

Enhancement of lipid production in two marine microalgae under different levels of nitrogen and phosphorus deficiency

ABSTRACT

Microalgae are important food sources for aquaculture animals. Among the different factors which influence the biochemical composition of microalgae, nitrogen and phosphorus are two of the most important nutrient sources for growth and development. The present study aimed to assess the effects of nitrogen and phosphorus deficiency on lipid production of *Chlorella* sp. and *Chaetoceros calcitrans*. Early stationary phase culture of these species were exposed to different stress levels of nitrogen and phosphorus (25%, 50% and 75% of the full $\text{NO}_3\text{-N}$ and $\text{PO}_4\text{-P}$ concentration in the Conway media), and solvent extraction and gas-liquid chromatography methods were performed for analysis of lipid and fatty acid composition. The results revealed that lipid production in these two species significantly increased ($P < 0.05$) as nitrogen and phosphorus decreased. The fatty acid proportion remained unaffected under nitrogen deficiency, while phosphorus limitation resulted in a decrease of saturated fatty acids and promoted a higher content of omega-3 fatty acids in these species. The protein and carbohydrate levels were also altered under limited nutrients. Therefore, these conditions could be used for enhanced lipid production in microalgae for aquaculture and other industrial applications.

Keyword: *Chaetoceros calcitrans*; *Chlorella*; Lipid; Marine microalgae; Nutrient stress; Omega-3 fatty acids