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Resilience of rhizosphere bacterial populations during phytoextraction of heavy metal polluted soil with poplar

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As the heavy metal (HM) content in remediated soils may be reduced due to the metal uptake by plant roots, continual monitoring of key bacterial communities might be useful to assess the resilience of the microbial structures and to find indicators for the removal of the HM. Here, we studied the response of *Pseudomonas* spp. and ammonia-oxidizing bacterial (AOB) populations during phytoextraction. Hybrid poplars were grown in compartmented root containers with an aged HM contaminated soil for 13 weeks. Bulk and poplar rhizosphere soils were analyzed by denaturing gradient gel electrophoresis (DGGE) of *Pseudomonas* (*sensu stricto*) 16S rRNA and *amoA* gene fragments. DGGE patterns revealed that *Pseudomonas* and *amoA*-containing populations in the contaminated soils were markedly different from those in the uncontaminated soils. *Pseudomonas* and *amoA* profiles appeared to be stable over time in the bulk soils. In contrast, contaminated rhizosphere soils revealed a clear shift of populations with removal of HM. Rhizosphere *Pseudomonas* spp. and AOB populations of the HM-contaminated soils became similar or at least shifted from HM-stressed back to the populations of the uncontaminated soils during phytoextraction. The effect of phytoextraction was, however, not evident in the bulk samples, which still contained large amounts of HM. Cloning and sequencing of dominant DGGE bands revealed that *Pseudomonas* were phylogenetically related to the *Pseudomonas fluorescens* cluster and the *amoA* sequences to *Nitrosospira* spp. This study suggests that two taxonomically different populations are able to recover after the relief of HM stress by phytoextraction practices and the use of simplified root container experiments provides valuable information for risk assessment of heavy metal polluted soils.

Keywords: heavy metal, phytoextraction, root container, rhizosphere bacterial populations