



Stabilisation of mine tailings by addition of microbially treated sugar beet and native bacterium inoculation in semiarid conditions

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Unstable mine tailings are susceptible to water and air erosion, so it is important to promote their stabilisation to avoid the spread of heavy metals. A mesocosm experiment was conducted to investigate the effect of the addition of *Aspergillus niger*-treated sugar beet, in the presence of rock phosphate, and inoculation with a native, metal-tolerant bacterium, *Bacillus thuringiensis*, on the stabilisation of soil aggregates of two mine tailings, with differing pH values, from a semiarid Mediterranean area and on the stimulation of growth of *Piptatherum miliaceum* in the polluted soils. Four months after planting, the inoculation of *Bacillus thuringiensis* combined with the organic amendment had significantly enhanced the structural stability (38% in the acidic soil and 106% in the neutral soil compared with their corresponding controls). Only the amendment increased pH, electrical conductivity, water-soluble C and water-soluble carbohydrates in both soils. While in the rhizosphere of the neutral soil both amendment and bacterium increased dehydrogenase activity, only fermented residue had a significant effect in the acidic soil. The amendment stimulated significantly greater growth of the plants of *P. miliaceum* than did inoculation with *B. thuringiensis*, in

both soils. The effects of both factors on plant growth depended significantly on soil type. This study demonstrates that the combination of fermented sugar beet and an autochthonous bacterium is a suitable tool for the stabilisation of the soil structure and promotion of microbiological properties of degraded mine tailings, although its effectiveness is dependent on soil pH.