

Plant Genomics

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An insight into the molecular mechanism of glutathione-ethylene interplay in plant defense

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Plant defense is regulated by a network of signaling pathways where salicylate, jasmonate and ethylene (ET) function as key signaling molecules. Glutathione (GSH) is gradually gaining importance as a dynamic player in this network playing critical roles during stress. We have earlier reported that enhanced GSH level can provide resistance against *Botrytis cinerea* infection presumably through its crosstalk with ET. In this study, we demonstrate that GSH induces ET biosynthesis by modulating the transcriptional and post-transcriptional regulations of its key enzymes, ACC synthase (ACS) and ACC oxidase (ACO). Transgenic *Arabidopsis* plants with enhanced GSH content exhibited remarkable up-regulation of ACS2, ACS6 and ACO1 at transcript as well as protein levels while they were down-regulated in the GSH depleted *pad2-1* mutant. We further observed that GSH induced ACS2 and ACS6 transcription in a WRKY33 dependent manner while ACO1 transcription remained unaffected. On the other hand, the mRNA stability for ACO1 was found to be increased by GSH which explains our above observations. In addition, we also identified the ACO1 protein to be a subject for S-glutathionylation which is consistent. However, S-glutathionylation of ACS2 and ACS6 proteins was not detected. Further, the transgenic plants exhibited resistance to necrotrophic infection and salt stress while the *pad2-1* mutant was sensitive. Exogenous GSH improved stress tolerance in wild-type plants but not in the ET signaling mutant, *ein2-1*, indicating that GSH mediated resistance to these stresses occurs via an ET mediated pathway. Together, our investigation reveals a dual-level regulation of ET biosynthesis by GSH during stress.

Biography

Riddhi Datta is a Gold-medallist in Botany in Under-graduate as well as Post-graduate courses from University of Calcutta, India. She has been working in the field of Glutathione and its role in plant defense since 2011 and has recently submitted her PhD thesis from CSIR-Indian Institute of Chemical Biology, India. She has published 14 papers in reputed international journals. At present, she is an Assistant Professor in Botany, Govt. General Degree College, New Town, India and a Visiting faculty in the Post-graduate Department of Botany, Barasat Govt. College, India.

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