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Editorial

The Mycorrhizal Fungi Microbiome is Shaped by the Combination of Soil Type, Plant Species, and Iron Diet

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Abstract

By mobilising and transporting nutrients, plant-associated microbes can promote plant growth and have an impact on crop yield and quality. Therefore, it seems that one of the important factors affecting the health and production of plants is the rhizosphere microbiome. Through the establishment of distinct chemical niches in the soil, which are mediated by the release of phytochemicals (i.e., root exudates), the roots of plants have the capacity to influence their surrounding microbiology, the rhizosphere microbiome. These factors include the genotype of the plants, the characteristics of the soil, the nutritional status of the plants, and the climatic conditions. In the current study, barley and tomatoes—two different crop species with distinctive Fe acquisition strategies—have been grown in the RHIZOtest system using either complete or Fe-free nutrient solutions to cause Fe famine. Following that, plants were grown for six days on two various calcareous soils. Total DNA was collected from the rhizosphere and bulk soil, and the V1-V3 16S rRNA gene region was sequenced using 454 pyrosequencing technology. For each sample, about 5000 sequences were retrieved(Lee, Peter et ., 2020).

Keywords: Nitrogen metabolism, Plant species of gypsiferous soils, Population demity, Proline

INTRODUCTION

(Bhutta et al., 2013) In terms of bacterial species diversity and community size, soils are acknowledged as the most varied environment for microorganisms on Earth. The most prevalent group of living things in the soil are bacteria. The first study to describe the diversity of microorganisms in soil estimated that 1 g of soil from a boreal forest could contain up to 10,000 different bacterial species, but later studies using more advanced tools showed that the number of prokaryotic genomes per gramme of soil could be as high as 1 million. Numerous factors, such as the physical-chemical characteristics of the soil, have an impact on the taxonomical and functional distribution of soil microbial communities (e.g. type, texture and pH), (Headey DD et al., 2013) the amount of water present, the weather, and how other soil organisms interact with it. The presence of plants and the species of plants can also have an impact on the structure of the soil microbial community. These factors lead to an(Headey D et al., 2012). Uneven distribution of microbes in soil, with the majority of them concentrated in the area immediately around the roots of plants, or the so-called rhizosphere. A sophisticated food web that exploits root exudates generated by plants as an easily useable carbon (C) source for growth is made up of the microbiota in this unusual habitat (Deaton A et al., 2008). In this concept, it was proposed that plants might selectively manage the growth of microorganisms, selecting those that exhibit qualities favourable to plant (Datt G et al., 1998) growth and health based on differing qualitative and quantitative exudation profiles. a source of expansion. In this concept, it was proposed that plants might selectively manage the growth of microorganisms, selecting those that exhibit qualities favourable to plant growth and health based on differing qualitative and quantitative exudation profiles. (Ravallion M et al., 2002) When plants experience abiotic stress, including a lack of nutrients, root exudates are especially stimulated. They are made up of a variety of low and high molecular weight organic chemicals. Root exudates are essential for improving nutrient solubility, absorption, translocation, and allocation in many plant species because of their solubilizing, chelating, reducing, and/or oxidising abilities. Iron (Fe) is a vital element for plants since it is involved in so many biological processes, but its bioavailability is quite low in calcareous and well-aerated soils. Fe-deficiency-induced chlorosis is hence frequently one of the main obstacles to plant growth, productivity, and quality.(Christiaensen L et al ., 2011) Plants have created two distinct techniques to deal with the Fe scarcity. Dicots, which are categorised as Strategy I plants, rely on the acidification of the rhizosphere, which occurs when protons are expelled, the reduction of insoluble FeIII to the more soluble FeII, which occurs when a ferric chelate reductase (FRO2) is active, and the transport of iron into root cells by the iron-regulated transporter 1 (IRT1) to be able to extract Fe from soil. Grassy plants use Strategy II, (Bamji MS et al ., 2011)which involves the exudation of non-proteinogenic amino acids (phytosiderophores, PSs), complexation with FeIII, and uptake of FeIII-PSs by transporters with a yellow stripe 1 or yellow stripe 1-like structure(Headey D et al ., 2013) .

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