Phosphate and glyphosate sorption in soils following long-term phosphate applications

Phosphate and glyphosate molecules compete for sorption sites in soil. The objective of this study was to quantify the impact of Olsen P concentrations in two contrasting soils on phosphate and glyphosate sorption. Soils were a sandy clay loam soil rich in iron oxides (SCL-Fe2O3) and a clay loam soil rich in calcium carbonates (CL-CaCO3). The phosphate Freundlich sorption coefficient (Kf) ranged from 3 to 68 L1/n mg1-1/n kg-1 in the SCL-Fe2O3 and from 21 to 76 L1/n mg1-1/n kg-1 in the CL-CaCO3. Glyphosate sorption coefficient (Kd) ranged from 293 to 1173 L kg-1 in the SCL-Fe2O3 but only 99 to 141 L kg-1 in the CL-CaCO3. Glyphosate Kd and phosphate Kf values decreased significantly with increasing Olsen P concentrations in both soils. Glyphosate Kd values were further significantly reduced when phosphate was added to the slurry solutions, but phosphate Kf values were not impacted by the presence of glyphosate in solutions. We conclude that annual phosphate fertilizer applications leave phosphate concentrations in Prairie soils to the extent that soils have a lesser capacity to retain glyphosate and phosphate that are subsequently applied, but glyphosate residues will not influence phosphate sorption.