NITROGEN SOURCES AND DOSES ON GROWTH AND QUALITY OF SEEDLINGS OF *Cassia grandis* AND *Peltophorum dubium*[1]

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ABSTRACT – The demand for seedlings of Brazilian native tree species has increased due to the growing number of recovery projects for degraded areas. In order to obtain success in the revegetation, high quality seedlings should be used. Among the factors that affect the quality of seedlings there is nitrogen fertilization, since nitrogen (N) is one of the nutrients required in the largest amount by plants. Thus, this study aimed to evaluate the response of *Cassia grandis* and *Peltophorum dubium* seedlings to N sources and doses. The treatments were represented by a factorial of three sources (ammonium nitrate, calcium nitrate and ammonium sulfate) by five N doses (0, 50, 100, 150 and 200 mg dm^{-3}), arranged in randomized complete block design, with four replicates. After 145 days of sowing, were obtained: height (H), collar diameter (CD), shoot dry matter (SDM), root dry matter (RDM), total dry matter (TDM), and calculated the dry matter mass ratio of shoot and root (SDM/RDM) and the Dickson Quality Index (DQI). Nitrogen fertilization resulted in growth gains and improved the seedlings quality of both species. However, the sources and the source × doses interaction were not significant for all variables. For the studied substrate (Red-Yellow Latosol) the recommended dose is 185 mg dm-3 of N for the production of *Peltophorum dubium* seedlings. For the production of *Cassia grandis* seedlings was not able to find the optimum dose of N.

Keywords: Plants nutrition; Seedling production; Nitrogen fertilization.

FONTES E DOSES DE NITROGÊNIO NO CRESCIMENTO E QUALIDADE DE MUDAS DE *CASSIA GRANDIS* E *PELTOPHORUM DUBIUM*

RESUMO – A demanda por mudas de espécies nativas tem aumentado devido ao crescente número de projetos de recuperação de áreas degradadas. Para o sucesso da revegetação, devem ser utilizadas mudas de qualidade, e entre os fatores que influenciam a qualidade, destaca-se a fertilização nitrogenada, uma vez que o nitrogênio (N) é um dos nutrientes requeridos em maior quantidade pelas plantas. O objetivo deste estudo foi avaliar a resposta das mudas de ***Cassia grandis*** *L. f. e* ***Peltophorum dubium*** *(Spreng.) Taub. às fontes e doses de N. Os tratamentos foram representados por um fatorial de três fontes (nitrato de amônio, nitrato de cálcio e sulfato de amônio) e cinco doses de N (0, 50, 100, 150 e 200 mg dm^{-3}), dispostos no delineamento em blocos casualizados, com quatro repetições. Após 145 dias da semeadura, foram obtidos: altura (H), diâmetro de coleto (DC), massa de matéria seca da parte aérea (MSPA), da raiz (MSR), e total (MST), e calculada a relação entre a massa de matéria seca da parte aérea e raiz (MSPA/MSR) e o índice de qualidade de Dickson (IQD). A fertilização nitrogenada resultou em ganhos no crescimento e qualidade das mudas de ambas as espécies estudadas. As fontes e a interação fontes × doses não foram significativas para todas as variáveis estudadas. Para as condições estudadas, recomenda-se a dose de 185 mg dm^{-3} de N para a produção de mudas de* ***Peltophorum dubium****. Para a produção de mudas de Cassia grandis não foi possível encontrar a dose ótima de N.*

Palavras-chave: Nutrição de plantas; Produção de mudas; Fertilização nitrogenada.

1. INTRODUCTION

The demand for Brazilian native tree species seedlings has risen due to the increasing number of recovery projects for degraded areas. Depending on the degradation level of the site to be recovered, planting of seedlings may result in a higher survival rate and initial growth compared to other recovery methods, such as natural regeneration and no-tillage. According to Parrota (1992), competition with grasses, unfavorable microclimatic conditions for establishment of plants, low availability of soil nutrients and seed bank reduction, are factors that hinder the natural regeneration of tropical forests. In this case, although costly, intervention by planting fast growing native species seedlings is more efficient in relation to establishment time, accelerating the recovery process (Suganuma et al., 2008).

The seedlings attributes necessary for the success of forest plantations have been termed "seedling quality" (Fonseca et al., 2002). According to Carneiro (1995), quality seedlings are those that present characteristics to resist the adverse conditions that may occur after planting, presenting higher growth and initial survival, and consequently, less need for replanting and lower frequency of crop treatments and maintenance. The quality standard of seedlings can be defined by physiological or morphological parameters, being the morphological ones more used due to a more intuitive understanding by the nurserymen (Gomes et al., 2002).

In addition to the use of good quality seedlings, with adequate nutrition and substrates, species adapted to the edaphoclimatic conditions of the environment should be chosen (Gonçalves et al., 2005). The native species have been preferred in recovery projects for degraded areas because they are more adapted to the site and to help return the ecological functions of the area (Furtini Neto et al., 1999). The *Fabaceae* family presents a wide diversity of species and versatility of uses, besides playing an important role in the dynamics of the ecosystems (Longo et al., 2011), favoring the nutrient cycling (Franco et al., 2003), improving soil fertility and stimulating the biological activity, since its litter constitutes a source of organic matter rich in nutrients, mainly N (Gonçalves et al., 2005).

Cassia grandis and *Peltophorum dubium*, belong to the *Fabaceae* family and subfamily *Caesalpinioideae*, are used in landscaping projects (because they are very ornamental), civil construction (Lorenzi, 2002) and recovery of degraded areas (Carvalho, 1988). Both species develop in environments with low fertility, although they present higher growth in soils with good fertility and deep, well drained and with clayey texture (Carvalho, 2002, 2006).

Despite the potential use of native forest species for logging purposes, or for the enrichment of forests and recovery of degraded areas, their use is still hampered due to the lack of information on their nutritional requirements for seedling production, establishment and development in the field of these species (Gonçalves et al., 2010).

The N is one of the nutrients absorbed in larger amounts by plants, being part of several plant molecules and structures (Cantarella, 2007). Its deficiency limits growth and forest production (Nambiar, 1989), being necessary nitrogen fertilizations when the demand of the plant is greater than the supply by the substrate.

Plants differ in preferences for N sources, and absorb it mainly in inorganic forms such as nitrate (NO^{3-}) and/or ammonium (NH^{4+}) (Williams and Miller, 2001). According to Cantarella (2007), the efficiency of N recovery from fertilizers varies according to soil type, species, fertilizer doses, management, incidence of pests and diseases and environmental conditions. The study of the responses of species to the application of N is necessary to correct management of fertilization, providing greater growth of the plants and optimization of the use of inputs.

Therefore, the objective of this study was to evaluate the response of *Cassia grandis* and *Peltophorum dubium* seedlings to the application of sources and doses of N.

2. MATERIAL AND METHODS

The experiment was carried out at the Research Nursery of the Department of Forestry Engineering at the Federal University of Viçosa, in Viçosa, located in Zona da Mata, Minas Gerais.

The substrate used was a dystrophic Red-Yellow Latosol taken at 20-50 cm depth. Subsequently, the soil was air-dried, sieved and characterized by chemical (Table 1) and physical attributes (570 g kg^{-1} clay, 110 g kg^{-1} silt, 190 g kg^{-1} coarse sand and 130 g kg^{-1} fine sand).

Table 1 – Chemical analysis of soil samples (Red-Yellow Latosol) used for the seedlings production of *Cassia grandis* and *Peltophorum dubium.*

Tabela 1 – *Análise química do solo Latossolo Vermelho-Amarelo distrófico utilizado na produção das mudas de Cassia grandis and* ***Peltophorum dubium****.*

pH	P	K	Al^{3+}	Ca^{2+}	Mg^{2+}	H+Al	SB	CEC(t)	CEC(T)	BS	m	OM
H_2O	—mg dm^{-3}—		—————————————— $cmol_c$ dm^{-3} ——————————————							——(%)——		dag kg^{-1}
4.79	0.70	6.00	0.92	0.11	0.01	3.93	0.14	1.06	4.04	3.5	86.80	1.66

pH-H2O (1: 2.5); P and K - Mehlich-1 Extraction; Ca^{2+}, Mg^{2+} and Al^{3+} - Extraction: KCl 1 mol L^{-1}; H + Al – Extraction: CaOAc 0.5 mol L^{-1}, pH 7.0; SB = Sum of bases; CEC(t) = Effective Cation Exchange Capacity; CEC(T) = Total Cation Exchange Capacity, pH 7.0; BS = Base Saturation; m = Aluminum Saturation; Organic Matter (OM) = C. org. x 1.724 - Walkley-Black Method.

The soil acidity correction was made based on the results of the analyses, using a mixture of $CaCO_3$ and $MgCO_3$ (4:1), so as to raise the base saturation to 60 %. After the incorporation of the lime, the soil was incubated for 30 days and the moisture content maintained close to the field capacity.

After the incubation period the soil was placed in pots with a capacity of 1.5 dm^3 and a macronutrient solution was applied in the following doses: P = 300 mg dm^{-3} ($NaH_2PO_4.H_2O$), K = 100 mg dm^{-3} (KCl) and S = 40 mg dm^{-3} (K_2SO_4) as suggested by Passos (1994), and micronutrients, at the doses: B = 0,81 mg dm^{-3} (H_3BO_3), Cu = 1,33 mg dm^{-3} ($CuSO_4.5H_2O$), Mo= 0,15 mg dm^{-3} [$(NH_4)_6Mo_7O_{24}.4H_2O$], Mn = 3,66 mg dm^{-3}($MnCl_2.H_2O$) e Zn = 4,0 mg dm^{-3} ($ZnSO_4.7H_2O$), according to Alvarez et al. (2006). Fertilization with macro and micronutrients was performed for both species and based on recommendations for perennial species, since there is no recommendation for them.

The seeds of *Cassia grandis* and *Peltophorum dubium* were acquired from the Society of Forest Investigations (SIF). *Cassia grandis* seed dormancy breakdown was performed by mechanical scarification with sandpaper, and for *Peltophorum dubium* a chemical scarification was carried out with sulfuric acid for 20 minutes.

Five seeds were sown per pot during 25 days, after this period the thinning was done, leaving only one seed per pot.

The treatments were represented by a factorial 3 × 5 (three sources and five doses of N), arranged in a randomized complete block design with four replicates. The sources of N were: ammonium nitrate (NH_4NO_3), calcium nitrate [$Ca(NO_3)_2$] and ammonium sulfate [$(NH_4)_2SO_4$], and the doses (0, 50, 100, 150 and 200 mg dm^{-3} of N) were divided into four applications at 25, 50, 75 and 100 days after transplanting.

The 145 days after sowing, the height (H) and collar diameter (CD) of the seedlings were measured using a ruler graduated in centimeters and a digital caliper with a precision of 0.01 mm, respectively. The dry matter (DM) was evaluated by the separation in aerial parts and roots, which were taken to the forced circulation oven at 65 °C until obtaining a constant mass. After weighing, the shoot dry matter mass (SDM), root dry matter mass (RDM) and total dry matter mass (TDM) were obtained and also the dry matter mass ratio of shoot and root (SDM/RDM) and the Dickson Quality Index (DQI), using the formula:

$$DQI = \frac{TDM\ (g)}{H\ (cm) / CD\ (mm) + SDM\ (g) / RDM\ (g)}$$

The data was interpreted statistically by means of analysis of variance and regression equations using Statistica 8.0 software (Statsoft, 2008). In the choice of the regression equations, the significance of the regression parameters and the coefficient of determination (R^2) were considered. The Pearson correlation coefficient was also calculated to evaluate the correlation between the dependent variables.

3. RESULTS

Nitrogen fertilization resulted in significant gains in seedling growth of the species studied. For *Cassia grandis*, a significant effect of N doses was observed for all evaluated characteristics. A similar result was observed for *Peltophorum dubium*, where N doses were also significant for H, CD, TDM, SDM, RDM and DQI. Sources × doses interaction did not have a significant effect for both species.

Most of the characteristics evaluated presented a positive linear response as a function of nitrogen fertilization and it was not possible to obtain the maximum

Table 2 – Summary of analysis of variance of the characteristics and relations studied in seedlings of *Cassia grandis*, valued at 145 days after sowing.

Tabela 2 – *Resumo da análise de variância das características e relações estudadas em mudas de* ***Cassia grandis****, avaliadas aos 145 dias após a semeadura.*

Source	df	Mean square						
		H	CD	SDM	RDM	TDM	SDM/RDM	DQI
Block	3	39.25^{ns}	0.711^{ns}	6.524^{ns}	18.313 ^{ns}	36.10^{ns}	0.140 ^{ns}	1.349 ^{ns}
Sources (S)	2	75.19 ^{ns}	0.300 ^{ns}	15.234 ^{ns}	6.629 ^{ns}	34.32 ^{ns}	0.035^{ns}	0.480 ^{ns}
Doses (D)	4	1727.21**	19.402**	266.110**	122.323**	725.21**	0.983**	8.602**
S x D	8	45.43 ^{ns}	0.544 ^{ns}	4.553 ^{ns}	19.275 ^{ns}	34.00 ^{ns}	0.214^{ns}	1.334 ^{ns}
Error	42	28.83	0.534	7.011	17.648	40.48	0.171	1.166
CV %		32.54	19.53	51.95	53.82	49.35	44.16	44.85

** and * Significant at 1% and 5% probability, respectively, by the test F. ns Non-significant at 5% probability by the test F. H - shoot height (cm); CD - collar diameter (mm); SDM - shoot dry matter mass (g); RDM - root dry matter mass (g); TDM - total dry matter mass (g); SDM/RDM - dry matter mass ratio of shoot and root; DQI - Dickson Quality Index.

Table 3 – Summary of analysis of variance of the characteristics and relations studied in seedlings of *Peltophorum dubium*, valued at 145 days after sowing.

Tabela 3 – *Resumo da análise de variância das características e relações estudadas em mudas de* ***Peltophorum dubium****, avaliadas aos 145 dias após a semeadura.*

Source	df	Mean square						
		H	CD	SDM	RDM	TDM	SDM/RDM	DQI
Block	3	75.12^{ns}	0.430^{ns}	39.04^{ns}	15.724 ^{ns}	96.87^{ns}	0.082 ^{ns}	6.128 ^{ns}
Sources (S)	2	38.61^{ns}	0.478^{ns}	20.35^{ns}	6.577^{ns}	24.34^{ns}	0.890^{ns}	0.661^{ns}
Doses (D)	4	421.56**	22.763**	270.11**	186.567**	867.94**	0.220^{ns}	37.884**
S x R	8	11.26^{ns}	1.821^{ns}	18.72^{ns}	24.375^{ns}	75.28^{ns}	0.414^{ns}	4.315^{ns}
Error	42	43.81	1.824	29.16	18.804	70.78	0.394	5.036
CV %		24.35	16.36	47.37	43.50	41.88	50.82	54.07

** and * Significant at 1 % and 5 % probability, respectively, by the test F. ns Non-significant at 5 % probability by the test F. H - shoot height (cm); CD - collar diameter (mm); SDM - shoot dry matter mass (g); RDM - root dry matter mass (g); TDM - total dry matter mass (g); SDM/RDM - dry matter mass ratio of shoot and root; DQI - Dickson Quality Index.

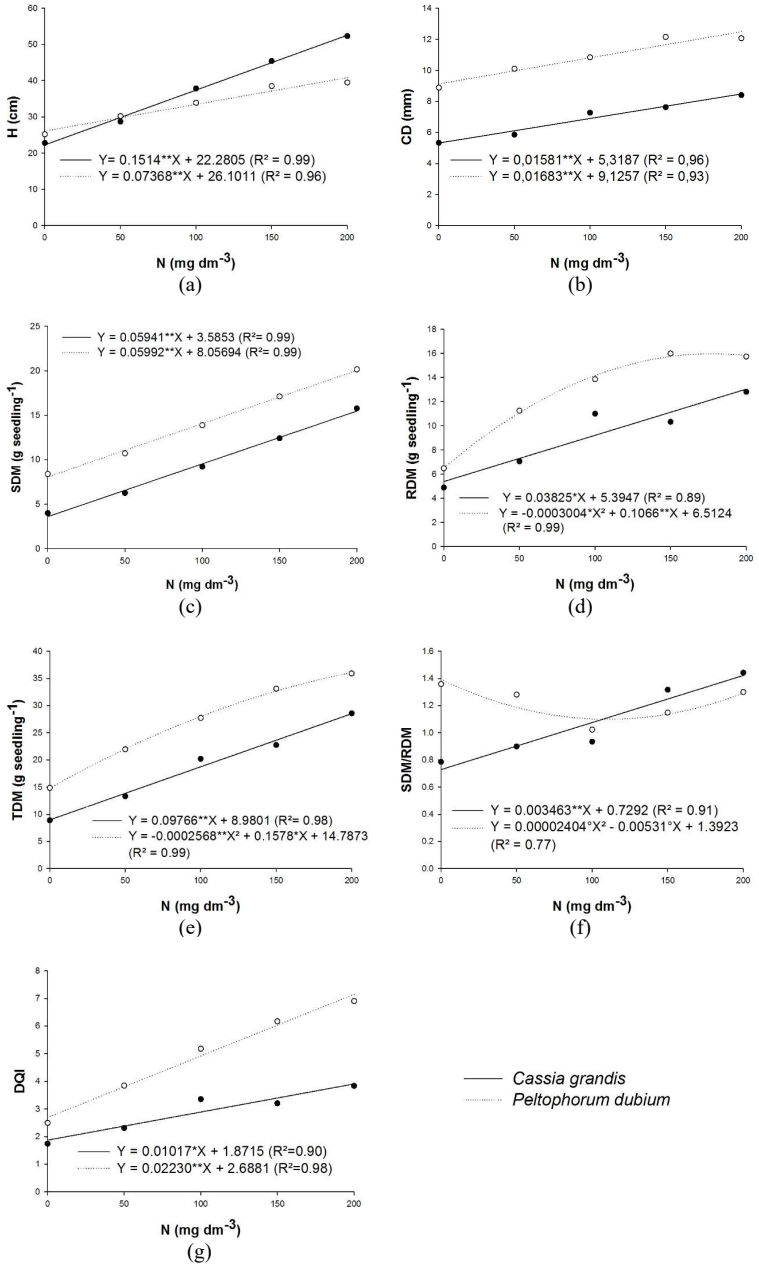
point within the studied dose range. The mean height obtained at the dose of 200 mg dm^{-3} of N was 51.3 cm and 39.5 cm, for the seedlings of *Cassia grandis* and *Peltophorum dubium*, respectively. From the dose of 50 mg dm^{-3} of N, the height of the *Cassia grandis* seedlings exceeded that of *Peltophorum dubium*, being the response rate due to the nitrogen fertilization superior to that presented by *Peltophorum dubium* seedlings.

For the collar diameter, the response to nitrogen fertilization was similar for both species. *Peltophorum dubium* collar diameter had a 40 % increase at the maximum dose studied in relation to the control, and for *Cassia grandis* this increase was 60 %.

The magnitude of SDM response as a function of N doses was also similar between Cassia *grandis* and *Peltophorum dubium*, with an increase of almost 0.06 g plant^{-1} for each mg dm^{-3} of N added. The RDM of the *Peltophorum dubium* seedlings presented a quadratic response to the applied N, being the dose for maximum production equivalent to 177.7 mg dm^{-3} of N and the critical dose of 104.5 mg dm^{-3} of N. A quadratic response was also observed for TDM of *Peltophorum dubium* seedlings, and the critical dose was 184 mg of dm^{-3} N. The total dry matter mass with 200 mg dm^{-3} of N was 28.6 g plant^{-1} for the seedlings of *Cassia grandis*, representing an increase of more than three times in relation to the seedlings that did not receive nitrogen fertilization.

None of the species presented the SDM/RDM ratio equal to 2.0, which is considered adequate according to Gomes and Paiva (2012), and this value was obtained in doses higher than the highest dose studied.

Both species presented a linear response of the DQI in relation to N doses. With the dose of 200 mg dm^{-3} of N the seedlings of *Cassia grandis* had a DQI equal to 3.9 and *Peltophorum dubium* a DQI equal to 7.2, being the response of *Peltophorum dubium* to N fertilization twice as high as that presented by *Cassia grandis*.



**, *, ° Signi?cant at 1 % , 5 %, 15 %probability, respectively, by the test t

Figure 1 – Shoot height (H) (a), collar diameter (CD) (b), shoot dry matter (SDM) (c), root dry matter (RDM) (d), total dry matter (TDM) (e), dry matter mass ratio of shoot and root (SDM/RDM) (f), and Dickson Quality Index (DQI) (g) to seedlings of *Cassia grandis* and *Peltophorum dubium* to 145 days after sowing, in response to nitrogen fertilization.

Figura 1 – *Altura da parte aérea (H) (a), diâmetro do coleto (DC) (b), massa de matéria seca da parte aérea (MSPA) (c), massa de matéria seca da raiz (MSR) (d), massa de matéria seca total (MST) (e), relação entre massa de matéria seca da parte aérea e massa de matéria seca da raiz (MSPA/MSR) (f), índice de qualidade Dickson (IQD) (g) para mudas de* ***Cassia grandis*** *e* ***Peltophorum dubium*** *aos 145 dias após a semeadura, em resposta à fertilização nitrogenada.*

Among the dependent variables, for *Cassia grandis*, TDM was the characteristic that had the highest correlation with the variables evaluated: H (r = 0.78), CD (r = 0.83), SDM (r = 0.93), RDM (r = 0.93), and DQI (r = 0.93). The same was observed for *Peltophorum dubium*, where the correlation between TDM and the variables studied were: H (r = 0.74), CD (r = 0.86), SDM (r = 0.93), RDM (R = 0.90) and DQI (r = 0.96).

4. DISCUSSION

The response of plants to nitrogen fertilization varies according to species, site, dose and source of nitrogen (Marques et al., 2006a). Ammoniacal sources may be preferred and advantageous for plants, since the ammonium absorption presents lower metabolic energy expenditure compared to nitrate, being the nitrate reductase action in the roots not necessary (Grespan et al., 1998). Preferential response to ammonium sulfate was found for *Piptadenia gonoacantha* seedlings by Marques et al. (2009), who observed greater growth of seedlings with the application of this source compared to ammonium nitrate and calcium nitrate.

However, species may exhibit distinct preferences in relation to the source absorbed as a consequence of the available form of N in the environment in which it adapts. According to Rosa et al. (2011), plants adapted to acid soils or with low redox potential usually use ammoniacal forms, whereas those adapted to soils with high pH, preferably use nitric forms. Santin et al. (2014) evaluated the productivity of *Ilex paraguariensis* as a function of different N sources and observed that its preference for nitrogen source is dependent on the place of origin of the crop. A similar result was observed (Moore and Keraitis, 1971) who assessed the growth of 12 *Eucalyptus* species in relation to the $N\text{-}NO^{3-}$ and $N\text{-}NH^{4+}$ and found that plants of ecological habitat similar tend to have similar responses in relation to the preferred source absorbed.

For the species studied, no differential response was observed among the sources tested. Cantarella (2007) points out that even when applying an ammoniacal source in a soil with aerobic conditions and high temperatures, it can predominantly present N in the form of nitrate. According to this author, ammoniacal N is oxidized to nitrate in an interval of approximately 15 to 30 days, being difficult, from the practical point of view, to obtain the advantages of the ammoniacal sources. Feitosa et al. (2011) also did not observe an influence of source in the growth of *Astronium fraxinifolium* seedlings in a Red Latosol, which corroborates the results of this study.

N doses resulted in significant gains in seedling growth and quality, showing the importance of this nutrient in the initial growth phase of *Cassia grandis* and *Peltophorum dubium*. Venturin et al. (1999) worked with *Peltophorum dubium* seedlings, using a Red-Yellow Latosol with low nutrients availability, where they applied a complete treatment (with N, P, K, Ca, Mg, S, B and Zn), one with the omission of one nutrient at a time, and a control (natural soil). Although they did not evaluate the best dose of N for the growth of this species, these authors observed that nitrogen is one of the limiting nutrients for the growth of *Peltophorum dubium*.

Similar results, with a positive response to the application of nitrogen fertilizers, have been observed: *Apuleia leiocarpa* (Nicoloso et al., 2001), *Eremanthus erythropappus* (Venturin et al., 2005), *Dalbergia nigra* (Marques et al., 2006b), *Samanea inopinata* (Cruz et al., 2006), *Piptadenia gonoacantha* (Marques et al., 2009), *Swietenia macrophylla* (Tucci et al., 2009), *Mimosa caesalpiniaefolia* (Gonçalves et al., 2010), *Astronium fraxinifolium* (Feitosa et al., 2011), *Calophyllum brasiliense* (Ciriello et al., 2014), *Tabebuia serratifolia* (Goulart et al., 2016), *Schizolobium amazonicum* (Carvalho et al., 2016).

As previously mentioned, in addition to the distinct species requirements, it must be taken into account that the response to nitrogen fertilization varies according to the conditions of the study, as the type of substrate used. Marques et al. (2006b) evaluated the effect of nitrogen sources and doses on the production of *Dalbergia nigra* seedlings in three soils (Red-Yellow Argisol, Cambisol and Red-Yellow Latosol) and observed a difference in response to the doses according to the soil used. The Argisol presented the best quality standard of the seedlings having as source the ammonium sulfate and the dose of 180 mg dm^{-3} of N.

Among the morphological characteristics evaluated in nurseries to indicate seedlings quality, the height and collar diameter stand out because they are easy to obtain. The height influences survival and development in the first years after planting, and the collar diameter correlates with the percentage of survival in the field (Carneiro, 1995). These parameters were influenced positively by the application of N to soil,

being the height of *Cassia grandis* more responsive to N doses compared to *Peltophorum dubium*.

Although the determination of dry matter of the plants in many nurseries is not feasible because it is destructive and requires greenhouses (Gomes and Paiva, 2012), this parameter has been considered one of the best to predict seedlings quality, since it is the characteristic that better reflects the production (Gonçalves et al., 2008). The importance of using this characteristic is also verified by the high correlation of TDM with the other characteristics evaluated, indicating that other variables which indicate seedlings quality can be inferred through TDM. *Cassia grandis* and *Peltophorum dubium* had higher production of TDM at the maximum dose studied, which may be justified by the rapid growth in initial phase of these species and, consequently, a higher nutritional requirement.

Both shoot and root dry matter masses responded positively to the doses of N. Marques et al. (2009) also observed a linear response of SDM and RDM as a function of N doses in *Piptadenia gonoacantha*. These authors observed higher production at the dose of 161 mg dm^{-3} of N. According to Gomes et al. (2002), the root dry matter mass is one of the most important and best characteristics to be inferred regarding the survival and initial growth of seedlings in the field.

Depending on the environment conditions and resources availability, the allocation of assimilates will prioritize different compartments of the plant. Among the factors that affect allocation of assimilates in the plant, Schumacher et al. (2004) mention the nutritional supply, which, when appropriate, usually leads to a greater allocation of mass to the aerial part rather than to the root system. This may justify the increase of the SDM/RDM ratio with the increase of N doses, i.e. with greater nutrient availability, larger shoot production occurs rather than root production.

The morphological characteristics can be considered in isolation, however, it is recommended that their values be related, so errors in the selection of seedlings are avoided, such as the choice for seedlings of higher heights, due to the blanching, but with lower quality, presenting smaller diameters and lower dry matter mass (Fonseca et al., 2002). According to these authors, the Dickson Quality Index (DQI) is one of the best indicators of seedling quality, since robustness and balance of mass distribution in seedlings are taken into account for its determination, considering the results of several important characteristics used for quality assessment. The higher the value of the DQI, the better will be the quality standard of the seedlings (Gomes and Paiva, 2012). A similar response to this study, where DQI responded positively to N doses, was found for *Mimosa caesalpiniaefolia* (Marques et al., 2006a) and *Piptadenia gonoacantha* seedlings (Marques et al., 2009).

In general, it was observed that, for the same study conditions, *Cassia grandis* has a higher nitrogen nutritional demand compared to *Peltophorum dubium*.

5. CONCLUSIONS

Nitrogen fertilization positively influences the growth and quality of *Cassia grandis* seedlings and there is no difference between the tested N sources for the conditions studied. It was not possible to find the optimum dose for *Cassia grandis* seedlings production.

Nitrogen fertilization results in significant gains in growth and quality of *Peltophorum dubium* seedlings and there is no difference between the tested N sources for the conditions studied. It is recommended, for the soil used (Red-Yellow Latosol), the dose of 185 mg dm^{-3} of N for the production of seedlings of this species, since this dose provided higher production of TDM.

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