# INFLUENCE OF BIOCHAR DOSES APPLIED IN SOIL CULTIVATED WITH EUCALYPTUS ON OXIDIZABLE FRACTIONS AND TOTAL ORGANIC CARBON

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## Abstract

The pyrolysis of agricultural wastes process in an environment with absence or deficiency of oxygen has drawn much attention for generating products such as biochar with potential to act as soil conditioners. Characteristics of biochar reinforce its performance as soil conditioner, such as high porosity, aromatic structure and presence of acid functional groups, which result in accumulation and persistence of carbon in the soil, generation of electrical charges, and retention and availability of nutrients. Considering that the time of adopting a management system can influence the quantity of total organic carbon (TOC) contents, but this may not indicate differences between the treatments evaluated, some authors have proposed to fractionate TOC according to four decreasing degrees of oxidation, through the use of different concentrations of sulfuric acid. This method, called TOC fractionation by degrees of oxidation, allows the classification of soil carbon into the fractions F1, F2, F3 and F4. Fractions F1 and F2 are more labile and are more related to the availability of nutrients and the formation and stabilization of macroaggregates, while fractions F3 and F4 are related to compounds with greater chemical stability and molecular weight. This work aimed to evaluate the influence of doses of eucalyptus bark biochar on TOC content and oxidizable organic carbon fractions in dry-separated soil aggregate classes. The study conducted in the field consisted of the application at a Eucaliptus urograndis plantation of five doses of eucalyptus bark biochar (0; 0.25; 0.5; 1 and 2% v v, equivalent to 0; 2.5; 5; 10; 20 t ha-1) produced at two pyrolysis temperatures (350 °C and 600 °C). Two soil samples were taken (365 days and 730 days) at depths of 0.0-0.10 m and 0.10-0.30 m. Through regression analysis of the biochar produced at 350 ºC, we observed a linear increase in the content of the fraction F2, in the classes of aggregates 4.00-2.00 mm ($p<0.05$) and <0.250 mm ($p<0.01$); F4 in the class of aggregates 4.00-2.00 mm ($p<0.1$), at depth 0.00-0.10 m; in F1int aggregate class <0.250 mm ($p<0.1$) and F2 in aggregate class 4.00-2.00 mm ($p<0.1$), at sampling depth 0.10-0.30 m, in the samples collected at 365 days. At 730 days, quadratic increases were found for F3 in aggregate class 2.00-0.25 mm ($p<0.05$) and linear increment of F4 fraction in aggregate class <0.250 mm ($p<0.1$), at depth 0.00-0.10 m. For the depth of 0.10-0.30 m linear increases in TOC contents were found in aggregate class 4.00-2.00 mm ($p<0.05$) and a quadratic increase in the F3 fraction in aggregate class <0.250 mm ($p<0.05$). The application of biochar produced at 600 ºC promoted, in the first collection, linear increases in TOC contents in aggregate class 2.00-0.25 mm ($p<0.05$) and in the F4 fraction in aggregate class 2.00-0.25 mm ($p<0.05$), at the 0.00-0.10 m depth. At sampling depth of 0.10-0.30 m, an increase occurred in fractions F1 in aggregate class 2.00-0.25 ($p<0.1$) and F3 in aggregate class 4.00-2.00 mm ($p<0.1$). For the F4 fraction, in aggregate class 4.00-2.00 mm, there was a quadratic increase ($p<0.05$). In the second collection (730 days), these effects were noted, in the form of a quadratic equation, for the F3 fraction in aggregate class 4.00-2.00 mm ($p<0.05$) for the collection performed at 0.00-0.10 m. At depth 0.10-0.30 m, linear increases in TOC were found in aggregate class 2.00-0.25 mm ($p<0.05$), F2 in aggregate class 4.00-2.00 mm ($p<0.1$) and F4 in aggregate class <0.250 mm ($p<0.1$). Few significant results were observed regarding the applied doses of the biochar on TOC contents and organic carbon fractions. We believe the possible causes for not obtaining more significant results from the application of eucalyptus bark biochar in the soil in this experiment were, first, the dosages chosen, which could have been higher, and the texture of the soil studied, which did not have a great need for cementing agents for soil aggregation. Another factor to be observed is the time of the experiment, since the evaluations were performed two years after implementation. We can conclude that according to studies in the area, changes in TOC levels in tropical climate soils are usually noted in the medium and long term after the implementation of new management practices.

## Keywords

Biochar, Oxidizable Fractions, Residues.