Effect of citrate on phosphorus availability in soils with contrasted mineralogy - a modelling approach

Marek Duputel[1*], Nicolas Devau[1], Michel Brossard[2], Philippe Hinsinger[1], Benoît Jaillard[1], Frédéric Gérard[1]

[1]INRA (UMR Eco&Sols),
[2]IRD (UMR Eco&Sols) 1 place Pierre Viala, 34060 Montpellier, France
marek.duputel@supagro.inra.fr

Aims and Background
Plants can exude large amount of carboxylates which ultimately increase phosphate (P) availability. Both anions compete for adsorption onto soil minerals. Mechanistic modelling approach can be profitably used to understand these competitive interactions in soils. The aim of this study was to use such an approach to investigate citrate effect on P desorption in soils of contrasted mineralogy.

Methods
As Devau et al., 2011a, three adsorption models were used to simulate citrate and P competition onto the major sorbents of the studied soils; 1-pK Triple Plane, simple ion exchange and Nica-Donnan. Tested citrate concentrations were representative of those found in the rhizosphere. We considered a large range of pH values.

Results
At high citrate concentration (100ìM), the larger increase of P availability was found at high pH in Luvisol and Chromic Cambisol and at low pH in Ferralsols. At lower citrate concentration (10ìM), the maximum increase was predicted at acidic pH in Ferralsols. Surprisingly, a decrease of P availability was calculated in Luvisol and Chromic Cambisol.

Conclusion The extent of P desorption is a function of citrate release, soil pH and mineralogy. Predicting the effect of citrate on P availability requires to account for the interactions with clay minerals, not only Fe oxides.

Reference
Devau N, Hinsinger P, Le Cadre E, Colomb B, Gérard F (2011a) Fertilization and pH effects on processes and mechanismes controlling dissolved inorganic phosphorus in soils. *Geochim. Cosmchim. Acta.* 75:2980-2996.

Burswood Convention Centre, Perth, Western Australia
Sunday 25 – Friday 30 September 2011

CONFERENCE MENU

DISCLAIMER: All program information, session times, presenters and other information is correct at time of printing. It is the responsibility of the submitters/presenters to provide clear and correct content to the conference organising committee prior to printing. Any content error is at the discretion of the submitter.