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Planting bench seedlings in the field: precocity, health, genetic traceability and homogeneity in rubber plantations

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Abstract

The present work aimed to evaluate establishment index and the initial development of rubber tree seedlings in the field, produced in pine bark substrate on suspended benches in the region of Colina/SP, Votuporanga/SP and Cassilândia/MS. Brazil. The variables evaluated were: establishment index, planting homogeneity, initial field development and early bleeding. The results showed that the establishment index was higher than 95% due to the large amount of roots of bench seedling and that this led to greater planting homogeneity. Regarding the development of bench seedlings in the field, this was superior comparing to the development of seedlings produced in the ground and also it was observed a bleeding precocity. In traditional plantations that use ground seedlings, bleeding takes place in the seventh year with an average of 50% of the suitable plants. In plantation with bench seedlings, there is an anticipation of the maturity period and with six years, more than 70% of the plants are ready to enter into production.

Keywords: rubber tree, bench seedling, bleeding anticipation, plant homogeneity.

Introduction, scope and main objectives

In Brazil, the production of natural rubber, coagulated latex (IBGE, 2019) in 2019 totaled 362,714 tons collected in 166,714 hectares. The State of São Paulo is the largest national producer (followed by Minas Gerais) and accounts for 49.08% of all Brazilian harvesting area (75,179 hectares) and for 68.19% of the volume produced (227,163 tons) of coagulated latex (GONÇALVES et al., 2021).

This production chain generates important foreign exchange and socioeconomic development for São Paulo. There are 132,000 hectares of planted rubber plantations (INSTITUTO DE ECONOMIA AGRÍCOLA, 2019), which generate direct jobs for more than 28,000 people in the countryside, in addition to jobs in industries.

Several factors have to be taken into account when it comes to rubber tree cultivation. However, one of the most important factor within a rubber enterprise is the use of good quality seedlings.

The productivity and profitability of rubber plantations fundamentally depend on proper management. In this sense, the production of quality seedlings is an essential factor for the successful implementation of the culture, given its very long production period. Good agricultural practices begin in the nurseries, from the choice of seeds to the sale of seedlings. Seed and bud propagation materials must have good physical, physiological and sanitary quality, in addition to a known and proven genetic origin. Many pathogens attack the rubber tree culture and among them the nematodes, and the seedlings produced on the ground are the main disseminator of this pathogens to other places (COELHO, 2018). In Brazil, we have a specific breed of Meloidogyne that attacks rubber trees and causes economic damage to the crop and, in order to prevent the dissemination of this nematode, a new protocol for the production of seedlings was developed: seedlings in suspended benches and the use of substrate.

The traditional method of cultivating rubber tree seedlings (ground nursery) has negative points such as: loss of roots when pulling them out of the soil for permanent planting; lack of selective herbicide, high cost for control, requiring the protection of the seedling in the application; cultural treatments in nurseries at ground level are more costly and require intensive use of labor in an uncomfortable position, being less productive; risks related to the dissemination of nematodes or weeds present in the soil, which may affect the future performance of the rubber plantation (ZAMUNÈR FILHO et al., 2012).

In Brazil, around 20 species of nematodes have been cataloged in association with *Hevea brasiliensis* (rubber tree). However, in this extensive list, few species actually show proven pathogenicity. However, root-knot nematodes (*Meloidogyne exigua*) are responsible for the greatest economic losses. This specie (*M. exigua)* constitutes a serious problem in rubber plantations and was detected for the first time causing damage in Rondonópolis, Mato Grosso, in 1992 (SANTOS, 1992). Subsequently, based on another survey (BERNARDO et al, 2019), it can be concluded that *M. exigua* was also widely distributed in the municipality of São José do Rio Claro, Mato Grosso. In the State of São Paulo, widespread dissemination of plant parasitic nematodes was reported (WILCKEN et al, 2015): in a survey of 75 rubber plantations, 85% was infected. From these species, *Pratylenchus brachyurus* was the most frequent specie (66%), followed by *Meloidogyne spp*. (present in 49% of rubber tree plantations). In addition, a sample of soil and root samples in 88 seedling nurseries in the State of São Paulo, the presence of *M. exigua and P. brachyurus*, respectively, was found in 26% and 62% of the analyzed roots (Paes et al, 2013).

On the other hand, the production and use of rubber tree seedlings produced in suspended benches and substrate, presents numerous advantages such as: traceability of seeds, buds and seedlings; better genetic quality of reproductive materials; better phytosanitary quality of seedlings; vigorous root system; precocity in the production of seedlings; better “sticking” of seedlings in field planting and greater uniformity in the rubber plantation (MARTINS et al; 2013, BRITO et al; 2017). Gonçalves et al. (2017), identified the main factors to achieve success in the production of rubber tree seedlings using substrate and bench. According to Oliveira et al (2017), the production cost of the suspended bench seedling is R$ 4.17 and the value that they have been commercialized in the state of São Paulo varies between R$ 8.00 to R$ 10.00 per seedling..

Methodology/approach

The present work was carried out in partnership with producers who chose to plant seedlings produced in suspended benches and substrate, in the cities of: Colina - SP, Votuporanga, - SP, and Cassilândia - MS. After planting, the items obtained were: establishment index (in the three locations), planting homogeneity (in the three locations), initial field development (in the three locations), precociousness of entry into bleeding (in Colina / SP).

Establishiment index: one month after planting, the number of dead plants in each location was counted;

Planting homogeneity: in the first year after implantation, a visual assessment was made on the development of the plants and what percentage of developed plants that were poorly developed or that had been replaced;

Initial field development: 10 consecutive plants were measured, evaluated at different points in different plantations, at each point, at a height of 1.30 meters from the ground, annually, and the annual average of plant development;

Precocity of bleeding: at 6 years after planting, an inventory or mapping of the areas was carried out and all planting plants were measured and considered suitable for entry into bloodletting;

Results and Discussion

One month after planting, the dead plants that needed to be replanted in each location were counted. The results showed that the plant establishment index was higher than 95% due to the large amount of root crops that it presents (Figures 1) when compared to conventional seedlings (produced on the ground).

Figure 1. Development of the root system and vigor of the ground seedling (left) and bench seedling (right).

Regarding the item evaluated planting homogeneity, it was found that in different regions the use of suspended bench seedling provided greater planting uniformity, and better field development, when compared to the traditional seedling. Also the root system of bench seedling during planting and during the distribution of the bags in the planting lines in the field, does not decay (Figure 2), which ends up providing greater planting homogeneity (Figure 3).

Figure 2: Seedling with clod intact.

Figure 3: High percentage of set at planting.

Regarding the development of seedlings in the field, this was superior to the development of seedlings produced in the ground and there was an anticipation of the entry of the trees into bleeding. In traditional plantations that use ground seedlings, bleeding takes place in the seventh year and there is an average of 50% of the plants suitable. In planting with bench seedlings, there is an anticipation of the maturity period and in six years, more than 70% of the plants are ready to enter into production. And, seven years after implantation, in the region of Colina/SP, 86% of the plants were ready for bleeding, with stem diameter development at 1.30 meters in height above 50 cm (Figure 4).

Figure 4: Seven years old rubber tree planting with 88% of the plants suitable for bleeding.

Conclusions/ wider implications of findings

The use of rubber tree seedlings produced on a suspended bench and substrate is an important tool that should be used in the implantation of new forests as it guarantees: better plant establishment, low replanting rate, greater homogeneity and anticipation of the period of maturity of the culture..

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