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Plants growing on abandoned mine sites: a chance in phytoremediation

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Introduction

Phytoremediation is a low cost and environmental friendly technique which uses metal-accumulator plants to clean up moderately contaminated areas, lessening metal mobility and bioavailability.

The choice of plants is a crucial aspect for the practical use of this technique. Up today, about 400 natural plants that hyperaccumulate metals are reported, Brassicaceae being the family with the largest number of hyperaccumulator species. However, metal hyperaccumulation is not a common phenomenon in terrestrial higher plants, and many of the European hyperaccumulator plants are of small biomass and a slow growth rate. Therefore, there is an urgent need for surveying and screening of plants with ability to accumulate metals in their tissues and a relatively high biomass.

Materials and methods

Plants growing on abandoned mine sites and naturally metal-enriched soils (e.g. serpentine soils) are of particular interesting this perspective, since they are genetically tolerant to high metal concentrations derived from rock weathering. For example, *Alyssum bertoloni* is well known as Ni accumulator, as well as *Thlaspi caerulense* for Zn and *Brassica napus* for Pb.

Weathering of mine tailings is considered as an environmental problem throughout the world, since acidic conditions induced by oxidation of sulphides increase the solubility of heavy metals and may determine serious hazard to groundwater, plants and ultimately the human health.

Results

In recent years, a survey of soils and plants growing on contaminated areas at several abandoned sulphide mines in Italy was carried out in order to evaluate the ability of these plants to accumulate metals, and to colonize mine waste in the perspective of an ecological restoration of sites.

Plants (grasses, shrubs and trees: fescue, silene, rock-rose, willow) were found to be metal-tolerant and to accumulate high levels of Cd, Co, Ni, Zn, Pb, Cu in their tissues (both roots and aerial parts), although at different extent in response to their metabolic activity, physiology, and to soil and environmental characteristics.

Conclusions

Plants growing on mine spoils appear to represent useful tools for soil remediation and environmental restoration at low cost.

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