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Effects of pH and phosphate on glyphosate adsorption to Argentina soils.

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Glyphosate is a non-selective, post-emergence herbicide that is widely used in Argentina. Due to the similar molecular structures, glyphosate and phosphate compete for the same adsorption sites in soil. Soil pH has a strong influence in glyphosate and phosphate adsorption since it modifies the net charge of the molecules and, consequently, the force of the electrostatic interaction between these molecules and soil components. Glyphosate adsorption generally decreases as the soil pH was increased, although there were exceptions.
In this work, we study the effects of pH and the presence of phosphate on the adsorption of glyphosate on six different types of Argentina soils. Batch equilibrium technique was employed to study the adsorption of glyphosate onto soils at different pH values (from 3 to 9) and phosphate content (0.5 and 1 mM). Stepwise multiple linear regression analysis was applied to obtain a relationship between the sorption parameters and soil properties.
The results indicated that Freundlich equations used to simulate glyphosate adsorption isotherms gave high correlation coefficients with Kf values range from 24.9 to 397.4. Clay contents and soil pH were found to be the most significant soil factors affecting the glyphosate adsorption process. The presence of phosphate significantly decreased the adsorption of glyphosate to soils. The Kf values obtained for all six soils decreased a 40% at 0.5 mM of phosphate and a 55% at 1 mM of phosphate. On the other hand, the affinity parameters of glyphosate to soils varied with changes in pH. A general trend of decrease in glyphosate adsorption with increase in pH was observed for all six studied soils. In turn, there appears to be a maximum glyphosate adsorption at pH close to 6 for most soils when the net charge of the molecule at this pH was approximately -1.7.