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Functional role of crustose coralline algae in nutrient dynamics of coral reef ecosystem

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Coral reefs worldwide, especially those located near coastlines are constantly being subjected to anthropogenic nutrient input. This anthropogenic nutrient input exclusively increases nitrogenous-compound concentrations in coastal seawater. This is in contrast with the paradigm that coral reefs thrive best in oligotrophic waters. Therefore, eutrophication is an emerging issue in biogeochemical study of nitrogen cycle in reef ecosystems. CCA is well known for its important role in reef-building process, the induction of invertebrates' larval settlement and metamorphosis as well as the primary production. However, crustose coralline algae (CCA) have been overlooked in the study of nitrogen cycling in coral ecosystems. In this study, we explored CCA as a combined system of the algal component and its calcium carbonate substratum. Here, we report NH_4^+ and NO_3^- uptake activities by CCA and endolithic microorganisms involved in these activities. We identified endolithic organisms involved in nutrients uptake by molecular approach. Our results suggest that microbial consortium residing in the substratum component may play a major role in nitrogen cycle in the CCA system. The substratum covered by CCA would create an anoxic environment that is ideal for the growth of various denitrifiers. The findings in this study lead us to conclude that CCA is an important functional group in the nutrient dynamics in coral reef ecosystems.