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P17

PHYTO-MYCOREMEDIATION: MORPHOLOGICAL AND MOLECULAR CHARACTERIZATION OF ARBUSCULAR MYCORRHIZAL FUNGI FROM A HEAVY METAL POLLUTED ASH DUMP DOWNTOWN VENICE

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Abstract

Sacca San Biagio is an island in the central lagoon of Venice (Italy) that hosted a municipal solid waste incinerator operating from 1973 to 1984 and producing ashes that were distributed in a thick layer all over the island. The island, that presents high levels of heavy metals (mainly Cu, Pb and Zn), in the last 25 years has been spontaneously colonized by plants and soil biota and represents a unique site for the study of microorganisms thriving in heavy metal polluted environments. Among soil microorganisms, arbuscular mycorrhizal (AM) fungi (AMF) are important plant symbionts living in association with the roots of most land plants (80%) and occurring also in heavy metals contaminated soils. In such soils, AMF are critical in the establishment and fitness of plants, affecting the physico-chemical characteristics of the soil and enhancing metal immobilization. For these reasons phyto-mycoremediation utilizing AMF as plant inoculants is regarded as a promising strategy to heavy metal pollution remediation. We investigated the mycorrhizal status of the different plant species colonizing Sacca San Biagio, 67% of which resulted mycorrhizal. Though, no AM fungal spores could be isolated from the rhizosphere. Since spores were not available we used PCR-based techniques to identify AMF within plant roots. The analyses revealed the presence of nine AM fungal sequence types, two of which new to science. In order to isolate AM fungal symbionts able to live in such harsh environment, trap cultures with plants and ashes originating from Sacca San Biagio were set up. After five months' cultivation five spore morphotypes were retrieved, morphologically identified and molecularly characterized. DNA was extracted from single spores and amplified using different primer pairs overlapping regions of the ribosomal DNA repeat units: the small subunit (SSU), the internal transcribed spacer (ITS) region and the large subunit (LSU) rDNA. The selection of ruderal plant species and the isolation of AM fungal strains from Sacca San Biagio will allow the detection of suitable stress-adapted plant-AM fungal associations to be used as biotechnological tools for land restoration programs of heavy metal contaminated areas.