Light-Dependent Hormone Regulation and Hormone-Dependent Light Signaling Pathways in Plants

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Plants use numerous signaling mechanisms and networks to regulate development, confer stress tolerance and ensure survival. Light quality and light quantity are key determinants that shape plant fitness in the adverse environment. Besides its role as an energy source for photosynthesis, light is implicated in a number of intertwined signal transduction pathways. The latter converge with plant hormone signaling at the level of common transcription factors to ensure finely tuned and coordinated transcriptional reprogramming. Here, I discuss the interplay of light and phytohormones with respect to photomorphogenesis and phototropism, with an emphasis on the role of auxins and brassinosteroids (BR) for these light-dependent processes. Recent studies have revealed important aspects of the signaling crosstalk that deal with the impact of light on hormone transport, hormone perception, and hormone-induced transcription. In particular, photoreceptor activation has been shown to induce changes in the polar localization of PIN-FORMED (PIN) auxin efflux transporters at the plasma membrane. Further on, light signaling affects the activity of BRI1-EMS-SUPPRESSOR 1 (BES1), a key transcription factor which is part of the BR signaling pathway. The importance of the intracellular localization of the BR receptor for photomorphogenesis will also be discussed by analyzing the involvement of the exocyst vesicle-tethering complex for plasma membrane protein trafficking. Altogether, the recent developments in light- and hormone-signaling research uncover novel possibilities for improvement of agronomically important plant traits based on modulation of the light regime.