



HOKKAIDO UNIVERSITY

Title	The presence of the chlorophyll cycle in chlorophyll b-containing cyanobacteria implicated by the in vitro activity assay [an abstract of dissertation and a summary of dissertation review]
Author(s)	HYUNSEOK, LIM
Degree Grantor	北海道大学
Degree Name	博士(生命科学)
Dissertation Number	甲第13949号
Issue Date	2020-03-25
Doc URL	https://hdl.handle.net/2115/78097
Rights(URL)	https://creativecommons.org/licenses/by/4.0/
Type	doctoral thesis
File Information	HYUNSEOK_LIM_abstract.pdf, 論文内容の要旨



学 位 論 文 内 容 の 要 旨

博士の専攻分野の名称 博士 生命科学

氏 名 L I M H Y U N S E O K

学 位 論 文 題 名

The presence of the chlorophyll cycle in chlorophyll *b*-containing cyanobacteria implicated by the *in vitro* activity assay

(*In vitro* における活性測定によって示された、クロロフィル *b* を合成するシアノバクテリアにおけるクロロフィルサイクルの存在)

In plants, chlorophyll *a* and *b* are interconvertible by the action of three enzymes – chlorophyllide *a* oxygenase, chlorophyll *b* reductase (CBR), and 7-hydroxymethyl chlorophyll *a* reductase (HCAR). These reactions are collectively referred to as the chlorophyll cycle. In plants, this cyclic pathway ubiquitously exists and plays essential roles in acclimation to different light conditions at various developmental stages. In contrast, only a limited number of cyanobacteria species produce chlorophyll *b*, and these include *Prochlorococcus*, *Prochloron*, *Prochlorothrix*, and *Acaryochloris*. In this study, we investigated a possible existence of the chlorophyll cycle in chlorophyll-*b* synthesizing cyanobacteria. First, we selected CBR and HCAR homologues from *Prochlorothrix hollandica* and *Acaryochloris* RCC1774 genomes and tested whether their gene products show CBR or HCAR activity *in vitro* by overexpressing them in *Escherichia coli*. All of these proteins show CBR and HCAR activity *in vitro*, respectively, indicating that both cyanobacteria possess the chlorophyll cycle. It is also found that CBR and HCAR homologues exist only in the chlorophyll *b*-containing cyanobacteria that habitat shallow seas or fresh water, where light conditions change dynamically, while they are not found in *Prochlorococcus* species that usually habitat environments with fixed lighting. Thus, it is hypothesized the chlorophyll cycle also contributes to light acclimation in cyanobacteria.