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## Microbial necromass shaped plant traits in a warmer condition

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Among many factors controlling root exudation, root hairs proliferation and warming have strong influence on exudate release as well as microbial substrate utilization and enzyme activities. Thus, the interactions of these two factors are important but least known in the rhizosphere. Phosphorus (P) is the most important growth limiting nutrient in soils. Concerns about a depleting supply of P as fertilizer has boosted research efforts on understanding P cycling and fluxes, as a breakdown of P availability would have disastrous global consequences. Efficient P recycling in temperate ecosystems provides an excellent possibility to study all kind of biogeochemical P transformations – those mobilizing low available P species and those recycling available P – maintaining a high level of microbial biomass P in the ecosystem. Such microbial cycling has been successfully shown for individual C compounds or within compound classes. P recycling, especially within microbial communities, has not been investigated so far. Microbial necromass as a source of available C and N affect microbial P utilization. However, the mechanisms underlying this alteration of biogeochemical transformations within the P cycle are not understood. To clarify these interactions for 21 days, rhizoboxes with Maize wildtype and mutant (rth3, no root hairs) under 20 and 30 °C, with and without necromass addition were incubated. The spatial distribution of acid phosphatase was assessed with MUF-based Zymography. Phosphatase activity as well as enzyme kinetics parameters (Vmax and Km) were determined in bulk and rhizosphere soil of all treatments.

Our result showed that necromass addition accelerated microbial activity and phosphates hotspots at high temperature ranges. Necromass had no influence on rhizosphere size but increased hotspots independent of temperature. In treatment without necromass amendment, root-hairs effects on enzyme activity and efficiency was pronounced only at elevated temperature. Necromass addition caused formation of roots with special morphology comparable to root hairs in mutant type (hairless root). This was plant strategy to compensate P limitation and acquire more P under competition with soil microbiome. Consequently, P content in plant biomass after changes of root morphology increased while MBP decreased. This, shows that microbial necromass was decomposed and used as a source of P by plant. Thus, plant by adaptation of their morphology over compete microorganisms for more efficient P uptake.