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Carbon and Nitrogen Elemental and Isotopic Composition in Atlantic Forest Soils Submitted to Different Land Uses

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The Brazilian Coast was covered by Atlantic Forest and now we have less than 5%. This Biome was mainly substitute by grasses and the perspective is to increase this profile due the alcohol and sugar production. As an environmental consequence we have drastic changes in organic matter quality and quantity that can present some ecological and geochemical implication compromising the carbon biogeochemical cycles. Therefore, the objective of this work was to study the impact of C3-C4 vegetation change in soils from Atlantic Forest in Rio de Janeiro State, Brazil.
On the survey basis for carbon isotopic composition (21 forest, 8 pasture and 3 sugar cane plants) the results showed that the forest are exclusively C3 plants raging between -34.1‰ and -29.7‰ (-31.7 ± 0.3‰ while C4 plants, from sugar cane plantation and pasture, presented a mean -12.2 ± 0.1‰ for D13C, ranging from -11.6‰ to -12.7‰Overall, the surface area for forest and pasture soils (0 to 10 cm) (41.2 ± 3.6 m2 g-1 and 46.1 ± 2.5 m2 g-1, respectively) were different than in the plantation soil (17.2 ± 2.7 m2 g-1). The C isotopic ratio in the soil samples showed a clear difference between land uses the forest (-27.5‰, pasture (-19.2‰ and sugar cane plantation (-17.7‰). In general, these values are also expressing the age of vegetation conversion (C3[U+F0DE]C4) for pasture and sugar cane plantation, ∼30 and ∼ 60y, respectively. In the modified areas soil organic matter (SOM) had a mixture of C3 andC4, and its balance controlled by diverse factors, such as the time since the change in land use, soil characters, frequency and type of management and the type of new vegetation. In the present case, the isotopic enrichment index (EI) was calculated as percentage of C4 organic matter participation in relation to C3 origin based on two end member model. Therefore, pasture showed 59% of C4-SOM, while the sugar cane plantation coming up to 73% of C4-SOM in the superficial layer (0 to 10 cm). The values presented here for EI confirm the descriptions of areas and showed the OM change into the local soils. At the same time laboratory experiments demonstrated a strong differences for solubility index {SI= Solubility Index [(Free Fulvic Acid + Fulvic Acid + Humic Acid/Humin) x 100]}, (Pasture and Sugar Cane Plantation ∼ 25%; and Forest ∼ 80%) suggesting that OM sources and soil surface area together are promoting the OM stabilization in these tropical soils.