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Perspective

Clinical Research on Plant Microbes

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ABOUT THE STUDY

Medicinal plants represent enormous biological resources with potential utility in modern medicine and agriculture, but their microbial flora is largely unknown. The purpose of this study is to introduce new insights into plant microbiomes focused on medicinal plants, provide details on the plant and microbial constituents of medicinal plants, promote plant growth and protect crops for commercial cultivation of medicinal plants. The soil microbial flora of desert ecosystems contained large amounts of Gram-positive bacteria, which are of paramount importance for controlling pathogens under dry soil conditions. Soil resources can control the coexistence of plant species through resource allocation and sharing.

Rhizosphere microorganisms can affect plant-plant interactions by altering the availability of various forms of nitrogen or phosphorus in soil and mediating resource sharing. Soil resources can also be migrated through a common symbiotic fungus called Common Mycorrhizal Networks (CMN). In nature, different plant species often share a wide range of specific mycorrhizal fungi. Simard and Durall have demonstrated the direct transfer of resources from one facility to another through a CMN containing tagged carbon, nitrogen and phosphorus. The dynamics of plant communities are driven by the mediation of microorganisms, the distribution and sharing of soil resources. The plant microflora is likely to be an important determinant of plant health and productivity and has received a great deal of attention in recent years as a topic of scientific and commercial interest.

Many studies highlighted the ability of plant-related microorganisms to influence important properties such as growth, disease resistance, abiotic stress tolerance, water retention, and synthesis of plant growth-promoting hormones. The dynamic density and composition of rhizosphere microorganisms can affect the coexistence of plant species. Ecologists have made three hypotheses to explain the mechanisms that produce less diverse plant communities. The empty niche hypothesis suggests that new symbionts inhabit areas where infestation plants are endemic. These symbionts are efficient at collecting resources and prefer to associate with invading plants over other plants. The microbiome of medicinal plants may directly impact the metabolome of the host, and thus could influence the efficacy of herbal medicine.

A herb for Traditional Chinese Medicine (TCM), that is Salvia miltiorrhiza, as a prime model system to study how microbes may interact with medicinal plants to modify phytochemical production. In comparison to soils of humid areas, the soil microbiome of the Egyptian desert farm Sekem was comprised of a high abundance of Gram positive, spore-forming bacteria primarily of the Firmicutes branch with 37% of the total bacterial soil community as revealed through a pyro-sequencing based amplicon sequencing approach. The drought resistant genera are of prime importance for pathogen suppression under arid conditions as nearly all isolated antagonists with activity against soil borne phyto-pathogenic fungi could be affiliated to this taxonomic group. A significantly higher proportion of Firmicutes and antifungal isolates were observed in field soil from the Egyptian farm than in the surrounding desert soil uninfluenced by human activities. Due to the long-standing agricultural use of the desert and the associated increased outbreak of phyto-pathogens, the soil's inherent antagonistic capacity was nearly double that of uncultivated desert soil.

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