

Immobilization of coagulant *Moringa oleifera* Lectin to Remove Humic Acid from Water

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Humic acids are linked to carcinogenic by-products formation in water treatment. In this work coagulant *Moringa oleifera* lectin (cMoL) immobilized to matrices was used to remove humic acid from water. Seed proteins were extracted with 0.15 M NaCl (E) and precipitated with ammonium sulphate (0-60F). Fraction was guar gel column chromatographed and cMoL was eluted (1.0 M NaCl). E, 0-60F and cMoL affinity to bind humic acid was characterized using hemagglutinating activity (HA) with rabbit erythrocytes. Inhibition HA was evaluated with humic acid, humic acid and calcium or magnesium (5 and 10 mM), carbohydrates and halogenated compounds. cMoL immobilized in silica, clay, cellulose, agarose and sepharose was packed into columns. Humic acid (29 mg/L of carbon) was pumped through columns at 0.2 mL/min. Total organic carbon (TOC) was measured (600 nm) using the Method 10129 from Hach Lange GmbH (0.0 to 20.0 mg/L of carbon). HA was detected in E, 0-60F and cMoL. With humic acid SHA decreased 94 % for E and cMoL; diminished 50 % for 0-60F. K⁺ enhanced interaction of cMoL with humic acid in comparison to Ca²⁺, since a larger decrease of SHA was obtained, 97 % and 75 %, respectively. D(+)-Galactose and L(+)-arabinose inhibited cMoL SHA by 87.5 %. Trichloroacetic acid, dichloroacetic acid and chloroform had no activity effect. The highest amount of cMoL was immobilized on cyanogen bromide-activated Sepharose 4B, 2.4 µg/mg, followed by cyanogen bromide-activated Agarose, 0.2 µg/mg. A considerable humic acid removal was obtained in the new purification protocol.

Keywords: Lectin, *Moringa oleifera*, immobilization, humic acid, water treatment.