EFFECTS OF NUTRIENT LIMITATION AND DAYLENGTH ON GROWTH AND CHEMICAL COMPOSITION OF *PAVLOVA LUTHERI*

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Abstract

The goal of this research is to study nutrient limitation and daylength effects on the growth and chemical composition of the prymnesiophyte *Pavlova lutheri*. A series of chemostat experiments were conducted under constant temperature and growth irradiance, and variable daylength and nutrient supply regimes. ANCOVA performed on the data from continuous light conditions supports the prediction of the Laws-Chalup (1990) model that there is a linear relationship between the nitrogen to carbon ratio (N/C) and the relative growth rate ($\mu/\mu s$). But overall, data from four different daylengths suggest that there is no unique relationship was found between the N/C ratios vs. $\mu/\mu s$. Actually, the N/C ratio and μ or μ/μ_S are actually hyperbolically related, although the curvature is minimal at high/long photoperiod. Multiple linear regression analysis of the experimental data reveals that the chlorophyll *a* to carbon ratio (Chl/C) can be expressed as the sum of three terms: one being a constant, the second one being proportional to the specific growth rate(μ), and the third one being proportional to the relative growth rate($\mu/\mu s$). The Chl/C ratio is also linearly related to the growth rate with a positive slope under nutrient limited conditions, but with a negative slope under nutrient saturated conditions, which is consistent with the predictions by both the Laws-Chalup (1990) model as well as the Kiefer-Mitchell (1983) model. In addition, the experimental data support previous predictions (i.e., Sakshaug-Kiefer (1990) and Bannister (1990)) which suggest that phytoplankton growth rate is linearly related to the product of the Chl/C ratio and daylength. Meanwhile, photosynthetic and photoprotective functions of various pigments were revealed by their variation patterns with daylengths. This study provides new results for improving the

current growth models and enhances our understanding of the factors affecting phytoplankton growth in oceanic waters.