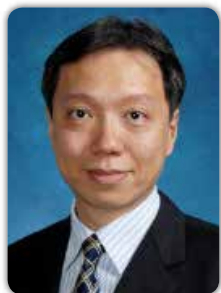


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Boosting bioenergy by coordinating the activities of chloroplasts and mitochondria

Increasing yield has been the ultimate goal of Agrobiotechnology and Biofuel industry for many decades. Current agrobiotech traits mainly rely on preventing yield loss, such as insect-resistance, herbicide resistance and drought resistance. Here, we would like to show that manipulation energy outputs of chloroplasts and mitochondria can enhance plant growth and seed yield significantly. Overexpression (OE) of a purple acid phosphatase (AtPAP2) in *Arabidopsis* results in faster plant growth and higher seed yield (+40-50%). The OE lines contain significant higher ATP and sucrose levels than the wild-type (WT). Subcellular localization studies showed that this phosphatase is anchored on the outer membranes of the two energy generating organelles of plants, chloroplasts and mitochondria. Our data show that AtPAP2 affects the energy output from these two organelles by modulating import of certain nuclear-encoded proteins into chloroplasts and mitochondria, and thus affect their energy harvesting and energy conversion efficiencies, respectively. Based on the data of chlorophyll fluorescence measurement, transmission electron microscopy, 2D Blue Native/SDS-PAGE analyses, enzyme assays, oxygraph measurement, and proteomics analysis, we proposed a model to explain how AtPAP2 enhances sugar and ATP production in leaf cells of *Arabidopsis thaliana* by simultaneously coordinating the activities of chloroplasts and mitochondria. Homologous sequence of AtPAP2 can be found in the genome of some green algae. Our discovery may open up a new direction for Agrobiotechnology and bioenergy research.

Biography

Boon Leong Lim is an Associate Professor of the School of Biological Sciences at the University of Hong Kong. He obtained a BSc from the Chinese University of Hong Kong in Biochemistry (1990) and a PhD degree from the University of Oxford (1994). He has published over 60 original articles and his current research interests focus on carbon flow of plants, plant organelle biology and Omics biology of plants. He has filed a few patents on agrobiotechnology and some of his patents have been successfully licensed to private companies.

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