



Effects of ocean acidification on the levels of primary and secondary metabolites in the brown macroalga *Sargassum vulgare* at different time scales



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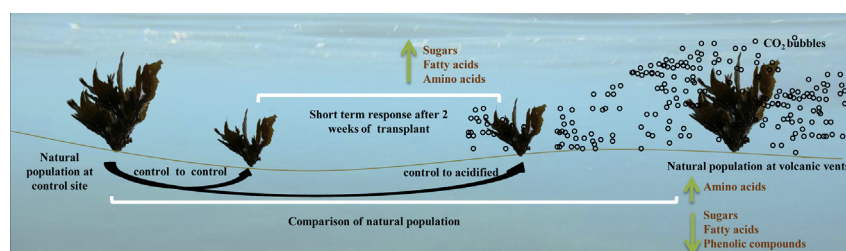
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HIGHLIGHTS

- *Sargassum vulgare* growing at CO₂ vents was compared with those growing at control site.
- *S. vulgare* from control site was transplanted to CO₂ vents for 2 weeks.
- In short-term responses, *S. vulgare* showed increased level of sugars, PUFAs, and EAAs.
- Natural population at vents showed decreased sugars, PUFAs, phenols, and increased EAAs.
- Nutritional values of algae will decrease under acidification in long time scale.

GRAPHICAL ABSTRACT



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ABSTRACT

Most of the studies regarding the impact of ocean acidification on macroalgae have been carried out for short-term periods, in controlled laboratory conditions, thus hampering the possibility to scale up the effects on long-term. In the present study, the volcanic CO₂ vents off Ischia Island were used as a natural laboratory to investigate the metabolic response of the brown alga *Sargassum vulgare* to acidification at different time scales. For long-term effects, algal populations naturally growing at acidified and control sites were compared. For short-term responses, *in situ* reciprocal transplants from control to acidified site and *vice-versa* were performed. Changes in the levels of sugars, fatty acids (FAs), amino acids (AAs), antioxidants, and phenolic compounds were examined. Our main finding includes variable metabolic response of this alga at different time scales to natural acidification. The levels of sugars, FAs, and some secondary metabolites were lower in the natural population at the acidified site, whereas the majority of AAs were higher than those detected in thalli growing at control site. Moreover, in algae transplanted from control to acidified site, soluble sugars (glucose and mannose), majority of AAs, and FAs increased in comparison to control plants transplanted within the same site. The differences in

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