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APPLICATION OF BIOSENSOR FOR THE STUDY OF COMPETITIVE ADSORPTION OF GLYPHOSATE: MODELING FOR ENVIRONMENTAL RISK ASSESSMENT

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Glyphosate is a herbicide that requires monitoring in water bodies and soils in agrosystems and natural ecossystems. In addition to determining glyphosate levels in water and soil, it is essential to define the factors that determine its mobility and agricultural management. The relationship between glyphosate sorption and some elements in soils, such as phosphorus, copper, cadmium, zinc and organic compounds is known. Due to the variable behavior of glyphosate, its periodic determination in the soil/water compartment is important considering frequent agricultural management. In order to meet the need for frequent and rapid evaluation, the proposal of this study was to develop a biosensor for the determination of both glyphosate and the main elements related. The biosensor was applied in the modeling of glyphosate sorption/desorption dynamics under agricultural soil fertility conditions (range [P] = 30 – 10000 mg Kg^{-1}; range [Cu = Zn] = 30 – 10000 mg Kg^{-1}). The experiments were carried out with soil samples collected at a depth of 10 cm and dried and sieved with 2 mm mesh. The sorption isotherms were constructed with batch experiments conducted with soils treated with different doses of phosphate used as fertilizer, in addition to zinc sulfate and copper sulfate. The biosensor is based on the fluorescence of bovine serum albumin and its interaction with glyphosate sorbed / desorbed from soil. The choice of was defined due to availability and low cost. The biosensor for glyphosate was able to quantify the glyphosate from 50 µg Kg^{-1} (soil samples). This relationship allows for the calculation of distribution coefficient (Kd): Kd (Gly) > Kd (P) > Kd (Cu) > Kd (Zn). This study demonstrated the application of the biosensor for the determination of glyphosate in desorbed soil fractions in the concentration range found in agricultural areas under the influence of elements of soil fertility.

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