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Review article

Impact of Climate Change on Soil Microbial Communities

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ABSTRACT

Environmental changes are causing shifts in the species distributions on a global scale and can alter the interactions between the microorganisms within ecosystems. The ecosystem comprised a complex web of species with diverse life history strategies and varying dispersal capabilities. Therefore, it is improbable that all species respond to climatic changes identically. Climate change disrupts the delicate balance of plant-soil ecosystems, which significantly affecting plant health and soil fertility. However, the effects on the intricate web of soil microbe-microbe interactions remain largely unknown. The crucial role of soil microorganisms in nutrient cycling, plant nutrition, facilitation of plant coexistence, and population regulation could have significant consequences for plant community composition and overall ecosystem function. This study focuses on climate-changes, which directly and indirectly have effects on soil microbes and their interactions with plants. We identify emerging questions and areas for future exploration, while evaluating the potential ramifications of changing these interactions on the composition and function of the ecosystem. Overall, this study has the potential to contribute to our understanding significantly of climate-changes effects on ecosystems and pave the way for the development of effective strategies to mitigate these effects and ensure the continued health and function of our ecosystem.

Keywords: Ecosystem, Microbial communities, Heat waves, Flooding, Drought.

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INTRODUCTION

Earth maintains a delicate balance of incoming and outgoing radiation (He *et al.*, 2023). However, human activity has disrupted this equilibrium by releasing greenhouse gases (Joly *et al.*, 2023). This amplified greenhouse effect pushes global temperatures higher, a seemingly small rise of 1°C masking a cascade of consequences (Peng *et al.*, 2023). Climate change is intensifying extreme weather events (heat waves, droughts, floods, storms, etc.), leading to devastating impacts on ecosystems (Anjileli *et al.*, 2021).

Climate change, the ongoing shift in global temperatures and weather patterns, is not only affecting visible ecosystems like forests and coral reefs but also exerting a profound influence on the invisible world of microbes (Mukhtar *et al.*, 2023 and Rio *et al.*, 2024). These tiny organisms, encompassing bacteria, Archaea, fungi, and Protists, play critical roles in biogeochemical cycles, nutrient cycling, and human health (Bastos *et al.*, 2023). Understanding how climate change disrupts microbial communities is crucial for predicting