

Does soil management system affect C content of a coarse sandy loam Amazonian Acrisol?

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The impact of No-till on the soil C content in comparison to Conventional Tillage (CT) depends greatly on the soil type, climate and initial C content. The main goal of this work was to investigate the effect of conservation soil management systems on the C content and humification in an Acrisol profile, Acre State, BR. The experiment was conducted randomized blocks with three repetitions, for NT and CT (main parcels), employing the succession manioc/green manure/maize. For each system, three treatments (subparcels) were established: Control: slash and burn (C); Mucuna aterrima as cover crop (M); as cover crop with addition of P-fertilizer and limestone (MPL). N and C content (dry combustion, C_{DC}, and Walkley-Black, C_{WB}) and humic substances (HS) were determined in samples collected after 10 years within 100 cm. C_{DC} content in the 0-5 cm depth ranged from 13.9 to 16.5 g kg⁻¹ and did not differ between treatments. As expected, C_{DC} decreased with depth reaching values between 3.9 and 5.1 g kg⁻¹. C_{WB} values were always smaller than the respective C_{DC}, indicating that part of soil organic matter (SOM) was not susceptible to oxidation. The index C_{WB}/C_{DC}, a proxy for chemical recalcitrance, varied between 0.7 and 0.9 in the 0-5 cm and decreased to values around 0.5 at 75-100 cm depth. No correlation was found between this index and clay content, indicating that chemical recalcitrance was not related to organo-mineral interactions. C/N ratio varied between 11.7 and 16.0 and no difference was detected between treatments. Cation exchange capacity (CEC) increased linearly (0.75 < R^2 < 0.98) with C_{DC} evidencing the important role of SOM on the fertility of these soils. Interestingly, liming increased pH and CEC only under NT, but showed no effect for CT. Probably, soil plowing under CT, by removing the protection of cover crop, favored liming wash out along the coarse sandy loam profile by high rainfall (1600 to 2700 mm y^{-1}). The proportion of humin fraction (C_{HU}/C_{DC}) varied between 0.4 and 0.6 and did not differ between treatments. Furthermore it did not correlate with clay content, suggesting that organo-mineral interactions were not determinant on the stabilization of SOM in depth. The AH/AF ratio decreased drastically with depth indicating a possible migration of fulvic fraction in all sites. Our results showed that soil conservation management systems did not affect SOM content and dynamics in a coarse sandy loam Amazonian Acrisol within 10 years.

Keywords: chemical recacitrance, humic substances, no-till

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