## S5T2

## The role of phenazines in regulating phosphate bioavailability in the rhizosphere

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### Abstract

Phosphate (P) is poorly available to plants and soil microorganisms due to its association with minerals. To combat limited P, plants release exudates and/or create beneficial relationships with microorganisms that liberate adsorbed P. The molecular drivers of P solubilization are often considered to consist of (organic) acids and chelators. However, reductive dissolution by redox active metabolites (RAMs) is an overlooked mechanism that may be relevant in soil anoxic microenvironments. Moreover, many RAMs (e.g., phenazines) are up-regulated under P limitation by rhizosphere-associated bacteria, and under controlled batch conditions, can liberate bound P. Here, we investigate whether microbially secreted phenazines can enhance P bioavailability and utilization in the rhizosphere. We describe a microscopy imaging technique that uses light sheet fluorescence microscopy to visualize, in real time, root/microbe interactions at the pore-scale without disrupting the spatial heterogeneity of plant roots (*Brachypodium distachyon*) and surrounding bacteria (*Pseudomonas synxantha* 2-79). Using fluorescent transcriptional reporters (i.e., an alkaline phosphatase, a phenazine biosynthesis, and an Fe(II) sensing reporter), we are tracking phenazine regulation during P limitation and testing if this results in the reductive dissolution of iron-oxide-bound-phosphate in a rhizosphere setting. Additionally, we are quantifying the total plant phosphorus concentration via ICP-MS to determine the contribution of phenazine-mediated plant P uptake by contrasting results from a phenazine deficient mutant and a phenazine producing bacterial strain. Our findings will help us assess the ecological relevance of phenazine secretion during P limitation and the potential utility of phenazine producing bacteria as P-solubilizing microorganism in agroecosystems.