Public Abstract

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Graduation Term:FS 2017
Department:Plant, Insect and Microbial Sciences
Degree:PhD

Title:**ELUCIDATING THE ROLE OF JASMONATE METABOLITES IN JASMONIC ACID SIGNALING**

Jasmonic acid is a plant hormone that has important role in plant growth, development and defense against insect herbivory. Jasmonic acid and its metabolites collectively termed as jasmonate (JA), is synthesized upon injury during wounding and herbivory. Among the JA, jasmonoyl-isoleucine JA-Ile is the biologically functional molecule responsible for JA regulated gene expression. Although jasmonic acid biosynthetic pathway has been well known with almost all the biosynthetic enzymes identified and characterized in detail, the metabolic pathways leading to a diverse JA has only beginning to be studied in recent years. The biological functions of JA metabolites other than JA-Ile are less clear. Identification of additional metabolic pathways of JA and respective gene deleted in such pathways are providing unique opportunity to study the biological function of such metabolites in plant stress responses. Chapter II presents the unusual phenotypes of the double homozygous T-DNA insertion mutant *cyp94b1cyp94b3 (b1b3)* blocked in JA-Ile oxidation. Despite having the increased JA-Ile, the active form of JA, *b1b3* mutant however, did not result in stronger, but rather, dampened JA-Ile-dependent wound responses. Those weakened responses were not limited to few but were prevalent among most if not all classical JA-Ile-dependent wound responses, such as growth inhibition, anthocyanin accumulation, trichome induction, specialized metabolite production and resistance to generalist insect caterpillars. The *b1b3* mutant was however normal with respect to its response to exogenous JA treatment indicating that the perception as well as signaling of JA-Ile are not defective in the mutant, thus are not likely the direct reason for the weakened overall responsiveness to the endogenous over accumulation of JA-Ile. Chapter III presents the JA-Ile like signaling function of 12OH-JA-Ile. 12OH-JA-Ile induced anthocyanin, trichomes, gene expression and metabolites in Arabidopsis. 12OH-JA-Ile induced anthocyanin and trichomes also requires JA-Ile receptor CORONATINE INSENSITIVE 1 (COI1) and is conserved in plant species such as tomato and sorghum. Increasing endogenous 12OH-JA-Ile amount through genetic modification had stronger wound-induced anthocyanin and growth inhibition, while the plants reduced in endogenous 12OH-JA-Ile had dampened wound-induced anthocyanin and growth inhibition phenotypes, indicative of JA-Ile-like signaling in wounded plants. These results show that 12OH-JA-Ile present in wounded tissues is likely to contribute to the JA-regulated wound response. Chapter IV discusses the screening work aimed at identifying the novel enzyme group involved in JA metabolism. A mutant population generated by randomly expressing full-length Arabidopsis cDNAs was screened for resistance to JA-inhibited root elongation and altered JA profile. Twenty two candidates were selected and the identity of cDNAs potentially responsible for the phenotypes in 10 candidates were determined by PCR and sequencing. Collectively, this work is a step further in understanding the importance of JA metabolism in plant’s growth and defense response.