Growth and biochemical responses of the benthic diatom Entomoneis paludosa (Bacillariophyceae) to dissolved inorganic and organic nitrogen in culture

Thierry Jauffrais*1,2, Bruno Jesus3, Vona Méléder2, and Véronique Martin-Jézéquel2,4

1 Université d’Angers, UMR CNRS 6112 LPG-BIAF – Université d’Angers, CNRS : UMR6112 – 2 Boulevard Lavoisier, 49045 Angers Cedex 1, France, France
2 Université de Nantes, EA2160 Laboratoire Mer Molécules Santé – Université de Nantes : EA2160 – Université de Nantes, Mer Molécules Santé EA2160, Faculté des Sciences et des Techniques, 44322 Nantes Cedex 3, France, France
3 Université de Nantes, EA2160 Laboratoire Mer Molécules Santé – Université de Nantes – Université de Nantes, Mer Molécules Santé EA2160, Faculté des Sciences et des Techniques, 44322 Nantes Cedex 3, France, France
4 Université de La Rochelle, UMR CNRS 7266 Littoral Environnement et Sociétés, LIENSs, – Université de La Rochelle : UMR 7266 – Université de La Rochelle, UMR CNRS 7266 Littoral Environnement et Sociétés, LIENSs, La Rochelle, France, France

Résumé

Benthic diatoms are dominant primary producers in intertidal flats. This study investigated the effect of different nitrogen sources and concentrations on Entomoneis paludosa growth and photophysiological response. Six nitrogen sources, either inorganic (nitrate and ammonium) or organic (urea, arginine, glutamine and glycine) supplied at two concentrations (40 and 400 µM-N) induced significant effects on growth, carbon, nitrogen, pigment content and maximum PSII quantum efficiency (Fv/Fm). Entomoneis paludosa grew under all nitrogen sources albeit showing differences in lag phase, growth rate and cell yield. Inorganic nitrogen, urea and arginine induced higher growth; whereas, glycine did not support high biomass. Fv/Fm showed variability dependent on nitrogen source and C/N ratio. Fv/Fm varied between 0.55 and 0.65 at 400 mM-N with the highest values observed in glycine, glutamine and urea; whereas, nitrate, ammonium and arginine induced lower Fv/Fm. All cellular components decreased in the 40 µM-N treatments, with nitrogen and pigments being lower than carbon content. Light-harvesting pigment ratios Chl c/Chl a and photoprotective pigment ratios (diatoxanthin + diadinoxanthin)/Chl a increased, while fucoxanthin/Chl a ratios were unaffected by N-limitations. Entomoneis paludosa was capable of quickly adapting and use a wide variety of nitrogen sources. This adaptability may contribute to microphytobenthos diatom ecological success in mudflat ecosystems.

Mots-Clés: Microphytobenthos, pigments, amino acids, nitrate, urea, ammonium, fluorescence, PAM

*Intervenant