Gregg A. Howe
MSU Foundation Professor, Michigan State University
Department of Energy-Plant Research Laboratory; Department of Biochemistry and Molecular Biology; Plant Resilience Institute, Michigan State University, East Lansing, MI 48824, USA
howeg@msu.edu
Plant-insect interactions, jasmonate signaling

Modularity in Jasmonate Signaling for Multi-stress Tolerance

The phytohormone jasmonoyl-L-isoleucine (JA-Ile) coordinates immune and growth responses to increase plant survival in unpredictable environments. The core JA-Ile signaling pathway comprises several functional modules, including a repertoire of COI1-JAZ co-receptors that couple hormone perception to degradation of JAZ repressors, JAZ-interacting transcription factors that execute physiological responses, and multiple negative feedback loops to ensure timely termination of these responses. Emerging evidence indicates that JAZs integrate various informational cues to enhance plant resilience to both biotic and abiotic stress. Interestingly, JA-Ile-mediated defense responses are accompanied by potent growth inhibition. Despite the importance of these growth-defense tradeoffs in shaping plant productivity in natural and agricultural ecosystems, the molecular mechanisms that link growth and immunity are still poorly understood. We are using genetic approaches in Arabidopsis to understand the role of JA-Ile signaling in growth-defense balance. Our recent findings show that bHLH-type MYC transcription factors play an important role in promoting both in leaf defense and growth inhibition. We have also used genetic suppressor screens to identify mutations that uncouple growth-defense antagonism, thus allowing plants to grow and defend well simultaneously. These findings have implications for designing crops for improved performance in harsh environments.