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Tracing the fate of organic P compounds in soil - a direct investigation of microbial organic P use

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In soils, the wide variety of organic phosphorus (Porg) compounds constitutes a large fraction of total soil P, and therefore represents an important pool of actively cycled terrestrial P. However, to date little is known about the decomposition dynamics of this highly heterogenic group of compounds in soil systems, mainly due to the lack of traceable Porg substrates for experimental approaches. It is further currently unknown whether Porg substrates released into the soil are generally mineralized to inorganic P by extracellular enzymes before microbial uptake or whether substantial amounts of low-molecular weight Porg compounds are taken up in an intact form. This study therefore aimed at directly investigating the short-term fate (0-24hours) of five different groups of 33P-labelled Porg components (teichoic acids in bacterial cell walls, DNA, RNA, phospholipids, and small organophosphates) relative to inorganic 33P in soils. To that end, depolymerization and dephosphorylation reactions of these Porg pools were measured concomitant with the uptake of organic versus inorganic 33P into soil microbial community. The purified 33P-labelled Porg components were obtained by growing Bacillus subtilis in a 33P amended liquid medium and subsequent fractionation of the biomass into the five groups of 33Porg compounds by optimized biochemical fractionation protocols. After adding these substrates to an agricultural soil and a pasture soil, the relevant organic, inorganic and microbial P pools were determined at seven timepoints over 24hours. The data of these experiments are currently under evaluation and will be presented at the conference.