

Redox Index of soil and sediment organic carbon stability

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Introduction

As an alternative to the relatively complex and expensive spectroscopic methods,¹⁻³ the redox properties of the humic acids, determined by potentiometric titrations, has been used to evaluate the soil organic carbon stability.^{4,5}

The redox index of carbon stability (RICS in mol_c ha⁻¹), as according of Baldotto et al. (2010),⁵ was defined by the sum of the product between the oxidation capacity (OC_{Fraction}, mol_c kg⁻¹) and stock (S_{Fraction}, Mg ha⁻¹) for each fractions (not necessarily of the chemical fractionation).

The objective of the present study was to establish a redox index of carbon stability (RICS) and to correlate it with some attributes of the humic acids extracted from different modal Brazilian soils (distinct weathering stages or management), fluvial and estuarine sediments, aiming at more easily comparing systems

Results e Discussion

The RICS varied significantly with sample origin. The soils at early and intermediate stages of weathering presented larger RICS values (than the weathered soils). The soil under continuous sugarcane cultivation, depending on its management, showed drastic changes of RICS, that decreasing in the following order: unburned, burned, burned with vinasse and burned without vinasse. Soil showed organic carbon with more large stability than fluvial and estuarine sediments.

Conclusions

This use of RICS is intended as a thermodynamic function, indicative of the oxidation

tendency of the carbon stock. It is waited that the soil carbon stock with the more reducer power would have a higher probability of persistence in the organic matter of a given system.

The RICS was efficient for soil comparison.

The RICS varied similarly with the chemical and spectroscopic methods (UV-Vis, Fluorescence, RPE and NMR) used for the humic acid characterization. The soil pH, PZSE, sum of basis, Ca²⁺ content, weathering index Ki and also the humic acid O/C ratio, quinone and semiquinone free radicals, aromatic carbon and fluorescence intensity, showed straight relationships with RICS.

The less weathered soils, with more active clay and higher fertility, presented larger RICS.

Under long term of sugarcane management the soil plots presented RICS following the order: unburned > burned with vinasse > burned without vinasse.

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