

Variation in color acclimation times: part of parameterizing a light color competition model for cyanobacteria in blue-green ocean niches

GOAL

Obtain chromatic acclimation parameter for model of competition for light color in marine cyanobacteria to blue (B) & green (G) ocean niches.

BLUE/GREEN COLOR ACCLIMATION (CA4)

ability to change absorption profile of accessory pigment to chlorophyll (CHL) towards blue & green wavelengths (λ) of light.

WHO CAN DO CA4?

- some strains of marine Synechococcus
- only those with 2 chromophores of phycoerythrin:
 - 1. phycourobilin (PUB, λmax 495 nm)
 - 2. phycoerythrobilin (PEB, λmax 545 nm).

HOW IS CA4 PERFORMED?

capable strains (BG generalists) change ratio of PUB:PEB through preferential gene expression and enzyme activity.

Fully acclimated BG generalists have similar absorption

PUB:PEB increases in blue light and decreases in green light





corresponding author raisha.lovindeer@uci.edu



Raisha Lovindeer, Hannah Medina, Katherine R. M. Mackey Earth System Science, University of California, Irvine, CA, United States

GROWTH EXPERIMENT & RESULTS





Mackey Lab

Ridge 2 Reef An NSF Research Traineeship

in Urban Ecosystem Management



6 BG generalists, 1 G-specialist, 1 B-specialist. Strains acclimated to initial light, then final light. Initial growth rates (BELOW) measured using relative chlorophyll fluorescence on a Turner Designs Trilogy lab fluorometer. Averages of three culture replicates are displayed.



- Average PUB:PEB (LEFT) of 6 replicates (initial & final) in each light color was estimated by fluorescence excitation ratio of 495 to 545 nm (emission, 570 nm). First report of full acclimation for strain WH8109. Published studies report genes present, but no phenotypic expression (Humily et al, 2013, PloS one).
- Time taken for acclimation (LEFT) varies with strain
- Most have delays initiating acclimation (lag).
- Without lag, acclimation rate is faster to green than blue in 50% of strains.

CA4 acclimation parameter is a function of PUB:PEB excitation range, lag time, acclimation rate & light color previous conditions and change.

FUNDING: Alfred P. Sloan Research Fellowship to KRMM, Ridge 2 Reef NSF Research Traineeship award DGE-1735040 & Student Travel Grant to RL from Turner Designs & R2R, Undergraduate Research Opportunities Program to HM



