

An integrated application of 'omics' to understand plant resistance mechanism against microbial invasion

Sharmila Chattopadhyay

Plant Biology Lab, Indian Institute of Chemical Biology, India

Plant responses to microbial invasion including various other environmental stresses are achieved through integrating shared signaling networks and mediated by the synergistic or antagonistic interactions with the phytohormones viz. salicylic acid (SA), jasmonic acid (JA), ethylene (ET), abscisic acid (ABA) and reactive oxygen species (ROS). Previous studies have shown that in response to pathogen attack, plants produce a highly specific blend of SA, JA and ET, resulting in the activation of distinct sets of defense-related genes. Regulatory functions for ROS in defense, with a focus on the response to pathogen infection occur in conjunction with other plant signaling molecules, particularly with SA and nitric oxide (NO). Recent reports added evidence to the previous studies that GSH has a distinct role in biotic stress tolerance and suggested GSH to be a member in cross-communication with other signaling molecules in mitigating biotic stress. Taken together, present investigation has been designed to obtain an in depth understanding on the plant disease resistance mechanism through an integrated "omics" approach with special reference to glutathione. For that transgenic tobacco constitutively overexpressing γ -ECS, the rate-limiting enzyme of glutathione biosynthetic pathway has been developed upto T₂ generation. ESTs analysis and disease test assay demonstrated that GSH, being a member of signaling network acts in a synergistic and/or antagonistic fashion with other established signaling molecules to combat biotrophic pathogen like *Pseudomonas syringae* pv. *tabaci* in comparison to the necrotrophic pathogen *Alternaria alternata*. Furthermore, proteomic analysis followed by mass spectrometric analysis identified the nature of proteins to control/prevent the disastrous microbial invasion in transgenic tobacco. Finally, an integrated analysis of genomics and proteomics datasets identified the genes and proteins regulated by glutathione level and involved in plant resistance mechanism to combat microbial invasion.

Biography

Sharmila Chattopadhyay has completed her Ph.D at the age of 26 years from Visva Bharati University and postdoctoral studies from Department of Biochemistry and Food processing, ATO-DLO, Wageningen, The Netherlands. She is presently engaged as a Senior Scientist of Drug Development/ Diagnostics & Biotechnology division, CSIR-Indian Institute of Chemical Biology, Kolkata, a premier R&D organization. She has published more than 20 papers in reputed journals and serving as reviewer of international journals. Dr. Chattopadhyay also published book chapters on Agricultural Biotechnology, Indian Medicinal Plants etc. She was invited and presented her research activities in GORDON RESEARCH CONFERENCE-Plant Metabolic Engineering, USA, 2009.

chattopadhyay62@gmail.com