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MOLECULAR BIODIVERSITY OF ARBUSCULAR MYCORRHIZAL FUNGI (AMF) IN TRACE METALS CONTAMINATED SOILS AND THEIR ROLE IN SOIL PHYTOREMEDIATION

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Abstract

We assessed the indigenous arbuscular mycorrhizal fungi (AMF) community structure from the roots and associated soil of *Plantago major* (plantain) growing on sites polluted with trace metals (TM), and on unpolluted sites. Uncontaminated and TM contaminated sites containing As, Cd, Cu, Pb, Sn, and Zn, were selected based on a survey of the TM concentration in soils of community gardens in the City of Montreal (Canada). Total genomic DNA was extracted directly from these samples. PCR followed by denaturing gradient gel electrophoresis (PCR-DGGE), complemented by cloning and sequencing, as well as direct sequencing techniques, were used together to investigate AMF community structure. We found a decreased diversity of native AMF (assessed by the number of AMF ribotypes) in soils and roots harvested from TM polluted soils compared to unpolluted soils. We also found that community structure was modified by TM contamination. Various species of *Glomus* and *Scutellospora* were the most abundant ribotypes detected in unpolluted soils; ribotypes of *G. etunicatum*, *G. irregulare/ G. intraradices* and *G. viscosum* were found in both polluted and unpolluted soils, while ribotypes of *G. mosseae* and *Glomus* spp. (B9 and B13) were dominant in TM polluted soils. The predominance of *G. mosseae* in metal polluted sites suggests the tolerance of this species to TM stress, as well as its potential use for phytoremediation.

A greenhouse trial was conducted to investigate the role *Glomus irregulare* and *G. mosseae* on cadmium (Cd) uptake by sunflower plants grown in soil complemented with three Cd concentrations (0.75, 10, and 30 mg kg^{-1}). Ten weeks after sowing, root colonization, plant biomass, and Cd, Zn, and Cu concentrations in plant tissues were determined. We found that root mycorrhizal colonization rates were not significantly affected by Cd treatments. At low soil Cd concentration (0.75 mg kg^{-1}), *G. irregulare*-inoculated plants had significantly higher shoot Cd and Zn concentrations than plants inoculated with *G. mosseae* and non-inoculated plants. At 10 mg kg^{-1} of Cd concentration in soil, no significant difference in shoot TM concentrations was found between plants inoculated with *G. irregulare* and non-inoculated plants. While, At 30 mg kg^{-1} of Cd concentration in soil, *G. mosseae*-inoculated plants had significantly lower shoot Cd and Zn concentrations and biological exchange factor (BCF) values than plants inoculated with *G. irregulare* and non-inoculated plants. The results indicated that these AMF strains mediate different tolerance strategies to alleviate TM toxicity in their host plants.