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CHEMOMETRICS FOR BIOREMEDIATION: METALS AND PESTICIDE FOR TOXICITY AND NATURAL ATTENUATION POTENTIAL ASSESSMENTS IN SOILS

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The effects of the contaminants modulate the toxicity and natural attenuation profile of both ecosystems and farming systems. The balance between these two pathways (toxicity and degradation or natural attenuation) determines the risk and vulnerability of such systems regarding the presence of different levels of contamination. In this study, the effects of compounds of intense use in agricultural areas, such as metals and pesticides, were evaluated: concentration of metals and pesticides and their effects on the activity of soil enzymes and their degradation. This study is part of the pesticide bioremediation plan in regions with intense agriculture overlapping environmental preservation. The collected soil samples was submitted to metal (Zn, Pb, Na, Cu, Co, Fe, Cr e Mn) and pesticide determinations and kinetic characterizations of enzymes present in soils. These analytical data were submitted to a multivariate statistical treatment, a Principal Component Analysis (PCA). Subsequently, the significant correlations identified in the PCA were confirmed by *in vitro* experiments. Experimental design and mathematical modeling of the biochemical process conditions related to the toxicity and/or biological degradation responses of the pesticides found. The accomplishment of exploratory statistical treatments allowed for the screening and identification of high functional relevance parameters for the evaluated edaphic systems. The model generated identifies the specific conditions for more efficient enzymatic activities in the pesticide degradation processes simultaneously to the metal/pesticide toxicity conditions in the dynamics of soil degradation. The importance of the local fauna and flora biodiversity was verified in this study regarding the increase of the potential for natural attenuation of pesticide levels. The conditions concerning increases in enzymatic performance for pesticide degradation are still not well explores in agroecosystems that display low specific diversity. The indications of the performance conditions where the performance of soil enzymes is required essentially indicate functional and non-specific deficiencies.

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