Study on Relative reactivity and Toxicity of Metal-Glyphosate Complexes

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Glyphosate (Gip), ($C_3$1¯1,1\10,1^{3}), N-(phosphonomethyl)glycin is a non-selective, post emergence organophosphorus herbicide. Metal-glyphosate complexes can be formed via coordination of amine, carboxylate, and phosphonate functional groups in glyphosate with di/tri valent metal ions in surface water. However, adequate studies on toxicity of metal-glyphosate complexes are not yet conducted. Furthermore, glyphosate metal complexes are suspected to cause chronic kidney disease in Sri Lanka. The goal of this study is to compare relative reactivity of metal ions towards glyphosate and toxicity of metal-glyphosate complexes. Therefore, metal-glyphosate complexes which has a higher potential to contaminate the surface water can be identified. Complexes were synthesized for Cu, Fe and Ca ions and characterized with FTIR and UV-Visible spectroscopy. Solubility was measured for these complexes and suggests higher solubility for Cu-Glp. However, the fastest complex formation was observed for formation of Ca-Glp followed by Fe- Glp and Cu- Glp. Fish embryo toxicity (FET) test results indicates metal-glyphosate complexes have a higher toxicity compared to individual metal ions and the highest toxicity was reported for Cu-Glp complex.

Keywords: Glyphosate, Metal glyphosate complexes, Toxicity, Glyphosate metal reaction rates.