Soil microbial communities and porosity from restored soils with organic amendments and mulches.

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In recent years, the restoration of degraded soils from semiarid environments is quite common, but little is known about the restoration effects on the physical, biological and microbiological soil properties. In an experimental restoration on limestone quarries from Sierra de Gádor (SE Spain), organic amendments (sewage sludge, compost, non-amendment) combined with different kinds of mulches (gravel, wood chips, non-mulch) have been tested for improvement in soil/substrate properties and accelerated ecological restoration. Natural undisturbed soils around the mine area were used as a reference for soil quality. 2D soil porosity was assessed by image analysis of soil thin sections. Composition and structure of microbial communities were estimated by PCR-DGGE. The combination of amendments and mulches significantly influenced most 2D-porosity parameters. Total number of pores and fissures (pore diameter > 500 µm) were higher under wood chip mulch. However, transmission pores (50-500 µm) were more abundant under non-amended and reference soils. In general, the combination of organic amendments and mulches provided more porous restored soils than un-amended substrates. The phylogenetic structure of soil microbial communities showed differences among all the treatments and the reference soils. The bacterial community was inversely correlated with the total porosity, though there was a positive correlation between the fungal community and transmission pores. These constructed soils should be studied over time in order to know the effects of the different restoration techniques on pedogenetic processes and their biological functionality.