

Iron Reduction and CEC Changes in a Temporarily Reduced Soil

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Summary

The long-term effects of intermittent flooding on soil properties were studied in field experiments on a vertisol cropped with rice in Senegal. The dominant soil clay minerals were smectite and kaolinite. When the soil was reduced, its CEC was twice that when oxidised. Mössbauer spectroscopy showed an increase in smectite structural Fe^{II} upon reduction, which explained part of the CEC increase. The rest of the increase was attributed to the removal of clay oxyhydroxide coatings by reductive-dissolution. The redox-induced CEC changes were found to be reversible after 22 cycles of rice cropping. Nevertheless, the structural Fe and free Fe contents of the Ap rice field horizon were lower than those of soil in uncropped neighbouring land, suggesting a continuing weathering and eluviation of the minerals. The observed changes in CEC and related redox reactions may substantially modify proton, anion and cation balances in intermittently flooded soils, as well as pollutant transfer.