Effects of Organic and Inorganic Nitrogen on the Growth and Production of Domoic Acid by Pseudo-nitzschia multiseries and P. australis (Bacillariophyceae) in Culture

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Résumé en anglais	Over the last century, human activities have altered the global nitrogen cycle, and anthropogenic inputs of both inorganic and organic nitrogen species have increased around the world, causing significant changes to the functioning of aquatic ecosystems. The increasing frequency of Pseudo-nitzschia spp. in estuarine and coastal waters reinforces the need to understand better the environmental control of its growth and domoic acid (DA) production. Here, we document Pseudo-nitzschia spp. growth and toxicity on a large set of inorganic and organic nitrogen (nitrate, ammonium, urea, glutamate, glutamine, arginine and taurine). Our study focused on two species isolated from European coastal waters: P. multiseries CCL70 and P. australis PNC1. The nitrogen sources induced broad differences between the two species with respect to growth rate, biomass and cellular DA, but no specific variation could be attributed to any of the inorganic or organic nitrogen substrates. Enrichment with ammonium resulted in an enhanced growth rate and cell yield, whereas glutamate did not support the growth of P. multiseries. Arginine, glutamine and taurine enabled good growth of P. australis, but without toxin production. The highest DA content was produced when P. multiseries grew with urea and P. australis grew with glutamate. For both species, growth rate was not correlated with DA content but more toxin was produced when the nitrogen source could not sustain a high biomass. A significant negative correlation was found between cell biomass and DA content in P. australis. This study shows that Pseudo-nitzschia can readily utilize organic nitrogen in the form of amino acids, and confirms that both inorganic and organic nitrogen affect growth and DA production. Our results contribute to our understanding of the ecophysiology of Pseudo-nitzschia spp. and may help to predict toxic events in the natural environment.
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