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Phototropins control chloroplast movement in *Phalaenopsis aphrodite*

Phalaenopsis aphrodite (moth orchid) is one of the most important ornamental crops in international trade. In nature, this epiphytic orchid grows on the surface of trees. It utilizes crassulacean acid metabolism photosynthesis that takes up CO_2 at night. High light environment might cause photodamage in orchid. Plants are sessile; therefore, they have evolved mechanisms to regulate growth and developed to cope with ever-changing environments. Phototropins are blue light receptors in plants that function in chloroplast movement, stomatal opening and affect plant growth and development. Full-length cDNAs of two *PHOT* genes, *PaPHOT1* and *PaPHOT2* were cloned from *Phalaenopsis aphrodite* and their functions in chloroplast movement were investigated in this study. Phalaenopsis orchid responds to Blue Light (BL). Slit assay indicated that chloroplasts did not move at 20 µmole $m^{-2}s^{-1}$; however, in low BL (<15 µmole $m^{-2}s^{-1}$) orchids accumulated more chloroplasts in the periclinal cell walls. Chloroplasts started moving at BL>25 µmole $m^{-2}s^{-1}$. Significant chloroplast avoidance movement was observed at BL>100 µmole $m^{-2}s^{-1}$. Orchids consistently expressed higher levels of *PaPHOT1* and *PaPHOT2* under low BL. while, *PHOT2* was up-regulated under high BL regimes. To verify the biological function of phototropins in chloroplast movement, Virus-Induced Gene Silencing (VIGS) was used. VIGS-treated orchid leaves showed decreasing gene expression of PHOTs and reduced chloroplast movement phenomena under high BL. In addition, we showed heterologously overexpressing *PaPHOT1* and *PaPHOT2* in *Arabidopsis* mutants recovered chloroplast movement. In conclusion, we successfully isolated and characterized two *PHOTs* from *P. aphrodite* and showed that they function in blue light-induced chloroplast movement.

Biography

Rachel Swee-Suak Ko is currently working in Academia Sinica Agricultural Biotechnology Research Center/BCST, Taiwan, China. She has obtained her PhD in National Chung Hsing University in Taiwan. The main focus of her research is to increase double spiking rate and increase flower production in *Phalaenopsis* orchid by manipulating the best environmental factors of CO_2, LED lighting and temperature. She is interested in understanding and discovers the complex molecular mechanisms that control spiking *phenomenon* in Phalaenopsis orchid.

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