

# 琉球大学学術リポジトリ

## Crustose Coralline Algae as Bio-remediator for Coral Reef Ecosystem

メタデータ	言語: 出版者: 琉球大学21世紀COEプログラム 公開日: 2008-10-07 キーワード (Ja): キーワード (En): 作成者: Yuen, Yeong-Shyan, Nakamura, Takashi, Yamasaki, Hideo メールアドレス: 所属:
URL	<a href="http://hdl.handle.net/20.500.12000/7397">http://hdl.handle.net/20.500.12000/7397</a>

## Crustose Coralline Algae as Bio-remediator for Coral Reef Ecosystem

Yeong-Shyan Yuen, Takashi Nakamura &amp; Hideo Yamasaki

Graduate School of Engineering and Science, Faculty of Science, University of the Ryukyus

Crustose coralline algae (CCA; Rhodophyta, Corallinales) are ubiquitously found in coral reef ecosystems. Although their contribution to the construction and maintenance of coral reef ecosystems has been documented in many literatures, nutrient dynamics of CCA in oligotrophic environments yet remains as a subject to be explored.

Eutrophication due to runoffs, in general, increases concentrations of nitrate, nitrite and ammonium ions in seawater, a potential threat to corals that have evolved and adapted to oligotrophic environment. In contrast to frondose macroalgae and turf microalgae, CCA do not bloom or outgrow other benthic organisms in eutrophic conditions. In addition, CCA and its substrate provide an environment for a wide variety of endolithic communities that play a potential role in the uptake of nitrogen compounds. Thus, we hypothesized that CCA play a significant role as a bio-remediator to keep oligotrophic conditions in coral reef ecosystem.

Here, we report the uptake activity for ammonium ions ( $\text{NH}_4^+$ ) and its uptake kinetics in CCA. Laboratory experiments showed that  $\text{NH}_4^+$ -uptake by CCA followed the first-order kinetics under both light and dark conditions. In a short term experiment (12 hours), the average half-decay time ( $t_{1/2}$ ) of supplemental  $\text{NH}_4^+$  was  $8.48 \pm 0.95$  h under light conditions. In contrast, the value of  $t_{1/2}$  was much higher under dark conditions ( $14.26 \pm 3.65$  h). We further examined the  $\text{NH}_4^+$  removal capability of CCA by a consecutive supplementation of  $\text{NH}_4^+$  into seawater at 0, 24 and 48 hours. The results showed no substantial difference in  $t_{1/2}$  for the decay of  $\text{NH}_4^+$  concentration under light conditions. On the contrary, an increment of 1.5 fold in the  $t_{1/2}$  was observed in every  $\text{NH}_4^+$  supplementation under dark conditions. These discrepancies suggest that CCA employs different mechanisms of ammonium uptake under light and dark conditions. We consider that photosynthesis stimulates the  $\text{NH}_4^+$ -uptake due to nitrogen assimilation activity in CCA under light conditions.

These results suggest that CCA are capable of thriving under elevated nutrient conditions. Their abilities in ammonium uptake at high concentration, without outgrowing other organisms, offer us to consider them as a bio-remediator in eutrophication.