

## Amendment effects on soil microbial communities in a quarry substrate

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Organic amendants, being rich in stable organic matter, can be used to restore degraded soils by improving their chemical and physical properties, supporting microbial communities and promoting natural revegetation. This approach to soil restoration is particularly relevant in Mediterranean ecosystems, where the susceptibility to climate-induced desertification is exacerbated by intensive human land use, resulting in soil degradation, biodiversity loss and reduced ecosystem functionality. As part of the EMBRACE National Interest Project (PRIN 2022 PNRR), this research aimed to evaluate the effects of a vermicompost made from marine waste and a sludge-based amendment, as well as their respective zeolite-enriched variants, on the microbial community of a quarry substrate poor in organic matter, through a comparative experiment with untreated controls. Six months after amendments, soils were characterised microbiologically, with a focus on spore-forming bacteria, siderophore-producing bacteria, actinomycetes, yeasts and moulds. Additionally, the antibacterial potential of all isolated colonies against two phytopathogenic fungi, *Sclerotinia sclerotiorum* and *Rhizoctonia solani*, was evaluated to assess the possible use of the amendants to promote revegetation through biocontrol. Results showed that different amendants induced significant changes in soil microbial community, with major variations across all groups of microorganisms. Specifically, both stabilized sewage sludge and vermicompost increased the abundance of the microbial groups studied to varying degrees, depending on the group itself. Natural zeolites generally reduced the positive effects of sludge and vermicompost but were crucial for increasing the abundance of specific groups, such as spore-forming bacteria. Significant variations in the biocontrol of pathogenic fungi were observed among treatments, particularly against *R. solani*, with promising results mainly from spore-forming bacteria. Overall, the obtained results provide valuable insights into the mechanisms that promote spontaneous revegetation through soil amendments, and could potentially enhance their role in the ecological restoration of degraded soils.