Developments in Applied Microbiology and Biotechnology

Role of Microbes in Ecosystem Processes and Environmental Management

Edited by
Ritu Mishra, Disha Mishra,
Sughosh Madhav, and Radhey Shyam Sharma

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Contents

CHAPTER 6

The role of microbes as biocontrol agents and plant protectors: guardians of the rhizosphere

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6.1 Introduction

One of the main issues in achieving food security for the world's expanding population is plant diseases. For sustainable agriculture, managing plant diseases has become a problem for the plant pathologist. The loss experienced by widespread diseases in grains and fruits has a significant impact on agricultural production. Many strategies have been used to manage plant diseases, including crop rotation and the adoption of resistant plant cultivars. Interest in other plant protection strategies has increased as awareness of the health risks connected to pesticide usage has grown. To limit the harm that chemical pesticide consumption does to the environment and human health, it is necessary to investigate more environmentally friendly alternatives. Biocontrol is among the most effective techniques that plant pathologists may employ. Of the several species employed in biocontrol, rhizosphere microorganisms are the most suitable for use as biocontrol agents (BCA) because they may act as a first line of defense against pathogen invasion (Kaushik et al., 2025). According to Prospero et al. (2021), the use of biocontrol agents, or naturally hostile microbes, is a safe and environmentally sound means of preventing plant diseases. In many circumstances, it is the only approach available. According to Köhl et al. (2019), biocontrol is the process of using microorganisms that suppress disease to enhance plant health. The result of connections amongst the pathogen, the plant, the biocontrol agent, the surrounding microbial population, and the physical environment is the suppression of disease by the biocontrol agent. BCA also helps to stimulate plant development in addition to avoiding plant diseases. They also help plants acquire nutrients, become more resilient to stress, and develop resistance to disease. The by-products of biocontrol agents can be employed as biopesticides, plant strengtheners, and fertilizers based on their actions and mechanisms. Biological control is the employment of nonpathogenic hostile microbes by humans to

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