APPLYING ISOTOPES TO UNDERSTAND GEOCHEMICAL PROCESS IN AN ONSITE WASTEWATER SYSTEM

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Areas lacking sanitary infrastructure lead inhabitants to use excavated wells for water needs and cesspits for wastewater disposal, thus favoring contamination of local groundwater with nitrate and microorganisms. An alternative wastewater treatment system and a conventional latrine were constructed and monitored in Parelheiros, south of the municipality of São Paulo. The alternative latrine was designed with a sawdust permeable layer to promote nitrate removal. In this alternative latrine, $N\text{-}NO_3$ concentrations ranged between 40 to 120mg/L above the sawdust layer and between 20 to 85mg/L in the sawdust layer itself. In the nitrification zone, the $\delta^{15}N\text{-}NO_3$ values ranged between 10 and 15‰, which are wastewater typical values. The $\delta^{15}N\text{-}NH_4^+$ values increased from 10 to 32‰ as the $N\text{-}NH_4^+$ concentrations decreased from 120mg/L, close to the effluent tank, to 30mg/L1m above sawdust layer. In the sawdust barrier, the decrease of nitrate concentrations was followed by $\delta^{15}N\text{-}NO_3^-$ enrichment (~23‰), thus indicating nitrate consumption by denitrification. CO_2 concentrations were detected over the profile (5 to 6%) and $\delta^{13}C\text{-}CO_2$ values ranged between -16 to -23.5‰, a fingerprint for organic material oxidation. In the conventional latrine, nitrification practically did not occur. $N\text{-}NH_4^+$ concentrations along the latrine profile varied between 100-350 mg/L. The lower values of $\delta^{15}N\text{-}NH_4^+$ (4-16‰) compared to those from alternative latrine show that ammonium was little affected by the nitrification process. The conventional latrine presented CO_2 concentrations (12-26%) higher than those of the alternative latrine, but the same fingerprint for $\delta^{13}C\text{-}CO_2$.