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Mitigation of Plant Abiotic Stress by Microorganisms
Applicability and Future Directions

2022, Pages 129-147

Chapter 7 - Microbe-mediated alleviation of heat stress in plant: Current trends and applications

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Abstract

Heat stress resulting from climate change is a grave global concern for crop production. Plant growth is hampered due to heat stress, and reduced yield can threaten global food security. Predictions regarding future climate show prolonged occurrence and intensity of temperature stress. However, most of the temperature effect is anticipated in tropical and subtropical areas. Heat stress is critical abiotic stress that can have multiple harmful effects on plants, such as changes in cell membrane structure, water content, photosynthesis, enzyme production, cell division, and plant growth. Plants have complex resistance mechanisms that allow them to thrive in various temperatures. Plants can withstand heat stress by generating and accumulating enzymes and osmolytes. Still, a prompt solution is required to reduce crop loss under changing climate through biotic interventions. Using bacterial culture is one way to escape temperature stress. Microbes are able to withstand temperature stress by bringing about change in their physiology and metabolism. With the help of their enzymatic feature, microbes can easily adapt to the extremely high- and low-temperature range. They have an exclusive mechanism to safeguard their membrane, protein, and nucleic acid to withstand under such conditions. When such microbial inoculum is introduced in the plant rhizosphere, it performs useful functions like stabilizing soil aggregates, producing chemicals and enzymes, and enhancing the plant's tolerance to adverse environmental conditions. However, long-term studies need to investigate the role of combinations of bacteria and fungi suitable for different agro-environments to mitigate the impacts of global warming. These investigations can find their practical implications in policy intervention related to organic farming and climate change.

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Keywords