Action Spectra of Chlorophyll *a* Biosynthesis in Cyanobacteria: Dark-Operative Protochlorophyllide Oxidoreductase-Deficient Mutants

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Both light-dependent and light-independent (dark) protochlorophyllide (Pchlide) reductase account for catalyzing the reduction of Pchlide to chlorophyllide during the biosynthesis of Mg-tetrapyrrole pigments in cyanobacteria. To gain more insight into the interaction between the wavelength of the light and these two chlorophyll synthetic pathways in *Synechocystis* sp. PCC 6803, the spectral effectiveness of the formation of chlorophyll *a* was investigated during the regreening process in *chlL*$^-$ and *chlN*$^-$ mutants, which could not synthesize chlorophyll during growth in the dark. The action spectra showed obvious maxima around 450 nm and 650 nm, similar to those of higher plants except that the intensities of two peaks are reversed. The mRNA levels of *chlL* and *chlN* and chlorophyll *a* content under different wavelengths of light in the wild-type strain were also measured. The RT-PCR analysis revealed that the transcripts of *chlL* and *chlN* were up-regulated in red light but simultaneously down-regulated in green light which resulted in corresponding changes of the chlorophyll content. This fact indicates that the regulation of dark-operative protochlorophyllide oxidoreductase (DPOR) in the transcriptional level is essential for cyanobacteria to synthesize appropriate chlorophyll for acclimating in various light colour environments.

Key words: Dark-Operative Pchlide Oxidoreductase (DPOR), Light-Dependent Pchlide Oxidoreductase (LPOR), *Synechocystis* sp. PCC 6803