Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 04, Issue: 03 (MAY-JUNE, 2024)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

The Role of Mycorrhizal Fungi in Plant Disease Resistance

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Not just the creatures of great size and there warring tribes but the quiet dance of life that goes unnoticed but for the players themselves, the mycorrhizal fungi turn out to be allies to the plants they help. Beyond their renowned role in enhancing plant nutrient uptake, recent research has unveiled another remarkable facet of mycorrhizal fungi: Their potential in enhancing the plant defense system against pathogens. In this article, we will focus on mycorrhizal symbiosis and discuss how these underground partners strengthen plants' ability to fight diseases, as well as contribute to developing practices for sustainable agriculture.

Understanding Mycorrhizal Symbiosis

A great many mycorrhizal fungi itself is in constant symbiotic relations with a wide range of land plants starting with forests up to agricultural fields. Such mutualistic interactions involve elaborate mycorrhizal systems of hyphal threads surrounding or penetrating plant roots and providing in return essentials such as nutrients. Among all types of mycorrhiza, the most commonly encountered is the arbuscular one, during which the fungi penetrate plant root cells, and ectomycorrhizas which form sheath around the tips of plant roots.

Boosting Plant Immunity

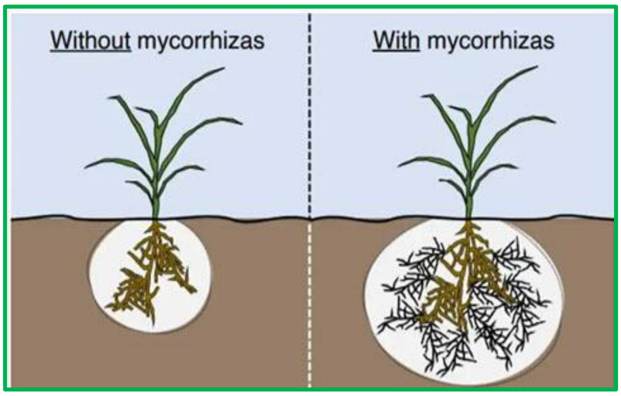
Other studies indicate that mycorrhizal fungi act as a triggering factor in the shop compartment of plant pathogens leading to augmented disease resistance. It causes systemic acquired resistance (SAR) and expresses the defense-related genes hence protecting the plants against potential pathogens through mycorrhizal symbiosis. Furthermore, mycorrhizal colonization can affect the JA and SA biosynthesis pathways that are involved in defense against different groups of pathogens.

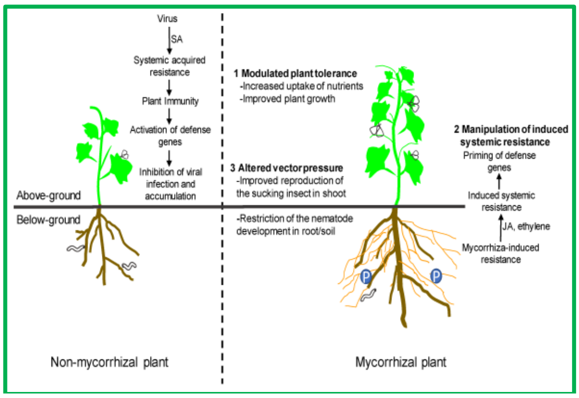
Mechanisms of Disease Suppression

The ability of mycorrhizal fungus to reduce plant diseases is supported by multiple processes. These include pathogen competition for nutrients, synthesis of antimicrobial chemicals, and bolstering of rhizosphere-wide physical barriers. Furthermore, modifications in leaf chemistry and enhanced root exudation brought on by mycorrhizal fungi can inhibit the growth and establishment of pathogens. Additionally, mycorrhizal networks promote collective immunity throughout plant communities by facilitating the transmission of defensive chemicals and signaling molecules between associated plants.

Practical Implications for Agriculture

Mycorrhizal fungi's potential can be used to address diseases in agriculture in a sustainable way. Through the implementation of mycorrhizal colonization techniques, such as reduced tillage, cover cropping, and organic amendments, agriculturalists can maximize plant resistance to diseases while reducing dependence on agricultural chemicals. Furthermore, the creation of mycorrhizal inoculants customized for certain crops and soil types provides a focused strategy to improve disease resistance and maximize crop yields.





Conclusion

In the pursuit of sustainable disease management, mycorrhizal fungi prove to be useful friends as we traverse the challenges of contemporary agriculture. Their complex symbiotic connections with plants are essential to the resilience of ecosystems because they protect plants from disease invasions and promote strong plant health. Mycorrhizal symbiosis is a secret that can be discovered. By incorporating these subterranean partners into agricultural techniques, we may create robust ecosystems that support plant growth, reduce illness, and increase food security.

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