Electrochemical method to study the environmental behavior of Glyphosate on volcanic soils: Proposal of adsorption-desorption and transport mechanisms

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Glyphosate is used extensively worldwide, but current evidence suggests detrimental effects on the environment, pollinators, and human health. Glyphosate adsorption kinetics and adsorption/desorption were studied through batch sorption experiments in ten typical volcanic ash-derived soils from Andisol and Ultisol orders. Two kinetic models were used to fit the experimental data: i. Models that allowed establishment of principally kinetic parameters and modeling of the adsorption process, and ii. Models described solute transport mechanisms commonly used for remediation purposes. Adsorption kinetic data were best fitted by the pseudo-second-order kinetic model and Two-Site Nonequilibrium model. These models suggest that mechanisms are complex due to rapid surface adsorption in ultisols with mass transfer controlling adsorption kinetics across the boundary layer, as indicated by the high h and low t1/2 values. High intraparticle diffusion into macropores and micropores was observed for Andisols. The Freundlich model accurately represented adsorption equilibrium data in all cases (R2 > 0.9580) with comparatively higher adsorption capacity on Andisols. Kf values (2.50?52.28 ?g1?1/n mL1/n g-1) and hysteresis were significant in all studied soils. Taken together, these data suggest that Glyphosate may be adsorbed more on Andisol soils in comparison to Ultisols.