



## **Effects of paper mill sludge and lime sludge on copper sorption and desorption in a marginal sandy soil**

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Copper (Cu) is most readily mobile and available in acid coarse-textured mineral soils, but adsorption by soil is expected to render it less mobile, and therefore less hazardous. The aim of the study is to assess the Cu sorption capacity of a marginal sandy soil (pH 5.5) amended with paper mill sludge (PMS) and lime sludge (LS). The amendments were added to the soil at nine rates (0 - 350 g/kg soil). The sorption measurement was carried out by adding 30 mL of 0.01 M CaCl<sub>2</sub> containing 100 mg Cu/L as CuCl<sub>2</sub> to 1.00 g of amended soil samples. The soil suspensions were shaken for 30 min and equilibrated at room temperature for 72 h. After centrifugation, the concentration of Cu in the supernatant was determined by atomic absorption spectrophotometry. The amount of Cu sorbed was calculated as the difference between Cu added and Cu remaining in solution. The sorption experiment was replicated 4 times. The statistical analysis showed a highly significant effect ( $p < 0.001$ ) of the type and the rate of sludges on both Cu sorbed and Mehlich3-extractable Cu (total of four successive extractions). The percentage of Cu sorbed by LS-soils varied between 9.4 and 88.4 % and that of Cu sorbed by the PMS-soils varied between 5.4 and 68.4 %. The percentage of Cu desorbed by sludges-treated soils varied between 1.4 and 9.4%. Application of LS tended to increase soil pH and was more effective than PMS in increasing the pH of acid sandy soil. The amounts of Cu sorbed were positively and significantly correlated ( $r = 0.937$ ,  $p < 0.001$ ) with pH of LS-treated soils. Lime sludge and paper mill sludge could provide possible means to remediate Cu contaminated soils through chemical stabilization.