

Metabolic Engineering of Brassinosteroids in Higher Plants

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Brassinosteroids (BRs) represent a class of plant hormones with high-growth promoting activity. They are found at low levels in pollen, anthers, seeds, roots, flowers, grain, and young vegetative tissues throughout the plant kingdom. The biosynthetic and metabolic pathways with enzymatic studies and the molecular mode of action of BRs have been investigated. In addition to their role in plant development, BRs have the ability to protect plants from various environmental stresses, including drought, extreme temperatures, heavy metals, herbicidal injury and salinity.

In animals and humans, steroid hormones regulate transcription via the membrane-bound receptor with an extracellular ligand-binding domain and an intracellular domain responsible for transducing the signal to the next member of the pathway. BRs show structural similarity to the animal steroids hormones of vertebrates and insects. Plants also use steroids as signaling molecules. BRs regulates the expression of numerous genes associated with plant development, and require the activity of a Ser/Thr receptor kinase to realize their effects. BR signaling in dicotyledonous (*Arabidopsis thaliana*) and monocotyledonous (*Oryza sativa*) models, respectively, is mediated by the receptor kinases BRI1 and OsBRI1. The extracellular domain of BRI1 perceives BRs and the signal is mediated via an intracellular kinase domain that autophosphorylates Ser and Thr residues and apparently has the potential to phosphorylate other substrates. BRI1 transduces steroid signals across the plasma membrane and mediates genomic effects.