CO_2 FIXATION BY SEAWEEDS AND THEIR ROLE IN DE-ACIDIFYING OCEAN- AN EXPERIMENTAL APPROACH

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Abstract

In marine ecosystems, seaweeds form one of the major primary producers due to its crucial role in the sustenance of the food web and ecosystem balance. CO_2 exerts profound influence on productivity and growth patterns of seaweeds by forming a vital constituent in the photosynthetic process. Present rise in atmospheric CO_2 concentration and its subsequent dissolution resulting in a notable drop in the ocean pH leading to ocean acidification is considered as a potential threat to the proper functioning and sustainability of the marine ecosystems. Keeping in view of this, an attempt was made to evaluate the potential of 12 seaweed species belonging to classes: Chlorophyceae, Phaeophyceae and Rhodophyceae to reduce ocean acidification through their primary productivity Each seaweed species were incubated separately in seawater with dissolved CO_2 levels 0, 50, 100 and 150ppm respectively and their primary productivity was measured using light and dark bottle incubation for a time period of 2 hours. It was observed that all the seaweed species exhibited significant variation ($p=<0.05$) in their productivity at treatments with different CO_2 concentrations. The productivity of all seaweeds increased at 50 ppm of CO_2 compared to the incubation in the de-carbonated (0 ppm) waters. Species such as *Gracilaria corticata, Padina tetrastromatica, Gratiloupia lithophila, Caulerapa recemosa* and *Gelidium pusillum* exhibited an increase in productivity at 100ppm of CO_2 compared to 50ppm of CO_2 concentration and de-carbonated waters. However seaweeds like *Chaetomorpha antennina, Ulva flexuosa, Sargassum wightii, Valoniopsis pachynema, Kappaphycus alvarezii and Jaina rubens* showed less productivity at 100ppm CO_2. All seaweed species had reduced productivity at 150ppm CO_2 concentration. A significant variation ($p=<0.05$) in the pH was also noticed at different CO_2 treatments. A reduction of 0.89, 1.31, 1.60 units in pH was observed at seawater of 50,100,150 ppm of CO_2 concentration respectively. The study hence strongly recommends the promotion of large scale mariculture of seaweeds as a strategy for mitigating the impacts of ocean acidification in response to climate changes in marine ecosystems, while the harvest can support livelihood of coastal fishers.

Keywords: Seaweeds, Carbon sequestration, Ocean acidification, Primary productivity, CO_2, Seaweed mariculture.