Responses to dissolved organic nitrogen compounds by recently isolated freshwater microalgae species

Catherine E. Bayliss1, Penny Johnes1, Richard P. Evershed2, Patricia Sanchez-Baracaldo1, and Stephen C. Maberly3

1Geography Department, University of Bristol, Bristol, UK (catherine.e.bayliss@bristol.ac.uk)
2Chemistry Department, University of Bristol, Bristol, UK
3Centre for Ecology and Hydrology, Lancaster, UK

Freshwater microalgae isolates from a UK headwater catchment (collected in 2017) were tested for their growth and media nitrogen speciation changes when presented with low molecular weight dissolved organic nitrogen compounds. The location has input from livestock run off increasing organic matter in stream. Experimental treatments and initial isolation took place in controlled culture cabinets kept at 15°C, with a 16:8 light:dark cycle and light c.a. 50 μmol m–2 s–1. Treatments included separately presented urea and glutamate, alongside negative (no N or P sources) and positive controls (nitrate or ammonium). Nitrogen addition treatments were provided with the same phosphorus source, trace minerals, trace metals and took place for two weeks. Different species isolated from the location showed optimal growth on different organic nitrogen sources. Organic nitrogen compounds caused growth at least comparable to inorganic sources. Cell growth was best on dissolved organic nitrogen compounds for some species. This relatively quick cycling of organic nitrogen compounds in river systems to photosynthetic growth has implications for ecosystem heath and capacity to mitigate organic nitrogen inputs. Anthropogenic activity that increases organic nitrogen may favour certain species compositions, altering downstream ecosystem functions such as algal bloom formation and dominant microalgae species. Further work will use stable isotope investigation of potential uptake mechanisms and wider work is required on understanding how the ecosystem may respond to organic nitrogen changes.