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Organic and inorganic chromium species at the soil-root interface

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The aim of this study was to investigate the interactions of different chromium forms such as CrIII and CrVI as free metal ions and CrIII as a complex (Cr-L) with a Ca-PG network.

Ca-PG networks, used as models for the soil-root interface, were treated with solutions of chromium (CrIII and CrVI) at different concentrations at three different pHs. Adsorption reactions were also carried out using Cr-L complex obtained by water extraction of hydrolysed leather. As known the Cr content in these extracts is coordinated by water-soluble amino acids and peptides.

Results showed that CrVI had almost no interaction with the Ca-PG networks, whereas CrIII as a free metallic ion was strongly retained by the network. In addition, the adsorption was pH dependent. The Langmuir adsorption isotherms indicated that at pH 5.50 the sorption was much greater than at pH 3.50 having though a lower affinity with the networks. This would indicate that the different chromium species, i.e. CrIII and its hydrolytic species, interact in a different way with the polygalacturonate chains causing structural distortions. On the other hand, the Cr-L complex causes a reduction (up to 94 %) of CrIII sorption. These results suggest that the pH dependent CrIII speciation and Cr coordination with organic compounds affect the sorption of the metal at the soil-root interface, probably influencing also its mobility and toxicity.