International Research Journal of Plant Science (ISSN: 2141-5447)
Vol. 14(4) pp. 01-2, August, 2023
DOI: http:/dx.doi.org/10.14303/irjps.2023.30
Available online @ https://www.interesjournals.org/plant-science.html

Short Communication

Symbiotic Marvels: Mycorrhizae and Rhizobia in Plant Health and Soil Fertility

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INTRODUCTION

Beneath the surface of the earth, a silent collaboration between plants and microorganisms has been unfolding for millions of years. Mycorrhizae and rhizobia are two remarkable groups of symbiotic organisms that play pivotal roles in enhancing plant growth, soil health, and ecosystem sustainability. In this article, we delve into the fascinating world of mycorrhizae and rhizobia, exploring their functions, benefits, and significance in agriculture and ecology Dighton, (2009).

Mycorrhizae are mutualistic associations between plant roots and certain fungi. These relationships are ancient, dating back over 400 million years, and they are found in most terrestrial ecosystems. There are two primary types of mycorrhizae: endomycorrhizae (or arbuscular mycorrhizae) and ectomycorrhizae.

Endomycorrhizae: These fungi penetrate the root cells of the host plant, forming intricate structures known as arbuscules and vesicles. Arbuscules facilitate the exchange of nutrients, particularly phosphorus and nitrogen, between the fungus and the plant, while vesicles store excess nutrients. This partnership increases the plant's nutrient uptake efficiency, improving its resistance to environmental stresses Hobbie et al., (2005).

Ectomycorrhizae: Unlike endomycorrhizae, ectomycorrhizae do not penetrate the root cells but form a dense network around the root tips. They are especially common in tree species and play a crucial role in the establishment and survival of forests. Ectomycorrhizae enhance the plant's access to nutrients, particularly nitrogen and water, while also protecting it from pathogens.

Rhizobia are a group of nitrogen-fixing bacteria that form symbiotic relationships with legume plants, including beans, peas, and clovers. These bacteria are nitrogen-fixing powerhouses, capable of converting atmospheric nitrogen into a form that plants can readily use. The process takes place within specialized structures called nodules, which form on the plant's roots Johnson & Pfleger (1992).

Nitrogen fixation: Atmospheric Nitrogen (N2) is abundant but unusable by most plants. Rhizobia possess an enzyme called nitrogenase that converts N2 into ammonia (NH3), a form of nitrogen that plants can assimilate. This symbiotic nitrogen fixation not only benefits the host plant but also enriches the surrounding soil with nitrogen, enhancing its fertility.

Increased crop yields: Leguminous plants, thanks to their partnership with rhizobia, often have higher nitrogen content and, therefore, greater growth potential. This makes them valuable crops in crop rotation systems, as they can improve soil nitrogen levels for subsequent crops, ultimately increasing overall agricultural productivity Nadeem et al., (2014).

Significance in Agriculture and Ecology

Sustainable agriculture: Mycorrhizal fungi and rhizobia contribute to sustainable agriculture by reducing the need for synthetic fertilizers. Their ability to enhance nutrient uptake and fixation reduces the environmental impact of farming practices, minimizing nutrient runoff and groundwater pollution.

Soil health: Mycorrhizae and rhizobia improve soil structure, increase nutrient cycling, and enhance microbial diversity. These effects are critical for maintaining healthy soils and preventing soil degradation.

Received: 03-Aug-2023, Manuscript No. IRJPS-23-113195; **Editor assigned:** 07-Aug-2022, PreQC No. IRJPS-23-113195(PQ); **Reviewed:** 21-Aug-2023, QCNo.IRJPS-23-113195; **Revised:** 23-Aug-2023, Manuscript No. IRJPS-23- 113195 (R); **Published:** 30-Aug-2023

Citation: Jessi Jhon (2023). Plant Physiology: Unraveling the Inner Workings of Nature's Green Marvels. IRJPS. 14: 30.

Ecosystem stability: In natural ecosystems, mycorrhizae and rhizobia are essential for the growth and survival of many plant species. They promote plant diversity, which, in turn, supports a wide range of wildlife and maintains ecosystem stability Remy et al., (1994).

CONCLUSION

Mycorrhizae and rhizobia represent two extraordinary examples of mutualistic symbiosis in the natural world. Their ability to enhance plant growth, improve soil health, and contribute to ecosystem sustainability underscores their importance in agriculture, ecology, and environmental conservation. As we continue to explore and understand the intricate relationships between plants and microorganisms, harnessing their potential offers exciting possibilities for a more sustainable and resilient future for our planet.

REFERENCES

Dighton, J. (2009). Mycorrhizae. In Encyclopedia of microbiology (pp. 153-162). Elsevier Inc.

Hobbie, E.A., Jumpponen, A., & Trappe, J. (2005). Foliar and fungal 15 N: 14 N ratios reflect development of mycorrhizae and nitrogen supply during primary succession: testing analytical models. Oecologia. 146, 258-268.

Johnson, N.C., & Pfleger, F.L. (1992). Vesicular-arbuscular mycorrhizae and cultural stresses. Mycorrhizae in Sustainable Agriculture. 54, 71-99.

Nadeem, S.M., Ahmad, M., Zahir, Z.A., Javaid, A., & Ashraf, M. (2014). The role of mycorrhizae and plant growth promoting rhizobacteria (PGPR) in improving crop productivity under stressful environments. Biotechnol Adv. 32: 429-448.

Remy, W., Taylor, T.N., Hass, H., & Kerp, H. (1994). Four hundred-million-year-old vesicular arbuscular mycorrhizae. Proc Natl Acad Sci. 91: 11841-11843.