Unveiling the genetic components involved in light-regulated developmental control in Arabidopsis

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Plant growth and development are regulated by interactions between the environment and endogenous developmental programs. Of the various environmental factors controlling plant development, light plays an especially important role, in photosynthesis, in seasonal and diurnal time sensing, and as a cue for altering developmental pattern. Genetic analysis demonstrates that photomorphogenesis is not a simply endpoint of linear signal transduction pathways but are the result of the integration of information from a variety of photoreceptors through a complex network of interacting signaling components. We have been trying to identify the genetic components involved in photomorphogenesis, photoperiodic control, and the interaction of photo-signals with the endogenous developmental programs.

Among the photoreceptors, phytochromes mediate diverse plant responses to red (R) and far-red (FR) light throughout development, ranging from germination to floral induction. In *Arabidopsis,* phytochome (PHY) apoproteins are encoded by five different genes: *PHYA, PHYB, PHYC, PHYD,* and *PHYE*. Characterization of the mutations in the phytochrome genes revealed both overlapping and unique functions of the individual phytochromes. phyA is the phytochrome that mediates various key responses to FR light in plants. phyA is primarily responsible for the FR high irradiance response (HIR), including inhibition of hypocotyl elongation , cotyledon unfolding/expansion, accumulation of anthocyanin and FR-preconditioned blocking of greening. phyA is also the primary photoreceptor for the very low fluence response (VLFR) such as germination. These phyA-mediated photomorphogenic responses involve coordinated changes in global gene expression, including regulation of multiple transcription factors.