

# Emerging roles of plant growth regulators for plants adaptation to abiotic stress–induced oxidative stress

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## Abstract

Major abiotic stresses such as heat, drought, salinity, heavy metal, light, pesticide, and cold are considered the great threat for the food and environmental security of the increasing population. During abiotic stresses, reactive oxygen species (ROS) is produced in the plants' cell that leads to inhibit physio-biochemical process of affected plants, which ultimately hampers the usual growth and development of plants. To avert the abiotic stresses–induced oxidative stress by hindering the production of harmful ROS (i.e., hydroxyl ions, superoxide ions, hydrogen peroxide, and other free radicals), tolerant plants generally enhance/accumulate various growth regulators (i.e., jasmonates, salicylates, brassinosteroids (BRs), nitric oxide, hydrogen sulfide, polyamines, glycine-betaine, oligosaccharides, strigolactones (SLs), melatonin, karrikins, sugars, serotonin, turgorins, system in myo-inositol, etc.) in plant cells. Among them, proline, glycine-betaine, polyamines, and sugars (i.e., mannitol, sorbitol, galactinol, trehalose, etc.) are known as osmolytes that have significant role for plant adaptation against abiotic stresses. Earlier studies revealed that during abiotic stresses several phytohormones (i.e., abscisic acid (ABA), BRs, cytokinins, ethylene, jasmonates, salicylic acid and SLs, melatonin, karrikins, etc.) encourage to enhance the accumulation of osmolytes in plant cells. Several genes involved signaling pathway also play an important role for the biosynthesis of these growth regulators for enhancing survival ability against abiotic stresses–induced oxidative stress in transgenic plants. As both osmolytes and plant hormones have been known to play most important roles during adverse ecological condition; therefore, it is crucial to understand the regulatory mechanisms of phytohormone-mediation for the accumulation of osmolytes in plants during abiotic stress.