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Chapter 13 - The role of soil microorganisms in plant adaptation to abiotic stresses: Current scenario and future perspectives

Akbar Hossain [a], Mohammad Eyakub Ali [b], Sagar Maitra [c], Preetha Bhadra [d], Md. Muzahid E. Rahman [e], Sahin Ali [e], Tariq Aftab [f]

[a] Department of Agronomy, Bangladesh Wheat and Maize Research Institute, Dinajpur, Bangladesh
[b] Soil Science Division, Bangladesh Agricultural Research Institute (BARI), Gaziupur, Bangladesh
[c] Department of Agronomy, Centurion University of Technology and Management, Paralakhemundi, Gajapati, Odisha, India
[d] Department of Biotechnology, Centurion University of Technology and Management, Paralakhemundi, Gajapati, Odisha, India
[e] Plant Pathology Division, Bangladesh Wheat and Maize Research Institute, Dinajpur, Bangladesh
[f] Department of Botany, Aligarh Muslim University, Aligarh, India

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Abstract

Extreme events of abiotic stress conditions such as high temperatures, prolonged drought, salinity, metal toxicity, intense rains, flooding, frost, and low temperatures affect the productivity of crops as well as significantly affect plants and soil microorganisms. The composite and active connections between microorganisms and plant roots during abiotic stress disturb not only the plants but also the physical, chemical, and structural properties of soil. While several studies have found that numerous species of microorganisms, particularly rhizospheric microorganisms generate diverse mechanisms to enhance both plants and their survival ability against abiotic stresses. Among the microorganisms, plant growth-promoting rhizobacteria (PGPR) and *Arbuscular mycorrhiza* fungi (AMF) were found to be the most important species that enhance plant to mitigate the adverse events of abiotic stress through the production of exopolysaccharides, cytokinins, antioxidants, and enzyme 1-aminocyclopropane-1-carboxylate (ACC) deaminase and also the formation of biofilm. Besides theses production of organic compounds, dual symbiotic systems of PGPR and AMF (endophytic rhizospheric bacteria and symbiotic fungi) also stimulate to alleviate the adverse effect of abiotic stress in plants. The current book chapter discusses the role of soil microorganisms in plant adaptation to abiotic stresses and also highlights the current scenario, future perspectives, and challenges to use for the sustainability of crop production under the future extreme events of climate change.