PHOTOPROTECTION CAPACITY DIFFERS AMONG MICROPHYTOBENTHIC DIATOMS INHABITING INTERTIDAL MUDFLATS: POSSIBLE CONSEQUENCES ON THEIR SPATIAL DISTRIBUTION RELATED TO THE LIGHT ENVIRONMENT

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Coastal ecosystems are one of the most productive areas in the world. Their productivity is mainly supported by the microphytobenthos (MPB) which inhabits estuarine intertidal mudflats. MPB is mainly dominated by diatoms that can divide in three main functional forms: 1) motile through the sediments/biofilm-forming at the surface; mainly un muddy mudflats, 2) attached to the sediments (stalked and adnate); mainly in sandy mudflats, 3) tychoplanktonic (they need to spend part of their life cycle resuspended in the water column) in all habitats. The light environment in intertidal mudflats is strongly variable so that MPB can experience very extreme light climates in terms of intensity and light fluctuations (amplitude, frequency). Diatoms have evolved physiological processes in order to acclimate to the light environment and especially to resist to excess stressful light conditions. Among these so-called photoprotective processes, the photosystem II electron cycle (PSII CET), the non-photochemical quenching of chlorophyll fluorescence (NPQ) and the associated xanthophyll cycle (XC) are believed to be the most important ones. The two aims of this study were to gain insight 1) on the potential photoprotective ability of the three functional forms of MPB diatoms, 2) on their ability to resist to a light stress and to maintain photosynthesis performances under such conditions. We performed a screening on 15 species (7 motile, 3 adnate, 3 stalked, 2 tychoplanktonic) isolated from different ecosystems (Atlantic coast and North Sea). We measured the PSII CET, NPQ and the XC extent and kinetics by performing light curves of different intensities up to full sunlight (2000 µmol photons m^{-2} s^{-1}). We especially observed that attached diatoms show a higher NPQ as well as a higher PS II CET capacity independent of stalked and adnate forms. In contrast, the motile tychoplanktonic (grown in benthic mode) forms showed a lower PS II CET and NPQ. Interestingly, the NPQ ability is not directly related with the extent of the XC. These results will be discussed as regards to the MPB ability/inability for motility through the sediment and the physical positioning of the diatom cells at an optimum level of light for photosynthetic production, i.e. are the motile forms showing a lower physiological photoprotection (PSII CET, NPQ, XC) because they can exert behavioural photoprotection (so-called 'migration') in contrast to the attached forms ?