Effect of bacteria on growth and biochemical composition of two benthic diatoms Halamphora coffeaeformis and Entomoneis paludosa

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Résumé en anglais	Benthic diatoms are the dominant microalgae in intertidal mudflats and are in constant interaction with their surrounding bacteria. This study was designed to investigate the effect of bacteria on growth, biomass, elemental (C & N) and biochemical composition, and extracellular polymeric substances (EPS) excretion by two marine benthic diatoms, Halamphora coffeaeformis and Entomoneis paludosa. The experiments were conducted on diatom cultures previously exposed or not to antibiotics. The treatment with antibiotics caused a decrease of bacterial abundance from 24 to fewer than 1 bacteria per algal cell. In non-treated cultures of E. paludosa and H. coffeaeformis, the bacteria phylogenetic affiliation was equally distributed between Bacteroidetes (Flavobacteriia) and Proteobacteria (alpha- and gammaproteobacteria). After treatment with antibiotics, the residual bacterial community was ~ 37% Flavobacteriia (Winogragskyella genus), 34% for the alphaproteobacteria (mainly Roseibacterium sp and Antarctobacter sp.) and 29% for the gammaproteobacteria (mainly Methylophaga sp. and Stenotrophomonas sp.). Growth of H. coffeaeformis and E. paludosa in non-treated cultures was enhanced by the abundance of the associated bacteria, with mean growth rate of 1 day− 1 compared to 0.7 for antibiotic treated cultures. In E. paludosa, maximal cell abundance was higher in the presence of bacteria while the final carbon biomass did not vary, but in H. coffeaeformis maximal cell abundance did not vary significantly while final carbon biomass was higher in the presence of bacteria. By contrast, for both diatoms, cellular content of protein and lipids decrease significantly, as did extracellular carbon (EPS fraction) in the presence of bacteria. However, only a minor effect was observed on cellular carbohydrates, C/N ratio, and pigments (Chl a). Diatoms carbon fluxes towards the main biochemical components were also modified, with the protein carbon fraction significantly lower relative to other carbon compounds in the presence of high bacterial biomass. These results showed the complex interactions between diatoms and their associated bacteria. Promotion of diatoms growth by the presence of bacteria appears linked to change in microalgae biochemical composition that will modify the biofilm. Our results might help understanding the regulation of benthic biota in mudflat ecosystems.
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