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Photosynthesis and mineralogy of *Jania rubens* at low pH/high pCO_2: A future perspective

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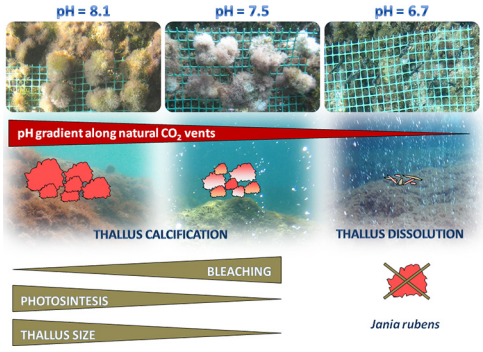
HIGHLIGHTS

- Calcifying red algae may show species-specific response to ocean acidification (OA).
- Photosynthesis and mineralogy (biosphere) were assessed after a three-week transplant.
- Field carbon chemistry (hydrosphere) and irradiance (atmosphere) were also considered.
- Photosynthesis decreased while calcification was maintained under future pH conditions.
- The calcifying *Jania rubens* may survive but reducing the fitness under OA.

GRAPHICAL ABSTRACT



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ABSTRACT

Corallinales (Rhodophyta) are high Mg-calcite macroalgae and are considered among the most vulnerable organisms to ocean acidification (OA). These sensitive species play fundamental roles in coastal systems as food source and settlement promoters as well as being involved in reef stabilization, and water carbonate balance. At present only a few studies are focused on erect calcifying macroalgae under low pH/high pCO_2 and the contrasting results make difficult to predict the ecological consequences of the OA on the coralline algae. In this paper the physiological reasons behind the resistance of *Jania rubens*, one of the most common calcareous species, to changing ocean pH are analysed. In particular, we studied the photosynthetic and mineralogical response of *J. rubens* after a three-week transplant in a natural CO_2 vent system. The overall results showed that *J. rubens* could be able to survive under predicted pH conditions even though with a reduced fitness; nevertheless physiological limits prevent the growth and survival of the species at pH 6.7. At low pH (i.e. pH 7.5), the maximum and effective PSII efficiency decreased even if the increase of Rubisco expression suggests a compensation effort of the species to cope with the decreased light-driven products. In these circumstances, a pH-driven bleaching phenomenon was also observed. Even though the photosynthesis decreased at low pH, *J. rubens* maintained unchanged the mineralogical composition and the carbonate content in the cell wall, suggesting that the calcification process may also have a

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