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Trophic relationships: role of bacteria, fungi and nematodes interactions on mineral nutrition from organic P and N in the rhizosphere of *Pinus pinaster* seedlings

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In forest ecosystems, P and N availability is often limiting plant growth, despite soil organic reserves. Plant mineral acquisition occurs in the rhizosphere, a highly competitive environment with food web relationships between roots, microbes and micro-fauna. This soil food web has been poorly studied in gymnosperms forming ectomycorrhizas. These ectomycorrhizas live with specific bacteria called mycorrhiza helping bacteria (MHB). We hypothesize that in the rhizosphere, these bacteria might mobilize unavailable organic sources of P and N into new pools of nutrients which become available to plants following predation by bacterial-feeding nematodes.

To test this, we used a simplified system with organic P (phytate) and combinations made of *Pinus pinaster* seedlings, an ectomycorrhizal fungus (*Hebeloma cylindrosporum*), populations of MHB bacteria (*Bacillus subtilis*) and their predator nematodes (*Rhabditis* sp).

The results showed that only nematodes predation exerted a positive effect on plant P accumulation up to 200% possibly via better N nutrition as compared to plant alone, plus mycorrhiza and plus bacteria, despite the fact that these bacteria possess phytase activity.

This nutrient release by bacterial predation in the rhizosphere represents a suitable pool of nutrients for plants. The work underlines the importance of taking into account a certain level of multitrophic interactions during nutrient acquisition studies.