The effect of photoperiod on *Pleurochrysis dentata* lipid and calcium carbonate accumulation and the novel discovery of calcium carbonate shell function

Xuantong Chen[1], Fan Lu[2], Wensheng Qin[1]

1. Department of Biology, Lakehead University, 955 Oliver Road, Thunder Bay, Ontario, P7B 5E1, Canada
2. School of Civil Engineering, Architecture and Environment, Hubei University of Technology, Wuhan, China, 430068

BACKGROUND/OBJECTIVES:

Abiotic stresses produce reactive oxygen species (ROS) causing oxidative stress. The reaction between ROS and biomolecules will inactivate biomolecules and lead to organ dysfunction, cell structure change, and gene mutagenesis. Algae have antioxidant defense systems for coping with harmful effects of ROS and maintaining them under oxidative stress. However, the way of marine microalgae *Pleurochrysis dentata* responds to oxidative stress is not clear. This study explored two directions by adjusting the photoperiod to cultivate *P. dentata*. [1] Effect of oxidative stress on calcium carbonate and oil accumulation of *P. dentata*. [2] Oxidative stress caused by long-wavelength light of *P. dentata*.

METHOD:

We set 6 different photoperiod cycles: 10L/14D, 12L/12D, 14L/10D, 16L/8D, 18L/6D, 20L/4D. Total lipid contents of *P. dentata* samples were determined using the standard chloroform-methanol extraction method. The calcium ion content in the supernatant was measured using the ethylenediaminetetraacetic acid (EDTA) complexometric titration method. We also measured the algal dry weight and chlorophyll α content. Scanning electron microscope (SEM) was used to examine the thickness changes of $CaCO_3$ shells under different photoperiods on day 15.

RESULTS:

Under 20L/4D photoperiod, *P. dentata* had highest algal dry weight, calcium content (Figure 1), and chlorophyll α, but lowest lipid content (Figure 2). The optimal photoperiod for lipid accumulation is 14L/10D. The SEM results (Figure 3) demonstrated the longer light exposure the thicker the shell of *P. dentata*.

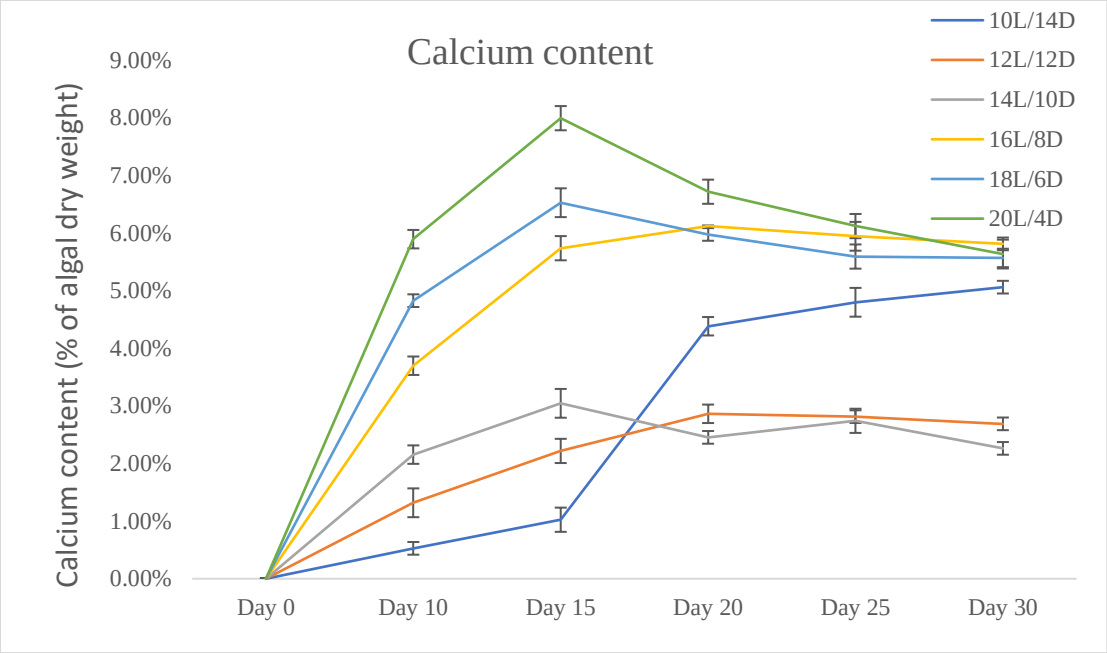

Figure 1 Calcium content of *P. dentata* under different photoperiod

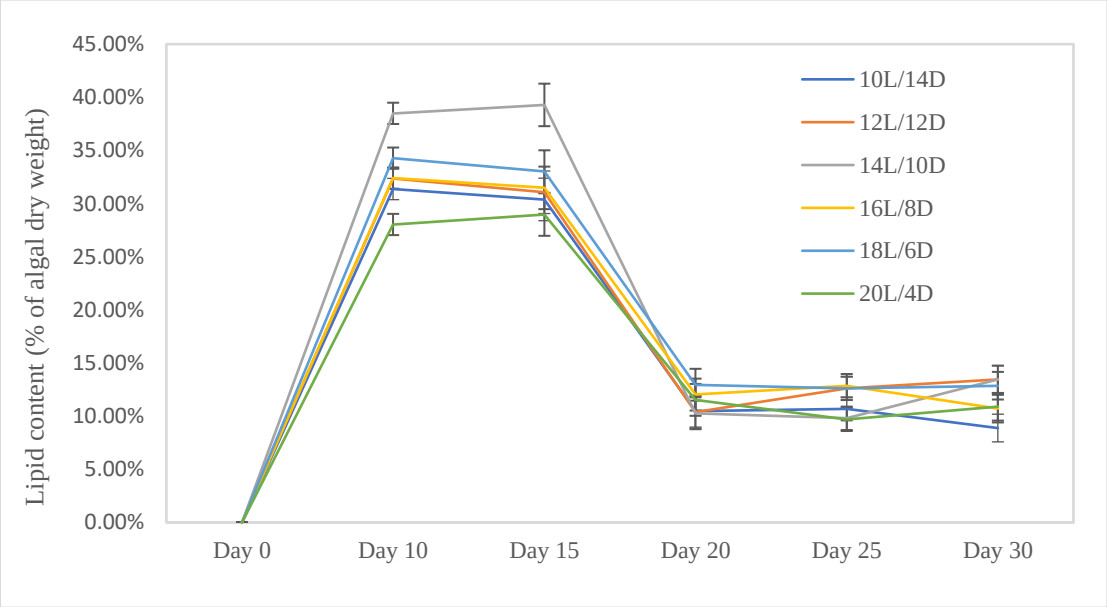

Figure 2 Lipid content of *P. dentata* under different photoperiod

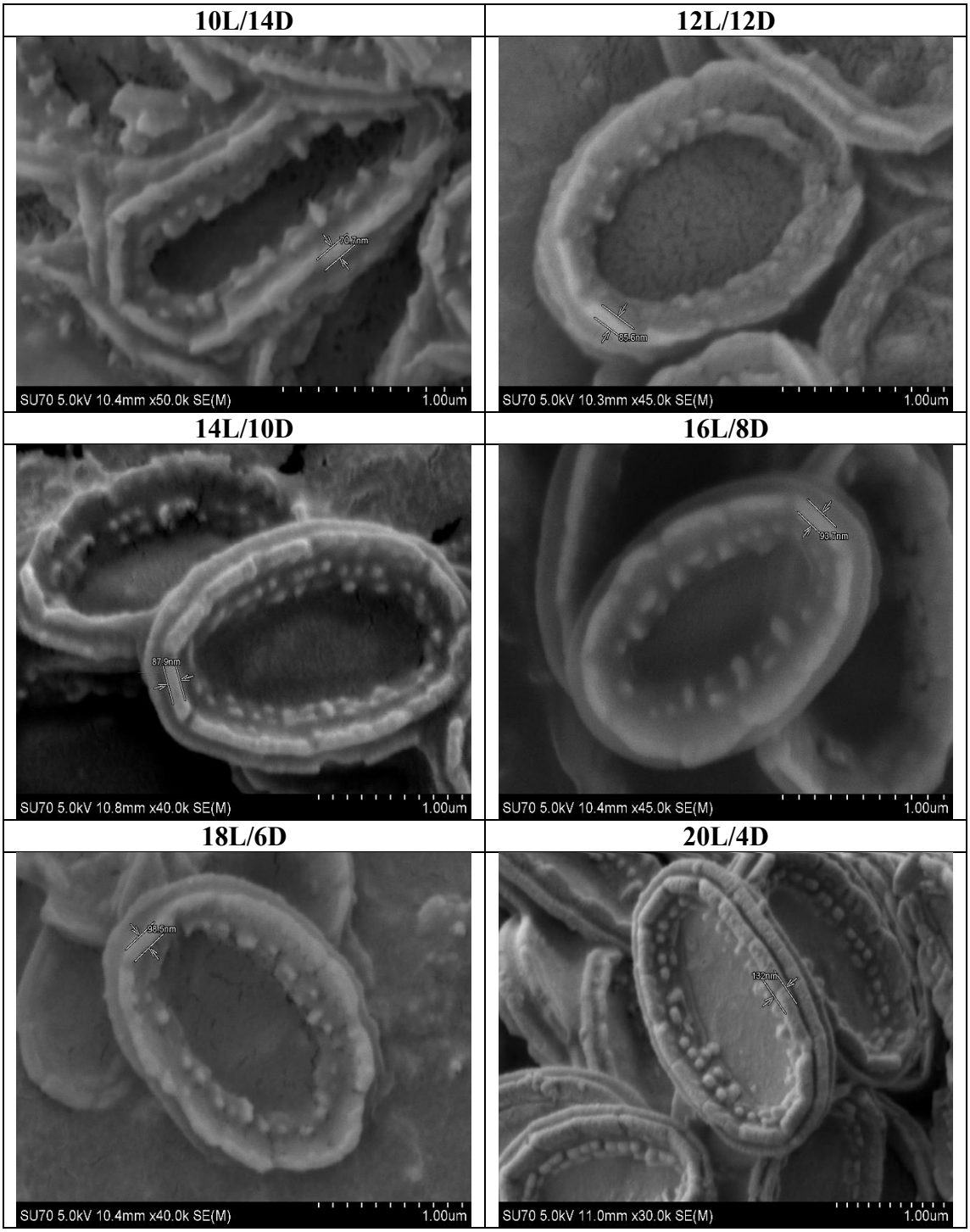

Figure 3 Scanning electron microscopy of calcium carbonate shell of *P. dentata* under different photoperiod

CONCLUSION/IMPLICATION: Our study showed a longer photoperiod is beneficial to *P.dentata* blooming. It also increased calcium accumulation, but not for lipid accumulation.