) affirm that the greatest percentage and germination rate were obtained under constant temperatures between 29.5 and 35.0 °C.

CONCLUSIONS

Seeds of *Tabebuia caraíba* presents, in average, total length, length without wings, width, thickness and fresh weight54.00, 19.88, 15.29, 2.58 mm and 0.18 g, respectively.

The seed germination test of *Tabebuia caraiba* should be perform in *germitest* paper at 30°C.

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