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# Light and temperature influence on seed germination of *Calliandra fasciculata* Benth. (Leguminosae)

**Fernando A. Oliveira e Silveira[1]; Felipe Fernandes[1] & Geraldo W. Fernandes[1,2]**

[1] Ecologia Evolutiva de Herbívoros Tropicais/DBG, CP 486, ICB/Universidade Federal de Minas Gerais, 30161-970 Belo Horizonte MG, Brasil.
[2] Author for correspondence. E-mail: gwilson@icb.ufmg.br

**Abstract**

The goal of this study was to verify the influence of light and temperature in the germination of seeds of *Calliandra fasciculata* (Leguminosae). Seeds were subjected to germination tests at the temperatures of 15, 25 and 35ºC under 12h-photoperiod and continuous dark for 30 days. Germination did not differ between the light and dark treatments at all temperatures tested ($p > 0,05$). The temperatures of 25 and 35ºC promoted higher germinability ($F = 19,31$; $p < 0,001$) when compared with the temperature of 15ºC. The mean time of germination was not influenced by photoperiod but was higher at 15ºC. High germinability values (> 70%) indicate lack of physical dormancy caused by tegument impermeability.

**Keywords:** Leguminosae, rupestrian fields, seed germination, Serra do Cipó.

## Introduction

Although the cerrado is considered one of the richest and most threatened biomes of the planet (Myers et al., 2000), studies on seed germination of its species are still necessary, particularly in one of its major physiognomies, the rupestrian fields. In Serra do Cipó, belonging to Serra do Espinhaço in southeastern Brazil, the rupestrian fields occur in areas where the altitude is higher than 1000 meters a.s.l. with predominance of rocky quartzite outcrops. In this physiognomy we find the highest rates of endemic and threatened plant species of the cerrado biome (Giulietti et al., 1997). A large number of streams and tributaries are found in the rupestrian fields, therefore allowing the development of rich and varied marginal vegetation (Giulietti et al., 1997).

*Calliandra fasciculata* Benth. (Leguminosae) is an endemic shrub of the Serra do Espinhaço that occurs along water courses between 820 and 1350 meters of altitude (Barneby, 1998). The distribution of *C. fasciculata* along water courses makes it a potentially useful candidate in the restoration of the marginal vegetations of water courses in this mountain chain. Due to growing human disturbances in the region, water courses have been damaged at increasing rates. However, the use of native species of the rupestrian fields in environmental restoration have been severely limited due to absence of basic knowledge on their biology, ecology, propagation techniques, and management (Ranieri et al., 2003). Therefore, the goal of this study is to provide the first studies on the influence of light and temperature in the seed germination of *C. fasciculata* in an attempt to start bridging the gap between this species natural history and propagation studies directed for its conservation and landscape restoration.

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## Material and Methods

Seeds of a population in the Natural Reserve Vellozia, an area adjacent to Serra do Cipó National Park, MG (19º 17'S, 43º 35'W) were collected during April and May 2002. The climate of this region is mesothermic with dry winters and rainy summers and annual average precipitation is 1350 mm (Madeira & Fernandes, 1999). Seed surfaces was sterilized with solution of sodium hipoclorite at 1% for 5 minutes and then washed with water for 30 minutes. Seeds were placed in Petri dishes covered with double sheet of filter paper and moistened whenever necessary. Petri dishes were placed in germination chambers B.O.D. under a 12-hr photoperiod and in absence of light during 30 days. The darkness condition was obtained by wrapping up the Petri dishes in double aluminum foil. Observations were carried under green safety light. Due to the small number of seeds produced in the studied population, the tests were carried only at the constant temperatures of 15, 25 and 35ºC ± 1ºC. Germination, defined as the emission of a radicle, was checked every 24-hour interval. Germinated seeds were removed from the Petri dish. The mean time of germination (MTG) was calculated according to Labouriau (1983).

The experimental design was completely randomized with four replicates of 25 seeds per Petri dish, and the data in percentage was transformed into arc sine for its normalization. After the transformation, means were compared by ANOVA followed by the Tukey's test at 5% of significance (Zar, 1996).

## Results and Discussion

Mean germination did not differ between seeds subjected to light or dark treatments in any of the studied temperatures ($p >$

**Table 1 -** Mean germinability (% ± SD) and Mean Germination Time (MTG ± SD) of *C. fasciculata* seeds. Means followed by different letters differed by Tukey test ($p < 0,05$). Upper case letters represent differences between temperatures (in a column) and lower case letters represent differences between light treatament (in a row).

| | Light | | Dark | |
|---|---|---|---|---|
| Temperature (ºC) | % | MTG | % | MTG |
| 15 | 72.0 ± 14.28 $^{Ba}$ | 2.09 ± 0.13 $^{Aa}$ | 77.0 ± 6.84 $^{Ba}$ | 2.34 ± 0.21 $^{Aa}$ |
| 25 | 98.0 ± 4.0 $^{Aa}$ | 1.32 ± 0.17 $^{Ca}$ | 95.0 ± 3.26 $^{Aa}$ | 1.31 ± 0.33 $^{Ca}$ |
| 35 | 96.0 ± 10.0 $^{Aa}$ | 1.65 ± 0.37 $^{Ba}$ | 95.0 ± 3.26 $^{Aa}$ | 1.28 ± 0.16 $^{Ca}$ |

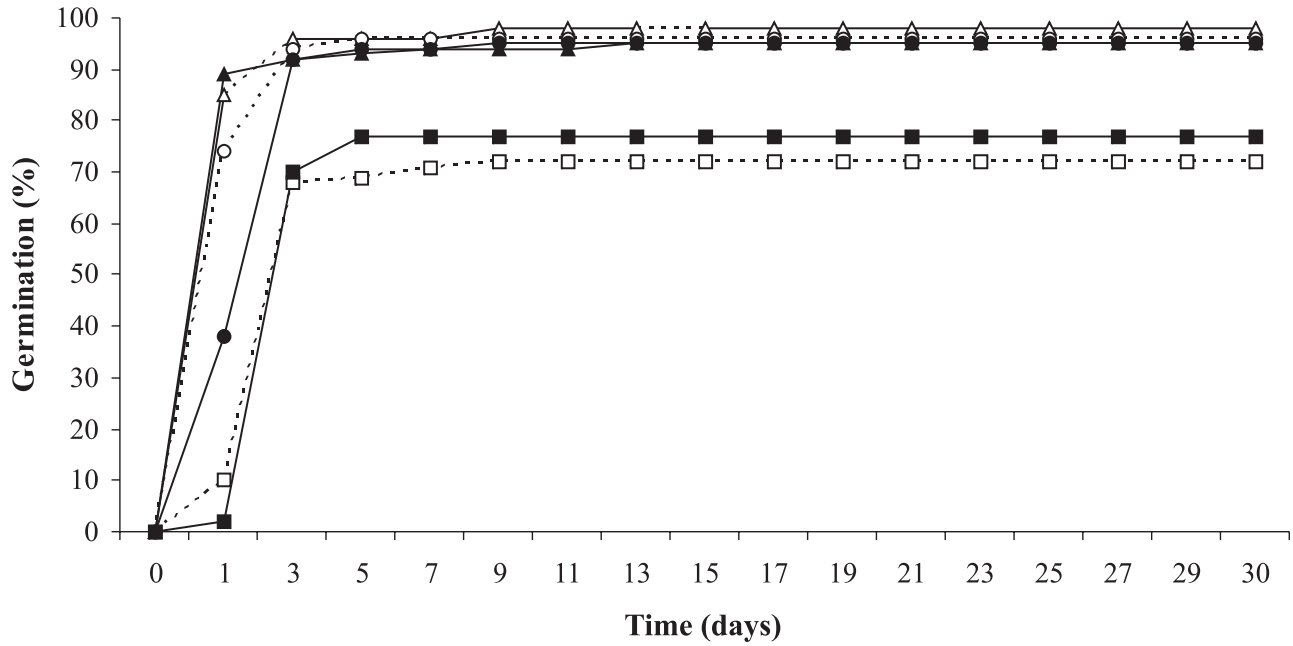


**Figure 1 -** Cumulative germination percentage of *Calliandra fasciculata* seeds in 12-hr photoperiod (open symbol) and continuous dark (full symbol), under the temperatures of 15 (□), 25 (Δ) and 35ºC (o).

0.05; Tab.1). These results suggest that *C. fasciculata* seeds are light insensitive, as reported for many species of the Leguminosae (e.g., Lemos Filho et al., 1997; Baskin et al., 1998; Hermansen et al., 2000; Ferraz-Grande & Takaki, 2001).

At all temperatures the germination percentage increased until the sixth day, remaining constant after this period (Fig. 1). At 15ºC, MTG was higher ($F = 11.26$; $p< 0.001$) and germinability (74.5%) was lower ($F = 19.31$; $p < 0.05$) when compared to the temperatures of 25ºC (96.5%), and 35ºC (95.5%) (Tab.1). Although temperature may differentially influence the germination behavior of cerrado species, the seeds of Leguminosae are capable of germinating under a wide thermal gradient (Baskin et al., 1998; Ferraz-Grande & Takaki, 2001). The high percentage of germination between the temperatures of 25 and 35ºC are similar to those found for several species of *Chamaecrista* from Serra do Cipó after scarification (Gomes et al., 2001).

At all temperatures, the MTG was low, indicating that germination occurred rapidly and the seed coat was not able to prevent water uptake. The mechanical restriction to water uptake by the seed coat has been described as the most common factor leading to physical dormancy in seeds of Leguminosae (Rolston, 1978), including tropical species (Lemos Filho et al., 1997; Hermansen et al., 2000). The 13 species of *Chamaecrista* studied by Gomes et al. (2001) showed some degree of physical dormancy that could be overcome by scarification. Physical dormancy is considered to be an adaptation to delay germination until environmental conditions are optimal for seedling establishment (Baskin, et al. 1998). Thus, its absence in *Calliandra fasciculata* can be related with its proximity to water

courses that is certainly a much less stressful environment than the adjacent xeric habitats colonized by *Chamaecrista*. More studies are needed to better address this hypothesis.

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