

OXIDIZABLE FRACTIONS AND TOTAL ORGANIC CARBON IN SOIL WITH APPLICATION OF BIOCHAR AND CULTIVATED WITH EUCALYPTUS

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Abstract

Brazil has the largest area of planted forests in the world, about 9 million hectares, mostly composed of eucalyptus and pine. This large plantation area generates a large production of residues, estimated at 10 t ha⁻¹ of eucalyptus bark per cultivation cycle. These residues have been reused for ground cover, heat and electricity production, and production of biochar through pyrolysis. Many characteristics of biochar make it attractive as a soil conditioner, such as its high porosity and specific surface area, associated with aromatic structure and acidic functional groups, which result in the accumulation and persistence of carbon in the soil, formation of electrical charges and nutrient retention and availability. Thus, the objective of this study was to evaluate the influence of the pyrolysis temperature of eucalyptus bark biochar, for periods of 365 and 730 days after the use of doses of biochar in *Eucalyptus urograndis* plantations, on the total organic carbon (TOC) content and oxidizable carbon fractions in the classes of dry separated soil aggregates. The study was conducted in the experimental area of the Instituto Federal do Espírito Santo (Ifes) Alegre Campus, Alegre, Espírito Santo, Brazil. The soil of the area is classified as Red-Yellow Latosol with medium texture. The experiment was implemented in March 2018, where each treatment, in each block, was composed of a total of six *E. urograndis* plants, arranged in rows, previously formed in each block. The eucalyptus bark biochar was produced in a pyrolysis reactor (model SPPT V60) and then distributed, prior to planting, in a furrow with depth of 0.30 m and width of 0.40 m. Two slow pyrolysis temperatures (350 °C and 600 °C) were used in the production of biochar, and five doses of biochar (0; 0.25; 0.5; 1 and 2% v v, corresponding to 0; 2.5; 5; 10; 20 t ha⁻¹, respectively). Two soil samplings were performed, at 365 days and 730 days after the start of the experiment, at depths of 0.0-0.10 m and 0.10-0.30 m for the evaluation of TOC content and oxidizable carbon fractions. The effects of treatments and evaluation times were compared by orthogonal contrasts. When contrasting the pyrolysis temperatures for the production of biochar (350 °C and 600 °C), it was not possible to observe great differences in the soil attributes evaluated. The exception was in the aggregate class 2.0-0.250 mm, where the biochar produced at 600 °C produced a significant increase in TOC content ($p < 0.01$) and oxidizable fractions F3 ($p < 0.05$) and F4 ($p < 0.001$) in both years and at both depths sampled. When the two sampling periods were compared, an increase in TOC values ($p < 0.001$) and of the fractions F1 ($p < 0.001$) and F2 ($p < 0.01$), in the first year of the experiment, was observed in the aggregate class < 0.250 mm in the two types of biochar studied. The results of this study, after two years of evaluation, show that the incorporation of oxidizable carbon to soil aggregates was relatively low compared to the results of other studies where biochar was as a soil conditioner. These results are related to the lack of adequate time for aggregate formation.

Keywords

Biochar, Eucalyptus, Residues.