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Opinion Article

Ectomycorrhizal Fungi and their Function in Horticultural Tree Cultivation

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ABOUT THE STUDY

The symbiotic relationship between plants and mycorrhizal fungi plays a crucial role in supporting plant growth, nutrient uptake, and overall ecosystem resilience. Mycorrhizal associations have gained increasing recognition in horticulture for their profound impact on soil health and plant vitality. The two primary types of mycorrhizae, Arbuscular Mycorrhizae (AM) and Ectomycorrhizae (ECM), dominate terrestrial ecosystems.

Arbuscular mycorrhizae are formed by fungi belonging to the Glomeromycota phylum. These fungi penetrate the root cells, forming intricate structures called arbuscules, which facilitate the exchange of nutrients between the plant and the fungus. In horticulture, crops like tomatoes, beans, and potatoes form symbiotic relationships with arbuscular mycorrhizal fungi. These fungi enhance nutrient uptake, improve resistance to soil-borne diseases, and contribute to the overall resilience of the plant. Ectomycorrhizal associations are established by fungi that envelop the outer surface of plant roots without penetrating the cells. This forms a mantle around the root tips, and hyphae extend into the surrounding soil, creating a hyphal network known as the Hartig net. ECM fungi are commonly associated with trees, such as pines, oaks, and birches.

The cultivation of certain tree species benefits from the presence of ectomycorrhizal fungi. These fungi enhance nutrient absorption, particularly nitrogen and phosphorus, and provide a protective barrier against soil pathogens. The improved nutrient acquisition contributes to the vigorous growth and development of trees, making them more resilient in various environmental conditions. Mycorrhizal associations significantly enhance the plant's ability to absorb essential nutrients from the soil. The extensive fungal hyphal network increases the surface area for nutrient absorption, especially for elements like phosphorus, which can be relatively immobile in the soil. This improved nutrient uptake is particularly advantageous in horticulture, where nutrient availability can be a limiting factor for plant growth.

The hyphal network created by mycorrhizal fungi acts as a natural extension of the plant's root system, increasing its capacity to absorb water from the soil. This is especially crucial in horticulture, where water management is a critical factor in crop production. Plants with mycorrhizal associations exhibit enhanced drought tolerance, a valuable trait in regions prone to water scarcity or erratic rainfall. Mycorrhizal associations contribute to the plant's defense against soil-borne pathogens. The symbiotic relationship induces systemic resistance in plants, making them less susceptible to diseases. This is particularly relevant in horticulture, where the intensive cultivation of crops can lead to increased pathogen pressure. Mycorrhizal fungi act as a natural bio control agent, enhancing the plant's ability to fend off harmful pathogens and promoting a healthier, disease-resistant crop.

The cumulative effects of improved nutrient uptake, water absorption, soil structure, and disease resistance result in overall enhanced plant growth and increased yields in horticulture. Plants with mycorrhizal associations often display greater vigour, better stress tolerance, and improved reproductive success. In horticultural practices, introducing mycorrhizal inoculants has become a common strategy to enhance symbiotic associations in the soil. These inoculants, typically consisting of spores or mycelium of mycorrhizal fungi, are applied to the plant roots during transplantation. This practice ensures the establishment of a robust mycorrhizal network early in the plant's life, promoting healthy growth throughout the growing season.

Integrating mycorrhizal-friendly crops into rotation systems can enhance the presence of beneficial fungi in the soil. It is well known that some crops encourage mycorrhizal relationships and provide an ideal environment for these fungi for growth. The principles of organic farming align closely with the benefits of mycorrhizal associations. Organic practices, such as avoiding synthetic fertilizers and pesticides, contribute to a healthier soil microbiome, including mycorrhizal fungi. Organic horticulture may produce crops in a sustainable and environmentally beneficial manner by fostering these ecological interactions.

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