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Initial growth of 'paricá' (*Schizolobium amazonicum*) seedlings under different nitrogen doses

Alaíde de Oliveira CARVALHO*[1], Anderson Cristian BERGAMIN[2], André de Paulo EVARISTO[1], André Henrique Bueno NEVES[1], Cemilla Cristina Alves do CARMO[1], João Neri dos Santos GUIMARÃES JUNIOR[3]

[1] Departamento de Engenharia Florestal, Universidade Federal de Rondônia, Rolim de Moura, Rondônia, Brasil.
[2] Departamento de Agronomia, Universidade Federal de Rondônia, Rolim de Moura, Rondônia, Brasil.
[3] Centro Multidisciplinar, Universidade Federal do Acre/campus Floresta, Cruzeiro do Sul, Acre, Brasil.
* E-mail: alaidecarvalho91@gmail.com

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ABSTRACT: This study aimed to evaluate the effects of different dosages of nitrogen (N) about the initial growth of 'paricá' (*Schizolobium amazonicum* Huber ex. Ducke) seedlings. The experiment was conducted in a greenhouse and the seedlings cultivated in plastic bags filled with 5.0 kg of Oxisol, arranged in a completely randomized design with five treatments and ten repetitions. The nitrogen tests doses were 0, 40, 80, 120, 160 kg ha^{-1}. The heights, stem diameter, fresh aerial matter, root and total and height/diameter stem, were evaluated at 45 days post-transplant. All variables responses in a quadratic way to N applied doses. Until 45 days post-transplant, it was indicated the dose of 84.66 kg ha^{-1} of N to obtain seedlings with greater height and 71 kg ha^{-1} of N seedlings with a larger diameter.

Keywords: *Schizolobium amazonicum*, seedling production, mineral nutrition, fertilizing.

Crescimento inicial de mudas de paricá sob diferentes doses de nitrogênio

RESUMO: O presente trabalho teve como objetivo avaliar os efeitos de diferentes dosagens de nitrogênio (N) sobre o crescimento inicial de mudas de paricá (*Schizolobium amazonicum* Huber ex. Ducke). O experimento foi conduzido em casa de vegetação e as mudas cultivadas em sacolas plásticas preenchidas com 5,0 kg de Latossolo Vermelho Amarelo, arranjados em delineamento inteiramente casualizado com cinco tratamentos e dez repetições. Testou-se as doses de 0, 40, 80, 120, 160 kg ha^{-1} de N. Avaliou-se aos 45 dias pós-transplante a altura, diâmetro do colo, massa fresca da parte aérea, da raiz e total e relação altura/diâmetro do colo. Todas as variáveis responderam de forma quadrática as doses de N aplicada. Até os 45 dias pós transplantio indica-se a dose de 84,66 kg ha^{-1} de N para obtenção de mudas com maior altura e 71 kg ha^{-1} de N para mudas com maior diâmetro.

Palavras-chave: *Schizolobium amazonicum*, produção de mudas, nutrição mineral, adubação.

1. INTRODUCTION

The 'paricá' (*Schizolobium amazonicum* Huber ex. Ducke), Fabaceae-Caesalpinioideae, is a large tree that can reach 40 m in height and 100 cm in diameter, has occurred in the Brazilian, Venezuelan, Colombian, Peruvian and Bolivian Amazon (CORDEIRO et al., 2006). It is naturally occurring in Rondônia State and has been widely used in the region to recover degraded areas or economic cultivation and can be inserted in agroforestry systems (QUISEN et al., 1999), and for being a pioneer species with good development in reduced chemically fertility soil, it is expected that plantations would show a good development in the state since according to Barboza et al. (2011) soils in the region are low chemical fertility and high acidity, but has good physical and biological characteristics, which makes the region a suitable place for its planting.

In this context, seedling production, with quality and in sufficient quantity, is one of the fundamental steps for the establishment of plantations with native species (MARQUES et al., 2009), and for the plant to develop satisfactorily, must provide all necessary conditions for its development, from the right climate, substrate preparation, fertilization until post-transplanting treatment, being of primordial importance that these activities are still carried out in the vivarium phase, for the production of high-quality seedlings. Thus, Cruz et al. (2006) state that there is a lack of studies about the fertilization for native species, so the fertilizer recommendations for these species are based on studies of exotic species, which are much more demanding in this respect.

Among the essential nutrients, the Nitrogen (N) is found in greater abundance in plants and also the most required, participating in various physiological processes of the plant,

and its availability is often a limiting factor in many production systems because it is the macronutrient that has the most influence on the vegetable growth, however the responses of plants to nitrogen fertilization may vary depending on numerous factors, such as soil, doses, and source of N and species that are working (BREDEMEIER and MUNDSTOCK, 2000; FALCÃO NETO, 2010) .The increase in demand for wood for profit is attracting interests in better ways of cultivation and, consequently, in seedling production. In this context, studies focused on the nutritional requirements of native forest species seedlings are of great importance for the northern region, especially for Rondônia, which has shown growth in forest production (FORESTRY PANEL, 2014), because applications of appropriate nutrient values provide better seedling development and cost reduction for the vivarium worker, from the acquisition and use of the amount of required fertilizer. This study aimed to evaluate the initial growth of 'paricá' due to different doses of nitrogen.

2. MATERIAL AND METHODS

The experiment was carried out on the premises of the experimental field of the Federal University of Rondônia, located in Rolim de Moura municipality between 26th April and 21st June 2015. The weather, according to Köppen, is Aw type, temperature average of 28 °C, average annual rainfall of 2,250 mm, with relative humidity around 85%, with dry well defined between the months of May to August, may last until September (LEITE et al., 2011).

The experimental design was completely randomized, with five treatments and 10 repetitions, the treatments followed the following nitrogen doses, using urea as a source: treatment 1 (0 kg ha^{-1}), treatment 2 (40 kg ha^{-1}), treatment 3 (80 kg ha^{-1}), treatment 4 (120 kg ha^{-1}), and treatment 5 (160 kg ha^{-1}).

For the implementation of these treatments, 'paricá' seeds were used, donated by Lano da Amazônia Ltda company, located in Rolim de Moura municipality, RO, Brazil. The surmounting dormancy was performed by immersion in boiling for one minute and subsequent immersion in water at room temperature for 24 hours (FLORIANO, 2004). Sowing took place in a bare root site, using washed sand as substrate. One week after sowing, the more homogeneous seedlings were selected and transplanted into bags with a capacity of 5.0 kg of soil, containing previously sifted soil from the 0-20 cm layer of an Oxisol, which has the following characteristics: Clay content 49%; Organic matter: 30.5 g kg^{-1}; water pH: 4.9; Phosphorus (P): 3.8 mg dm^{-3}; Potassium (K): 0.15 $cmol_c$ dm^{-3}; Calcium (Ca): 2.4 $cmol_c$ dm^{-3}; Magnesium (Mg): 1.1 $cmol_c$ dm^{-3}; Aluminum (Al): 0.49 $cmol_c$ dm^{-3}; H: 6.11 $cmol_c$ dm^{-3} and Bases Sum (SB) 3.6 $cmol_c$ dm^{-3}.

All seedlings received 100 kg hav^{-1} of P_2O_5 and K_2O, using superphosphate and potassium chloride as a source, respectively, and the application of these occurred on the day of seedling transplanting. Nitrogen rates were divided into three applications, 15 days apart, with the first held in conjunction with the other nutrients. The experiment was conducted using daily irrigations in the greenhouse.

The parameters evaluated at 45 days after transplantation, were: circumference of the lap, obtained with the use of tape, which was later transformed to stem diameter (Sd in millimeters) by the division obtained by pi (π), height (H in centimeters) and root length (RL in centimeters), measured using the graduated scale, and fresh aerial matter (FAM in grams) and root (FRM in g) measured after sectioning of parts, via electronic accuracy scale of 0.01g, brand Bel Engineering, S2202 model. The means were analyzed by regression in Microsoft Excel 2013 program, accepting the most fitted (R^2).

3. RESULTS AND DISCUSSION

There was a quadratic response for all parameters (Figures 1 to 7). Souza et al. (2007) point out that the plant height is considered the most important variable in the seedlings assessment since it is this that sets the right time for planting. In this work, the time showed a peak at a dose of 84.66 kg ha^{-1} of N, for a height of 36.33 cm. Taiz and Zeiger (2009) point out that nitrogen is the nutrient required in largest amounts

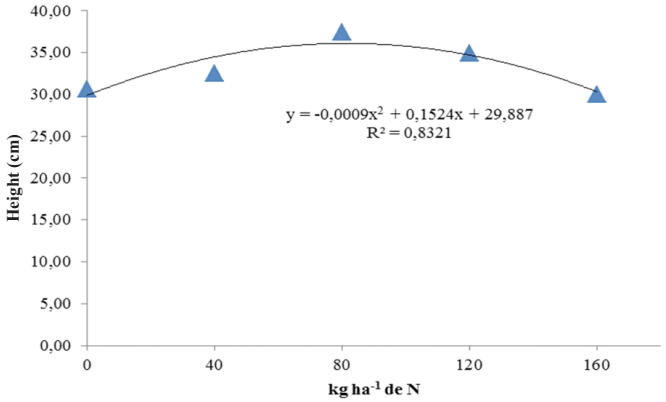

Figure 1. 'Paricá' height seedlings on 45 days depending on the nitrogen doses.

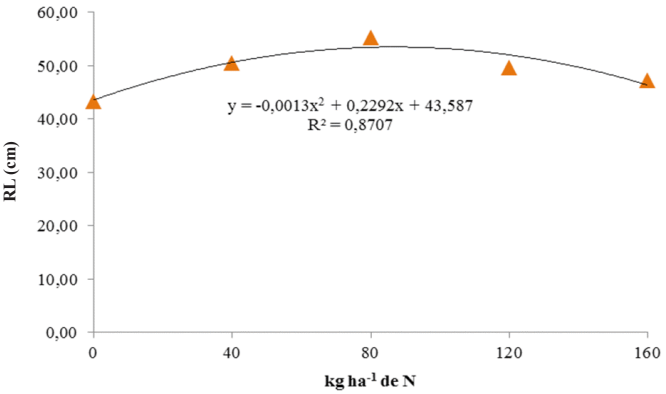

Figure 2. Root length (RL) of 'paricá' seedlings on 45 days depending on the nitrogen doses.

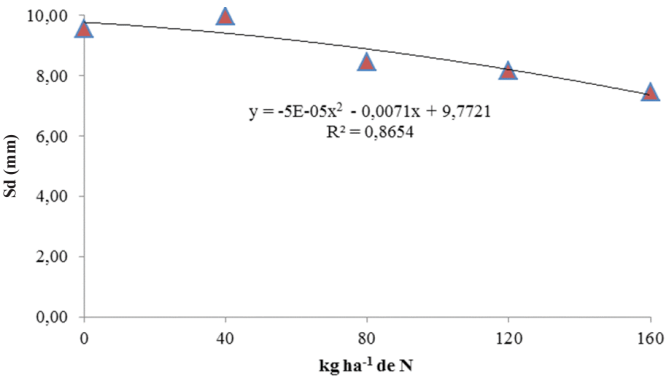

Figure 3. Stem diameter (Sd) of 'paricá' seedlings on 45 days depending on the nitrogen doses.

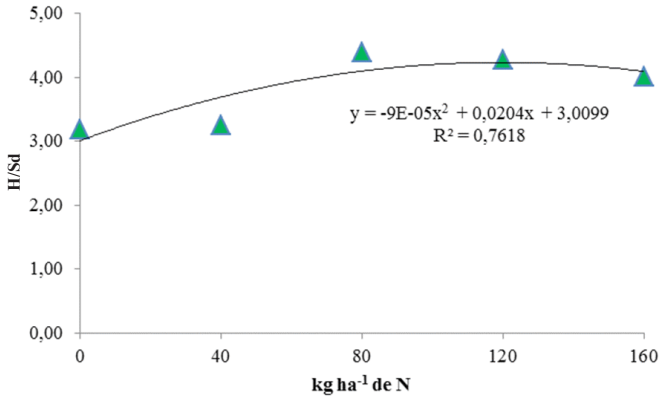

Figure 4. Relationship height with stem diameter (H/Sd) of 'paricá' seedlings on 45 days depending on the nitrogen doses.

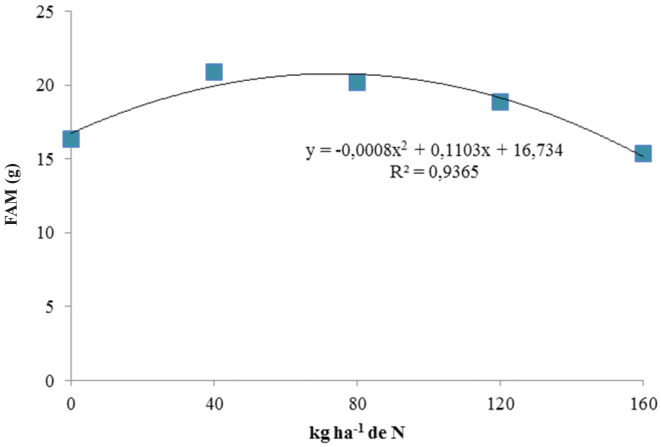

Figure 5. Fresh aerial matter (FAM in g) of 'paricá' seedlings on 45 days depending on the nitrogen doses.

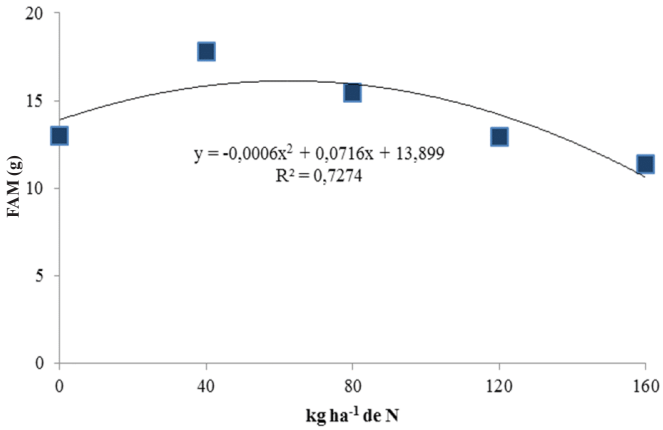

Figure 6. Fresh aerial matter (FAM in g) of 'paricá' seedlings on 45 days depending on the nitrogen doses.

by plants, being a constituent of many components of the cell and participating in various metabolic activities, thus, its removal may cause disturbances in the seedling development, a fact observed by Salvador et al. (1998) and Nascimento et al. (2014) evaluating the omission of nutrients in Guava and Jatoba seedlings, respectively.

The ability of higher plants to obtain water and mineral nutrients in the soil is closely related to the development of the root system (TAIZ and ZEIGER, 2009). Thus, the length and root fresh matter presented quadratic behavior with the maximum dose of 88.15 and 59.66 kg ha^{-1} of N, respectively, obtaining in these values, length of 53.68 cm and weight of

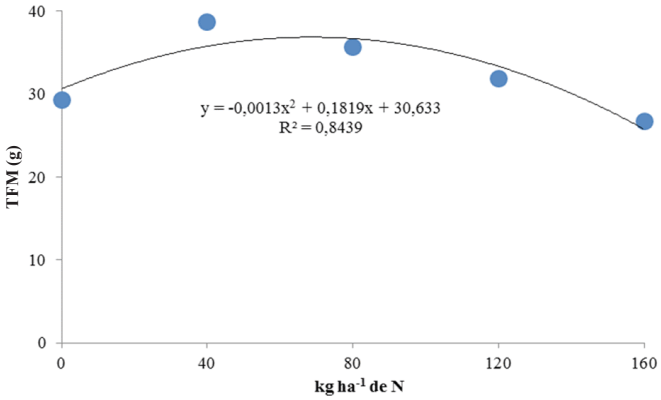

Figure 7. Total fresh matter (TFM in g) of 'paricá' seedlings on 45 days depending on the nitrogen doses.

16.03 g. Mendonca et al. (2006) observed a quadratic response to root length as a function of N fertilization in papaya seedlings, presented maximum value of 14.29 cm at a dose level of 3000 kg ha^{-1} of N, as Falcão Neto et al. (2011) evaluating the effect of different N doses in *Gurguéia*-nut seedlings, they found that at a dose of 150 kg ha^{-1} was greater root length using treated substrate. Related to fresh matter of root, Maia et al. (2011) evaluated the omission of nutrients in *Jatropha* seedlings found 27% reduction in weight of the root when omitted the N, while *Gurguéia*-nuts seedlings have presented higher average weight of the root when not received nitrogen fertilizer in coverage (FALCÃO NETO et al., 2011).

The stem diameter is an important parameter in the study of seedling potential as to the survival and growth after planting (VIEIRA et al., 2006), this study showed a quadratic response, with a peak of 9.89 mm with the application of 71 kg ha^{-1} of N. The found regression model was also observed by Cruz et al. (2006), though it differed from other studies conducted with the same nutrient (VIEIRA et al., 2006; FREIBERGER et al., 2013). Assessing *Jatobá* seedlings under suppression of nutrients, Nascimento et al. (2014) found that these fell by 21% in stem diameter compared those who received a complete solution, although the biometric variable was less affected by nutritional suppression.

The relationship between height and stem diameter is one of the characteristics used for inference about the quality of forest seedlings because as well as reflecting the accumulation of reserves also ensures greater resistance and better fixation in the soil (STURION and ANTUNES, 2000 *apud* MARQUES et al., 2006a) and Marques et al. (2006a) and Marques et al. (2006b) found linear responses to this relationship in *Jacarandá da Bahia* and *Thrush* seedlings when subjected to different doses of nitrogen, different from the response shown by the seedlings in this study, which showed quadratic response reaching maximum value of 4.16 with the application of 113 33 kg ha^{-1} of N, indicating that this point was greater height and lower stem diameter of seedlings, and this increase in H/Sd may have been influenced by the greater vegetative growth of seedlings, favored by nitrogen fertilization (MARQUES et al., 2006a).

The accumulation of the material for seedlings is a function of several factors, and the N plays a fundamental role in this activity, as it related to photosynthesis and is a constituent of chlorophyll, and participates in the synthesis of various compounds (PRADO, 2004). The results indicate that both, the FAM as the TFM were affected by N doses of a quadratic form,

reaching peaks in doses of 68.93 and 69.96 kg ha^{-1} of N with the production of 20.53 and 36,99g, respectively. Falcão Neto et al. (2011) found that seedlings *Gurguéia*-nuts fertilized with 150 kg ha^{-1} of N showed a 17.39% increase in FAM compared to those who did not receive nitrogen fertilizer, since Maia et al. (2011) found an average reduction of 43.95% to FAM and 41.64% for TFM in *Jatropha* seedlings conducted without nitrogen fertilization.

4. CONCLUSIONS

The greater height of 'paricá' seedlings at 45 days after transplantation is achieved with a dose of 84.66 kg ha^{-1} of N while the larger diameter of the stem is obtained with the dose of 71 kg ha^{-1} of N.

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