

Mini Review

Contemporary Biotechnological Interventions in Plant Disease Management

Meena Barupal

*Department of Botany, Jai Narain Vyas University, Jodhpur, Rajasthan, 342 001;
Email: meena.barupal@gmail.com*



Meena Barupal

Abstract

Crop production stands as a key determinant of global food security, with climate change posing a threat through both direct and indirect routes, including shifts in the spread and effects of plant pathogens that lead to losses in production. Globally 137 species of plant pathogens and insect pests have been documented that are associated with the major crops of wheat, rice, maize, potato, and soybean. In plant disease management, biotechnologies a cornerstone of a modern and revolutionizing approach through various innovative avenues. It facilitates the development of genetically modified crops with enhanced disease resistance, curtailing reliance on chemical pesticides and sustaining crop resilience. Cutting-edge biotechnological innovations encompass techniques like introducing small RNA via exosomes to deactivate pathogen genes and employing cross-kingdom RNAi, inducing gene silencing within the host to cultivate resistance. CRISPR-Cas and other genome editing tools facilitate precise modifications of plant genomes, enhancing traits like disease or biotic and abiotic stress resistance. Furthermore, these advancements play a crucial role in developing rapid and precise diagnostic tools, enabling early detection and containment of diseases. In this review, recent progress in biotechnology tools and techniques, the challenges, limitations, and prospectus in plant disease management are discussed.

Key words: CRISPR, gene-silencing, MiRNA, plant immune system, phyto-pathogens, stress-resistant varieties, synthetic biology

Citation: Barupal M. 2025. Contemporary biotechnological interventions in plant disease management. *J Mycol Pl Pathol* 55 (2): 103-120 (<https://doi.org/10.59467/JMPP.2025.55.103>)