PHYSIOLOGICAL FUNCTION OF PIF3 IN THE PHYTOCHROME-MEDIATED LIGHT SIGNAL TRANSDUCTION

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Introduction

Phytochromes, red and far-red light receptors, regulate various light responses including seedling photomorphogenesis, shade avoidance, and flowering (Deng and Quail, 1999). In Arabidopsis, five members of phytochromes (PHYA - E) can be categorized into a photolabile PHYA and photostable other phytochromes (PHYB-E) (Clack et al., 1994). Regardless of the photostability, both classes of phytochromes undergo the same red and far-red light-dependent photoisomerization between the biologically inactive Pr form and the active Pfr form. During photomorphogenesis, however, the photolabile PHYA acts as a photoreceptor that mediates the very low fluence response (VLFR) and the far-red high irradiance response (FR-HIR), while the photostable PHYB act as a typical red light receptor that mediates the low fluence response (LFR) and the red light high irradiance response (R-HIR) (Quail et al., 1995). The molecular mechanism how PHYA acts as a far-red light receptor may reside in its ability to translocate into the nucleus even under far-red unlike PHYB, which translocates into the nucleus only under red light (Kircher et al., 1999).

Molecular and genetic approaches have identified many phytochrome signaling components including PHYA- or PHYB-specific signaling components, common signaling components and components that interact with phytochromes directly (Hudson, 2000). Among phytochrome interacting proteins, PIF3, a bHLH protein, has been most extensively characterized. PIF3 was originally identified as a phytochrome interacting protein using the yeast two hybrid screening. By characterizing the transgenic plants expressing the N-terminal truncated *PIF3* gene and the antisense *PIF3*, the physiological role of PIF3 has been assigned as a positive regulator of PHYB signal transduction (Ni et al., 1998). The later discovery of the shorter hypocotyl phenotype of the *poc1* mutant, which has the higher expression level of