PHYTOCHROME SIGNALING AND REGULATION OF FLOWERING TIME IN ARABIDOPSIS

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Introduction

Plants use light as both energy source and environmental signal. The most important photoreceptor to sense the light environment is phytochrome (Fankhauser and Chory, 1997). In Arabidopsis, phytochrome is encoded by five different genes, *PHYA* through *PHYE* (Quail et al., 1995). The night break experiments using short day plants demonstrated that phytochrome is involved in floral induction (Borthwick et al., 1952; Downs, 1956). The recent genetic analysis of phytochrome mutants also suggests that phytochrome regulates flowering time in Arabidopsis. For example, *phyA* mutant is insensitive to photoperiod and *phyB* mutant is early flowering under both long days and short days (Reed et al., 1993; 1994).

Although it is very clear that phytochrome mediates the light signaling and floral induction, it is largely not known how phytochrome regulates flowering at molecular level. It has been suggested that phytochrome regulates flowering time through the control of circadian rhythm (Mouradov et al., 2002). However, the rhythmic expressions of the flowering time genes, which are under the control of circadian rhythm, were not changed by *phyB* mutations (our observations).

To understand the molecular mechanism how phytochrome regulates flowering time, we isolated mutants that show both early flowering and defects in phytochrome mediated light signaling. The molecular characterization of such mutants and corresponding genes would allow understanding the link between light signaling and floral induction.

Results and Discussion

We have isolated a *dhy1 (dominant long hypocotyl 1)* mutant from activation tagging mutagenesis of winter annual strain of *Arabidopsis*. The mutant *dhy1* showed very similar phenotype with *phyB* mutant; it produced long hypocotyl and long petiole, pale green leaves, and showed early flowering phenotype (Fig. 1). Genetic analysis showed that *dhy1* is semi-dominant. However, the mutant phenotype was not cosegregated with basta resistance. Further physiological characterization showed that