



Carbon stabilization and microbial growth in acidic mine soils after addition of different amendments for soil reclamation

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The extreme soil conditions in metalliferous mine soils have a negative influence on soil biological activity and therefore on soil carbon stabilization. Therefore, amendments are used to increase organic carbon content and activate microbial communities. In order to elucidate some of the factors controlling soil organic carbon stabilization in reclaimed acidic mine soils and its interrelationship with microbial growth and community structure, we performed an incubation experiment with four amendments: pig slurry (PS), pig manure (PM) and biochar (BC), applied with and without marble waste (MW; CaCO_3). Results showed that PM and BC (alone or together with MW) contributed to an important increment in recalcitrant organic C, C/N ratio and aggregate stability. Bacterial and fungal growths were highly dependent on pH and labile organic C. PS supported the highest microbial growth; applied alone it stimulated fungal growth, and applied with MW it stimulated bacterial growth. BC promoted the lowest microbial growth, especially for fungi, with no significant increase in fungal biomass. MW+BC increased bacterial growth up to values similar to PM and MW+PM, suggesting that part of the biochar was degraded, at least in short-term mainly by bacteria rather than fungi. PM, MW+PS and MW+PM supported the highest microbial biomass and a similar community structure, related with the presence of high organic C and high pH, with immobilization of metals and increased soil quality. BC contributed to improved soil structure, increased recalcitrant organic C, and decreased metal mobility, with low stimulation of microbial growth.