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Digested Sugar Cane Wastes Can Improve the Early Growth of Brazilian Leguminous Trees and Soil Chemical Parameters

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Abstract

Agroforestry systems in the Brazilian Cerrado region can mitigate negative environmental effects of agriculture in this area. Digestates as remaining by-product of the biogas process were proofed to have a good fertiliser value. However, application of digestates to tropical trees is not evaluated yet. A greenhouse experiment was conducted at Forschungszentrum Jülich, Germany, from August to December 2014. The leguminous tree species Enterolobium contortisiliquum (Tamboril) was cultivated in 5 l pots with two different Oxisols brought from the Cerrado region, whereas one soil was taken from an agroforestry field the other soil was taken from field used for maize and livestock. Soils were amended with digestates based on a blend with filter cake (70 % w/w) and bagasse in five replications in three doses (192 ml per pot; corresponding to 33 m^{-3} ha) in the 7^{th}, 9^{th} and 11^{th} week of tree cultivation. A control was established without any supply of the digestates. We used the protocol of chemical soil analysis from EMBRAPA (Brazil) to analyse pH, organic C and the available P and K contents in the soil at the end of the experiment. The trees (stem+leave and roots) were weighted and the plant tissue was analysed for the concentration of nutrients. When the digestate was applied the length of Tamboril plants increased (28 %), more shoot biomass (17 %) and less root biomass (12 %) were produced in comparison to the control (average of all soils). The N and P concentration in plant biomass did not show significant differences but tended to increase for the digestate treatments. Furthermore, with the digestate application the soil organic C (1.97 %) and the bioavailable P content (87.6 mg kg^{-1}) were higher than in the control. The soil pH was not affected by the treatments. Higher tree biomasses were always found for the agroforestry soil. The results showed that the application of digestates can have advantages for the early development of tropical trees. However, further studies under natural conditions in the Cerrado region are necessary.

Keywords: Agroforestry, organic residues, soil fertility

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