FaST sOil REstoration with biochaR as a micrObiOMe Carrier

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Abstract:

Climate change intensifies soil salinization through drought and inefficient water use, reducing crop productivity and bacterial diversity while disrupting nutrient cycling. Urban soils, altered by human activities, face challenges in sustaining essential ecosystem services. Biochar amendment offers a promising solution for soil restoration due to its high water and nutrient retention, support for beneficial microbes, and ability to enhance soil quality. Acting as a long-term carbon sink, biochar contributes to soil stability for centuries. Pre-conditioning biochar with nutrients or microbes can further improve its nutrient-holding capacity, aiding in degraded soil restoration, carbon sequestration, and agricultural sustainability.

A related study on urban degraded soil in Bari, Italy, analyzed bacterial communities considering spatial variability, depth, and sampling position. Soil samples from 0-10 cm and 10-20 cm depths revealed depth-dependent microbial diversity: oxygen-tolerant bacteria dominated surface layers, while anaerobic species thrived deeper. Edge-specific bacterial OTUs highlighted ecological variability compared to the center, which showed greater microbial uniformity. These findings underscore how depth and location significantly shape bacterial diversity, reflecting local environmental conditions and influencing soil health. Together, these insights emphasize biochar’s potential in mitigating climate impacts on soils and supporting microbial ecosystems in urban and agricultural settings.

Keywords:

Bacterial diversity, Biochar amendment, Urban soil restoration, Carbon sequestration.