

Chemical and organic fertilization in development of native species used in slope recovery**Adubação química e orgânica no desenvolvimento de espécies nativas utilizadas na recuperação de taludes**

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ABSTRACT

The aim of the study was to evaluate the development of *Senna* spp. and *Solanum palinacanthum* used in initial process of slope recovery with application of chemical and organic fertilizer. The experimental area is located on Universidade Federal Rural da Amazônia in Parauapebas city, Brazil, the experimental design was completely randomized with three treatments, as specified: Control (without fertilization), organic fertilization (goat manure mixed with palm residue) and chemical fertilization with NPK (04:30:10), with three replications, totalizing nine compound plots. The experimental data were subjected to analysis of variance, by the Tukey and Wilcoxon tests, at 5% probability. The percentage of seedling emergence was higher than 70%, in which the chemical fertilizer promoted a greater increase in growth and initial development of *Senna* spp. and *Solanum palinacanthum*, with higher values of height and diameter compared to plants treated with organic fertilizer.

Keywords: Degraded areas, planting fertilization, sustainability.

RESUMO

O objetivo do estudo foi avaliar o desenvolvimento de *Senna* spp. e *Solanum palinacanthum* utilizados no processo inicial de recuperação de taludes com aplicação de fertilizante químico e orgânico. A área experimental está localizada na Universidade Federal Rural da Amazônia, na cidade de Parauapebas, Brasil. O delineamento experimental foi inteiramente casualizado com três tratamentos, assim especificado: Controle (sem adubação), adubação orgânica (esterco de caprino misturado com resíduo de palma) e adubação química com NPK (04:30:10), com três repetições, totalizando nove parcelas compostas. Os dados experimentais foram submetidos à análise de variância, pelos testes de Tukey e Wilcoxon, a 5% de probabilidade. A porcentagem de emergência de plântulas foi superior a 70%, em que o fertilizante químico promoveu maior aumento no crescimento e desenvolvimento inicial de *Senna* spp. e *Solanum palinacanthum*, com maiores valores de altura e diâmetro em relação às plantas submetidas à adubação orgânica.

Palavras-chave: Áreas degradadas, adubação de plantio, sustentabilidade.

1 INTRODUCTION

To reverse or avoid the degradation process, the use of chemical fertilizers is recommended, with a higher concentration of nutrients, lower cost per unit of element, less humidity, promoting faster results for plants (Porto, 2018). Another alternative is use of organic fertilizer, promoting the

improvement of physical, chemical and biological attributes of the soil (Ding et al., 2016), different from chemical fertilization for showing slow release of nutrients.

In situations where degradation occurs on slopes is recommended according to Barbosa and Lima (2013) the use of vegetation for their respective stabilization, since the roots provide greater resistance against mass movements and water erosion. Therefore, the use of native, pioneer and fast-developing species should be prioritized (Reis et al., 2010; Silva et al., 2017), in which plant species such as *Solanum palinacanthum* Dunal, *Senna obtusifolia* (L.) H.S. Irwin & Barney and *Senna occidentalis* (L.) Link, show potential to be used in plant restoration processes, being rustic and suitable for Brazilian climate.

The aim of the study was to evaluate the development of *Senna* spp. and *Solanum palinacanthum* used in initial process of slope recovery with application of chemical and organic fertilizer.

2 MATERIAL AND METHODS

The experiment was carried out on a cut slope, with dimensions of 117 m in length, 8 m of ramp and average inclination of 50 °, located at coordinates 06°04'23"S and 049°48'562" W, on Universidade Federal Rural da Amazônia in Parauapebas city, Brazil, with tropical "Aw" climate, average annual temperature of 29 °C and average rainfall of 1500 - 2000 mm year⁻¹, according to the Köppen classification, and the soils classified as Ultisol and Entisols (Embrapa, 2018).

The slope ramp was divided in nine plots of 80 m². The experimental design used was completely randomized, consisting of three treatments, as specified: T1 (control): without fertilizer used; T2 (Organic fertilizer): 10 g of goat manure mixed with palm residue for each microcove, this fertilizer was composed of 64% of goat manure and 36% of palm residue; and T3 (chemical fertilization): each micro-cove received a total of 3 g of NPK (04:30:10), with three repetitions.

The cocktail of seeds, in the proportion of 1: 1: 1, was composed by *Solanum palinacanthum*, *Senna obtusifolia* and *Senna occidentalis*, and in each micro-coves, 1.2 g of seeds were sown. The arrangement of the micro-coves showed a 20x20 cm spacing, and a 10 cm width and depth.

Height and diameter assessments were made using a digital caliper and a ruler on existing plants (Scheer et al., 2017), totaling four samples during 120 days of monitoring. The experimental data were subjected to analysis of variance, by the Tukey and Wilcoxon tests, at 5% probability, using the BioEstat 5.0 (Ayres et al., 2007) and Systat 12.0 (Wilkinson, 2007) statistical software.

3 RESULTS AND DISCUSSION

The seedling emergence evaluated on the tenth day after sowing (DAS) showed values above 70% in the micro-coves, with no statistical difference by F-test at 5% probability. The speed and homogeneity of seedling emergence are important components within the concept of seed vigor (Rossi et al., 2017), being dependent on use of seeds with high physiological potential. Possibly, the failures obtained in emergency process were result of seed dormancy and/or death from direct exposure to climatic factors such as high incidence of sunlight and water deficiency.

Considering the data collected after 120 days of monitoring of *Senna* spp. and *Solanum palinacanthum* observed the efficiency of use of chemical fertilizer (NPK 04:30:10), resulting in highest average values for plant height and stem diameter variables (Figures 1 and 2).

Figure 1 – Height (A) and diameter (B) measurements of *Senna* spp., considering all data collected during the 120 days of monitoring.

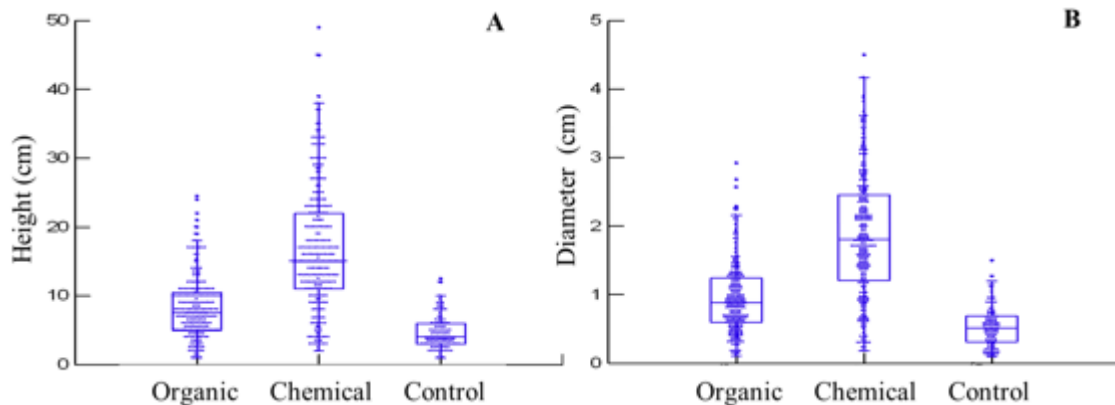
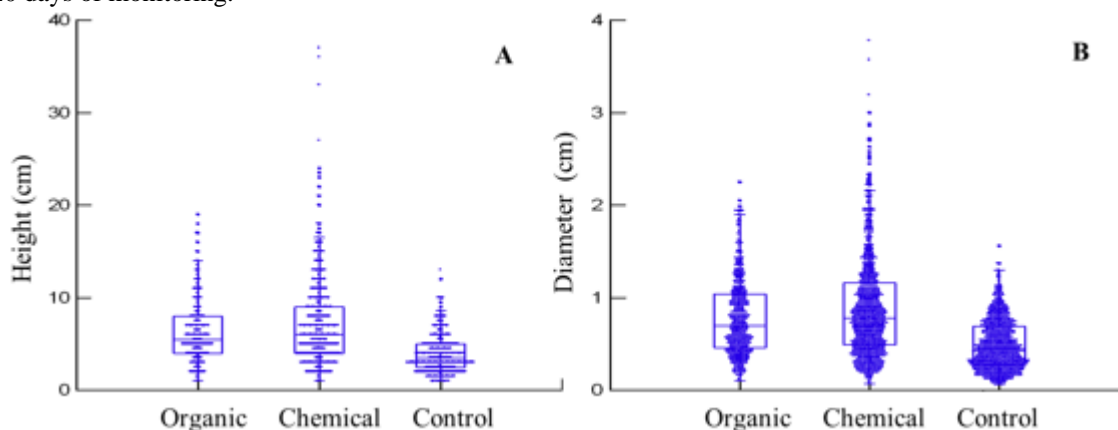


Figure 2 – Height (A) and diameter (B) measurements of *Solanum palinacanthum*, considering all data collected during the 120 days of monitoring.



Chemical fertilizers provide nutrients more quickly for plants, and that nutrients have specific functions in plants that promote greater development, such as nitrogen directly participating in plant metabolism, acting as a constituent of the chlorophyll molecule, nucleic acids, amino acids

and proteins (Hildebrandt et al., 2015). Potassium enables better functioning of stomata (Ahmad and Maathuis, 2014), promoting greater CO₂ assimilation and increase in photosynthetic rate (Taiz and Zeiger, 2013). While, phosphorus, contributes to the rooting, tilling and acceleration of the initial growth of plants (van de Wiel et al., 2016), this characteristic is of fundamental importance for slope recovery process.

For the treatment with organic fertilization and control (without fertilization) observed lower values for evaluated variables, probably occurred due to low availability of nutrients offered to plants (Silva et al., 2007; Mundus et al., 2008), therefore, it is not readily available after application to soil.

4 CONCLUSIONS

The chemical fertilizer (NPK 04:30:10) promotes greater increase in the growth and development of *Senna* spp. and *Solanum palinacanthum* compared to organic fertilizer in initial slope recovery process.

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