Effects of light and temperature on photosynthesis and calcification in rhodoliths from a tropical lagoon

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The effects on photosynthetic carbon uptake, electron transport rate (ETR), oxygen evolution, respiration and calcification rates of Halimeda macroloba and Halimeda opuntia were studied in the laboratory under the exposure to inhibitors of photosynthetic electron transport (DCMU), of extra cellular carbonic anhydrase (acetazolamide, AZ), TRIS buffer and under varying pH conditions. Addition of 100μM DCMU to the media caused a significant reduction in the ETR, carbon-uptake and oxygen evolution, while some calcification was still taking place (15-33% of controls). Exposing the algae to 100μM AZ reduced carbon uptake and oxygen evolution as well as calcification to about 50% of the controls. However, the ETR was relatively un-affected. A high pH (9.8) in the seawater medium had a strong effect on carbon uptake and the ETR, which was inhibited to 40% of controls, whereas calcification rose drastically. Addition of 10 mM TRIS buffer to the alga under ambient seawater conditions (pH 8.2) reduced ETR, photosynthetic Ci uptake, oxygen evolution and respiration to below 45% of the controls, while calcification was less affected. The inhibitors and varying pH showed the same trend in experiments with H. opuntia, with minor differences. From the present findings, it's proposed that photosynthesis and calcification in Halimeda are linked together as it has been previously reported. Nevertheless, the inhibition effect of TRIS on photosynthesis and not on calcification, suggests the presence of proton pumps in Halimeda, possibly involved in both the formation of alkaline micro-zones favouring high calcification as well as  acid zones where the low pH favour CO2 formation for photosynthetic uptake of inorganic carbon