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Rapid Communication

Complexity, Diversity of Forest Microbiome

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INTRODUCTION

Forests are highly productive ecosystems that contribute as carbon sinks, forming soil organic matter from residuals during biomass decomposition as well as rhizodeposited carbon. Forests have a great degree of geographical variation, and trees, the leading primary producers, are critical to their structure and function. Bacteria, Fungi and archaea can be found in a range of habitats in the forest, including foliage, living tree wood, the bark surface, ground vegetation, roots and the rhizosphere, Soil, litter, Rock Surfaces, deadwood, Wetlands, Invertebrates or the atmosphere, each of which has its own unique characteristics, such as nutrient availability or temporal dynamics, as well as specific drivers that influence microbial abundance, dominance, and the composition of their communities [1].

Several microorganisms, particularly fungus, live in or connect numerous habitats, and most ecosystem processes have an impact on multiple habitats. Forests are dynamic on a large temporal range, with processes ranging from short-term occurrences to long-term stand development following disturbances like fires or insect epidemics. Exploration of the complex 'ecosystem microbiome' and its functioning via focused, integrated microbiological and ecological research conducted across many environments is the only way to comprehend these processes [2,3].

Trees rely heavily on microbial symbionts to provide growth-limiting elements like nitrogen by mobilising it from organic debris and storing it in mineral forms that plants can use. Mycorrhizal fungi and nitrogen-fixing bacteria are responsible for up to 80% of all nitrogen and 75% of all phosphorus delivery [4].

Most modern temperate and boreal forests are established on nutrient-poor and rocky soils, leaving fertile soils for agriculture, due to land use history. As a result, the conditions in forest ecosystems differ significantly from those in other terrestrial habitats, emphasising the need of nutrient supply and recycling for the long-term growth of forest ecosystems.

Plants are not just damaged by wildfires in their visible portions. They also have an impact on the plant microbiome, which is made up of bacteria that live in close proximity to plant tissues [5]. Understanding these impacts aids scientists in reducing the impact of wildfires by allowing them to better understand how vegetation regenerates and how the plant microbiome aids ecosystem recovery.

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