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Simultaneous biotic and abiotic stress in plants: Implications on gene expression, morpho-physiological and biochemical parameters

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Drought is a major abiotic stress which affects the growth and yield of crops globally. The water deficit is primarily responsible for the reduced crop productivity especially in legumes in arid and semi-arid regions. Macrophomina phaseolina is a notorious fungal phytopathogen capable of infecting and thereby damaging a broad range of agriculturally important crops. The increased incidences of infection in agricultural fields caused by pathogens that flourish under hot and dry conditions have put up a challenge to researchers to produce multiple stress tolerant crops. The microsclerotia of Macrophomina phaseolina can survive in the soil for decades resisting low moisture and high temperature conditions. The pathogen has a wide host range and is accountable for substantial yield loss (20-60% worldwide, 30-44% in South Asia) and seed deterioration on storage (2-36%).

The combined stress studies improve our understanding about the crosstalk between the underlying defense mechanisms in plants which could further help in the development of multiple stress resistant crops. Whenever a plant is subjected to the combined stress, the final overall effect depends on the interaction of individual stress responses. Recently, a surge has been observed in the disease incidences caused by the phytopathogens that flourish under hot and dry conditions.

Prompted by our earlier work and new thoughts, the present work has focused on the gene expression of certain enzymes, and various physiological and biochemical implications of the effect of combined drought stress and M. phaseolina infection in the crop species. The gene expression of major defense enzymes such as ß-1,3-glucanase, chitinase and stilbene synthase in the crop plants in response to M. phaseolina alone/ combined with drought along with various biochemical parameters, such as proline, salicylic acid, MDA, callose deposition, pigment content and photosynthetic rates, will be discussed. It could be inferred that the already stressed plants switch their defense strategy on encountering another stress condition.

Biography

Prof. Dr. Vinay Sharma, Dean Research and Director, Amity Institute of Biotechnology at Amity University Rajasthan has over 36 years experience of teaching and research in Plant Sciences/ Biotechnlology. He has delivered over 120 invited/ keynote lectures and has chaired sessions at many national and international forums in India and abroad. He had extensive international research experience as Postdoc/ Visiting Professor at many institutions including Max Planck Institute, Koeln, Technical University, Darmstadt, Germany, University of Central Florida, USA and others. He has published over 350 research papers (i-10 index of 150, h index of 40 with over 6200 citations), authored 8 books and has mentored 75 doctoral students. He has been conferred with several prestigious recognitions and awards in India and abroad including Fellow of Science Academies and Societies in India. He has a keen interest in Plant Biology (Plant Stress/ Plant Informatics)/ Biotechnology) and his current major research focus is on Molecular Biology and Biochemistry of Plant Stress.

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