

Auxin: a simple molecule with a complex reputation

A. THEOLOGIS

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The plant hormone auxin, typified by indole-3-acetic acid (IAA), is a pleiotropic signaling molecule that regulates a variety of physiological and developmental processes. Molecular genetic analysis has provided a comprehensive understanding of how this simple molecule regulates complex functions during plant growth and development. It appears that transcriptional regulation is the primary mechanism of auxin action and that non-transcriptional effects may be involved in some of auxin's effects. Experimental evidence will be presented on chemical and molecular genetic approaches that have attempted to elucidate the mechanisms of events orchestrated by this unique molecule.

Regulation of plant growth and development by cytokinin

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The recent years have witnessed dramatic progress in understanding cytokinin metabolism and signalling. This is particularly true for Arabidopsis where the major genes of cytokinin biosynthesis, cytokinin breakdown and cytokinin signalling were discovered. These genes were used as tools to establish cytokinin loss-of-function mutants. This was achieved either by constitutive or tissue-specific overexpression of different cytokinin oxidase/dehydrogenase (CKX) genes or by isolating and combining genetically knockout alleles of the three receptor genes. This contribution will mainly address the question what we have learned from the resulting mutants - which have either a lowered cytokinin content or a reduced cytokinin signaling - about the functions of cytokinins in regulating plant development. A number of cytokinin-dependent processes during vegetative development of roots and shoots, as well as during generative development, were identified. Potential biotechnological applications will be discussed. In addition, some analytical data of the Arabidopsis CKX and AHK gene families and progress in finding links between the cytokinin signalling system and the rest of the Arabidopsis genome and proteome will be reported.