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Functional genomic analysis of inducible defense responses to *Venturia inaequalis* infection in scab-resistant apple genotypes

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Apple is the main deciduous fruit crop in the India and worldwide, consumed for its delicious test and health-protective constituents. However, dramatic losses in fruits and trees are caused by the apple scab fungus Venturia inaequalis. To combat this disease, apple forms antifungal metabolites, so-called phytoalexins. Although apple has high economic value, metabolism of these pathogen-inducible defence compounds is poorly understood. This deficit prevents biotechnological exploitation of phytoalexin metabolism for enhancement of disease resistance. The present study reports the differential accumulation of two special classes of phytoalexins (biphenyl and dibenzofurans) in the scab-resistant apple cultivar. GC-MS based targeted metabolomics analyses revealed the accumulation six major phytoalexins upon scab infection. Using subtracted complementary DNA (cDNA) library and sequence information from Genome Database of Rosaceae, a cDNA encoding the o-methyltransferase (*MdOMT1*) enzymes was isolated from scab-infected apple plants. *MdOMT1* utilyzed 3,5-dihydroxybiphenyl as a preferred substrate, converting it to 3-hydroxy-5-methoxybiphenyl, the precursor of noraucuparin biosynthesis. Methylation of 3,5-dihydroxybiphenyl proceeds only on one hydroxyl group. Expression of *SaOMT1* was transiently induced in apple plants upon scab-infection. High expression level of *MdOMT1* precedes the accumulation of noraucuparin. *Saomt1* was N- and C-terminally fused with the modified yellow fluorescent protein (YFP) and the fluorescent reporter fusions products were localized to the cytoplasm of the leaf epidermis cells of *Nicotiana benthamiana*. Collectively, our results demonstrated that phytoalexin biosynthesis plays crucial role in determining inducible defense responses to *Venturia inaequalis* infection in scab-resistant apple cultivars.

Biography

Debabrata Sircar has completed his PhD in Plant Natural Product Biology from Indian Institute of Technology Kharagpur, India. He has completed his Post-doctoral research from Institute of Pharmaceutical Biology (IPB), Technical University Braunschweig (TU-BS), Germany, in the area of Roraceous Plant Metabolomics. Currently, he is an Assistant Professor in the Department of Biotechnology, Indian Institute of Technology Rookree. He has published more than 20 papers in reputed journals.

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