
SUMMARY OF **RECTOR** PROGRAM IMPLEMENTED AT OKAYAMA UNIVERSITY INSTITUTE OF PLANT SCIENCE AND RESOURCES

Title: **Collaborative Research Program on Comprehensive Understanding of Photosynthetic Regulation against Photo-oxidative Damage in Chloroplasts**

Duration: FY2019-FY2021 (three years)

Coordinator: Wataru Sakamoto (Professor, Institute of Plant Science and Resources)

Foreign PI to be appointed as "**Specially Appointed Professor (SAP)**":

Professor Dr. Michael Hippler (University of Muenster, Germany)

Assigned department at Okayama University:

Institute of Plant Science and Resources (IPSR)

Internal Collaborators:

IPSR: Yusuke Kato

Research Institute for Interdisciplinary Science

Yuichiro Takahashi, Jian-Ren Shen

Description of Proposed Research Project

IPSR as center-of-excellence plant research institute is focusing on Genetic Resources and Stress Biology. Hence, this program aims to launch innovative research in the field of 'atmospheric stress', particularly in photooxidative stress in photosynthetic machineries of chloroplasts.

Photosynthesis is one of the most fundamental chemical reactions maintaining our environment on Earth, which utilizes light energy to assimilate atmospheric carbon dioxide into organic compounds. In plants, photosynthesis occurs exclusively in the chloroplasts, the organelle derived through endosymbiosis from a relative of present-day cyanobacteria. To understand photosynthesis, we witnessed tremendous advancements in deciphering the structural components of photosynthetic reactions in the past decades. Of an emerging importance, now commonly accepted in the field of photosynthesis, is

the fact that the photosynthetic machineries are highly vulnerable to excess and/or fluctuating light that consequently results in inhibitory status, and ultimately leads to cell death in plants. Therefore, photosynthesis requires photoprotection: dynamic mechanisms to dissipate excess energy, or to repair damaged components.

Plant Light Acclimation Research Group at IPSR, headed by Professor Sakamoto, has been studying the molecular mechanisms to maintain Photosystem II reaction center, which is targeted to photoinhibition and is known to undergo rapid turnover for repair. To explore the novel photoprotection mechanisms, which can be potentially exploited for development of crops with high yield, or promote biomass production, and/or can lead to high-impact discoveries in this field, we invite Professor M. Hippler (University of Muenster) as a SAP, and launch the collaborative project that includes interdisciplinary networks formed by the other faculty members in Okayama University. Core collaborative members include Professors Takahashi and Shen at Research Institute for Interdisciplinary Science, who are world-wide established researchers in photosynthesis research field and are expected to support this program in mass-spectrometric and structural analyses.

About SAP

Professor Hippler is a Professor at the Institute of Plant Biology and Biotechnology since 2006 and published 95 papers (h-index 39). He has a broad spectrum of background in biochemistry and photosynthesis research; his research extends to the area of photoprotection, particularly in the organization of light-harvesting antenna, regulation mechanisms through cyclic electron flow, and signaling. Currently, he serves as European Representative of International Society of Photosynthesis Research, along with other academic contributions to the society as Editorial Board Member in Journal of Biological Chemistry, Frontiers in Plant Science, and other involvements in academic self-administration.

Professor Hippler’s specialty also extends to biophysical measurement of biological macromolecules. In particular, he is an expert in high-resolution quantitative mass-spectrometric analysis of proteins and performed some

pioneering research in proteome analysis of photosynthetic complexes. Given this advantage, this program proposes to exploit mass-spectrometry for proteome analysis of photosynthetic complexes in terms of abundance and modification against stress.