EFFECT OF SUBSTRATE ON THE INITIAL DEVELOPMENT OF SEEDLING CEDRELA FISSILIS VELL. (MELIACEAE)

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Abstract

The objective of this study was to evaluate the effect of different combinations of substrates in the initial development of seedlings of Cedrela fissilis. The experiment was conducted in a greenhouse at the Instituto Federal de Educação, Ciência e Tecnologia of Minas Gerais - São João Evangelista campus. We used a randomized block design (RBD), with seven treatments and four replications with each replicate contained 25 seedlings. The substrates used in the treatments were vermiculite, bark and fruit of annatto earthworm castings alone and combined. We evaluated the basal diameter, shoot length and root dry weight of shoot and root and Dickson quality index (DQI). It was found that the initial growth of the seedlings were influenced by the type of substrate. The skin of the fruit mixture containing annatto, vermiculite and earthworm humus shows good potential for use as substrate in the production of seedlings of Cedrela fissilis. The inclusion of the fruit peel waste annatto as a supplier of nutrients to compose substrates formulations aimed at producing native plants, represented a good alternative to reduce production costs of these seedlings.

Key words: Production of seedlings. Substrates. Cedrela. Morphological parameters. Initial growth.

1. Introduction

The Cedrela fissilis Vell. is a Brazilian native forest tree species commonly known as Cedro. It belongs to Meliaceae family. It is a kind of rapid growth and significant economic value, landscape and producer of hardwood of high quality (Martins & Lago, 2008). Considered hardwood is exploited mainly in construction, shipbuilding and aerospace, furniture, manufacturing of musical instruments, sculptures and crafts, too, can be employed, the extraction of essential oils as perfume like the cedar of Lebanon and tanning substances the bark of the trunk (Angeli, 2005). A great advantage to use this kind of wood is its good workability with hand tools and mechanics, besides being resistant to warping and cracking after drying (LorenziI, 2002). The cedar-pink, like any other forest tree species, to generate quality products demand different care at all stages of its production, and quality of seedlings to be used in planting is one of the main factors to be observed.

The design of good quality forest seedlings involves the processes of seed germination, initiation and formation of root and shoot, which are entirely related characteristics that define the level of efficiency of the substrates. In this context, alternative substrates should be evaluated in order to reduce the costs of production, taking advantage of the raw material of each region, making the activity accessible to nursery forest producers.

Currently, several studies have been done on the morphological parameters, in order to verify if the stem diameter, shoot length, the ratio shoot / root dry weight of shoot and root formation and root system can influence methods of seedling production (Simões, 1987). These features are easy to evaluate and can be good qualification requirements (Sarzi et al., 2008). Armed with these data it is possible to evaluate the Dickson Quality index (DQI) what is a good indicator of quality seedlings, because in his estimation are considered the robustness and balance the distribution of biomass in the seedling, weighing the results of various parameters key employees for quality assessment (Fonseca et al., 2002).

The objective of this study was to evaluate the effect of different combinations of substrates in the initial development of seedlings of Cedrela fissilis Vell.

2. Material and Methods

The experiment was conducted in a greenhouse of Instituto Federal of Minas Gerais - São João Evangelista Campus, Minas Gerais, Brazil.

Were used to evaluate the initial growth of seedlings of Cedrela, the vermiculite, the fruit peel of annatto (not charred) and earthworm castings, and the combination between them, thus the seven treatments were: T1 - vermiculite, T2 - urucum fruit bark, T3 - earthworm castings, T4 - urucum fruit bark + earthworm humus (1:1 v / v), T5 - fruit rind annatto + vermiculite (1:1 v / v); T6 - earthworm humus + vermiculite (1:1 v / v), T7 - urucum fruit bark vermiculite earthworm humus (1:1:1 v / v).

For the initial growth, were used as parameters to assess the basal diameter, height of seedlings (shoot and root) dry mass and DQI. The stem diameter and seedling height were measured respectively with a digital caliper to an accuracy of 0.05 mm and a ruler graduated in millimeters. For determination of dry mass the seedlings were divided into roots and shoots through a cut in the neck of time changes. Both parts were separately placed in paper bags properly identified and taken to the laboratory for drying in an oven at 70 ° C for 72 hours. After this period the samples were weighed on a precision balance of centigrams. The average dry weight of shoot and root were calculated by dividing the weight of all the treatment by the number of repetitions of this. Measurements of morphological parameters were made using 10 plants per replicate of each treatment at 90 days after sowing.

With these results, we determined the Dickson quality index (DQI) which is evaluated in a balanced way, which include the relationship of morphological parameters, obtained as a function of shoot height (SH), stem base diameter (SBD) (DC), shoot dry matter (SDM) – sum of stem base dry matter and leaf dry matter (PMSPA) and root dry matter (RDM) (PMSR) (Dickson et al., 1960, Melo et al., 2008).

The experimental design was randomized blocks with seven treatments, four replications of 25 plants per plot, totaling 700 seedlings. Analysis were made of variance (ANOVA) and means were evaluated using the Tukey test when the F test was significant at 5% significance level.

3. Results and Discussion

In the evaluation of morphological parameters (basal diameter, length and dry massof shoot and root) there was no statistically significant difference only on the data ofroot length. Even if they did not differ between treatments, the roots had a volumevisually differentiated. This volume change may be due to loss of roots during the withdrawal of the substrate (TABLE 1).

Table 1 - Mean stem base diameter (SBD), shoot height (SH), shoot dry matter (SDM) and root dry matter (RDM) of seedlings of *Cedrela fissilis* parameters.

TRAT*	SBD (mm)	SH (cm)	SDM (g)	RDM (g)
1	1,88 d	5,80 c	0,15 b	0,13 b
2	2,95 c	14,35 b	1,13 a	1,21 a
3	4,56 a	31, 59 a	4,13 a	0,58 a
4	4,52 a	29,69 a	2, 90 a	0,55 a
5	2, 88 c	17,55 b	0, 98 ab	0,25 ab
6	4,31 ab	28,14 a	3,36 a	0,67 a
7	3,93 b	32,55 a	0,58 a	0,60 a

* T1 – vermiculite; T2 – urucum fruit bark; T3 – earthworm humus; T4 – urucum fruit bark + earthworm humus (1:1 v/v); T5 – urucum fruit bark + vermiculite (1:1 v/v); T6 – vermiculite + earthworm humus (1:1 v/v); T7 – urucum fruit bark + vermiculite + earthworm humus (1:1:1 v/v). Values followed by same letter do not differ statistically from each other by Tukey Test, with confidence range of 95%.

It was noticed that the vermiculite and bark of the fruit of annatto isolated or combined, did not show good growth in diameter, and this may compromise the quality of seedlings to be taken to the field.

The best results for the growth of stem diameter were observed in treatments 03, 04 and 06, which showed no statistical differences between them. 07 The treatment group showed statistically equal treatment to 06 and differed from the others. According to Gomes & Paiva (2004), the diameter and shoot height are one of the best parameters to diagnose the morphologic pattern of seedling quality. According to these authors seedlings of larger diameter have a more balanced growth of the shoot, especially when it requires further hardening them.

It was observed that the substrates containing earthworm castings into your mixing these treatments had better results. In this sense, realizes the importance of studying the formulation of a substrate to provide better nutrition for the seedlings.According to Ribeiro et al. (2001), the presence of organic matter in the composition of the substrate improves its porosity, benefiting aeration, drainage and water storage, and this must have influenced the mechanism of germination, emergence and seedling development.

Data of the height of the growth area were similar to those obtained for the stem diameter and shows the best results in treatment 03, 04, 06 and 07. It was noticed that the substrate earthworm castings alone or combined with the different components favorable to a better development in height of seedlings of Cedrela fissilis, these being essential to the survival of seedlings after planting final.

The minimum height growth was obtained by treating 01, followed by two five treatments, which were the intermediate results. According to Souza et al. (2006), the shoot growth of the species Cedrela fissilis may have been compromised by the fact that it is a secondary plant, demanding better conditions of shading for better development.

The mean values of dry mass of shoot and root dry weight showed the same behavior as a function of treatment, providing superior value for treatments 02, 03, 04, 05, 06 and 07. Son according to Carvalho et al. (2003), the substrate composition and size of the container can provide a better development of the roots and thus higher dry matter.

The highest Quality Indices of Seedlings occurred in treatments 02, 03, 04, 06 and 07. In the treatments 01 and 05, the seedlings did not reach the minimum value of 0.20 suggested by Hunt (1990) and thus their quality is lower (FIGURE 1).

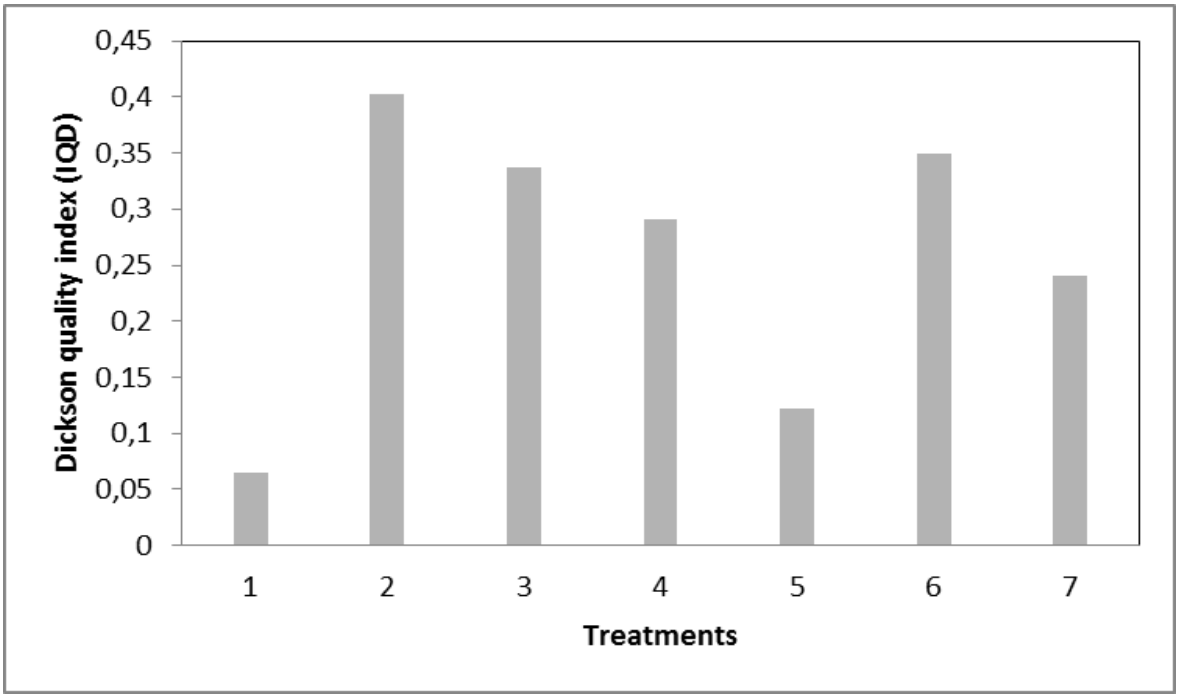

Figure 01: Dickson quality index (DQI), of *Cedrela fissilis* seedlings produced in different substrates. T1 – vermiculite; T2 – urucum fruit bark; T3 – earthworm humus; T4 – urucum fruit bark + húmus (1:1 v/v); T5 – urucum fruit bark + vermiculite (1:1 v/v); T6 – vermiculite + húmus (1:1 v/v); T7 – urucum fruit bark + vermiculite + húmus (1:1:1 v/v).

It was noted that the evaluations of morphological parameters and the DQI were necessary to determine the morphological quality of the seedlings, ensuring thus the success of a program of afforestation.

In general, the substrates isolated and tested in this study combined influence the development process of early seedling Cedrela. Thus, it was checked that the choice of

substrate is essential to obtain better results when they are expected to acquire seedlings quality, due primarily to the large variability among species with the substrate.

4. Conclusion

The earthworm humus substrate, isolated and combined with the different components gave better results for the initial development of seedlings of Cedrela fissilis.
The mixture containing urucum fruit bark, vermiculite and earthworm humus (T7) shows good potential for use as substrate in the production of seedlings of the studied specie.

The inclusion of urucum bark fruit as a supplier of nutrients to compose substrates formulations aimed at producing native plants, represented a good alternative to reduce production costs of these seedlings.

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