Effect of Elevated Carbon Dioxide and Phosphorus Levels on Nitrogen Uptake, Lipid Content, and Growth of *Tetraselmis* sp.

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ABSTRACT

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Effect of elevated carbon dioxide (CO_2) and phosphorous levels on nitrogen uptake, lipid content, and growth of *Tetraselmis* sp. were investigated. Cultures of *Tetraselmis* sp. were added with CO_2 and phosphorus at concentrations above those currently used in aquaculture practices in a factorial experiment. Three levels of CO_2 (no addition, 5% v/v, and 10% v/v of the incoming air for aeration) and three levels of phosphorus added as NaH_2PO_4 (5, 10, 20 mg L^{-1}) in modified F medium with NH_4^+ as the primary nitrogen source were used. Optical density (680 nm) and residual NH_3-N in the culture medium were monitored daily over a culture period of 6 days. Relative growth rate (k'), nitrogen uptake (µg NH_3-N $cell^{-1}$ day^{-1}), and lipid content (% dry weight) were calculated and determined at the end of the culture period. No interactive effect between phosphorus and CO_2 levels was observed in all variables measured ($p > 0.05$). Highest growth rate ($k = 1.82 \pm 0.04$), nitrogen uptake (0.316 ± 0.008 µg NH_3-N $cell^{-1}$ day^{-1}), and lipid content (10.95 ± 0.15 %DW) were exhibited at 10% CO_2 supplementation. Growth and nitrogen uptake were similar in treatments with elevated levels of phosphorus but lipid yield (9.41 ± 0.27 %DW) was lowest at 20 mg L^{-1} of phosphorus supplementation ($p < 0.05$). These results showed the critical role of CO_2 in nitrogen uptake, lipid content, and growth of *Tetraselmis* sp. It also indicates the potential of this algal species for waste water remediation, biofuel production, and carbon sequestration.