Abstract

Coral reefs are impacted by a range of environmental variables that affect their growth and survival, the main factors being the high irradiance and temperature fluctuations. Specimens of Pocillopora capitata Verrill 1864 were exposed to photosynthetically active radiation (PAR) and ultraviolet radiation (UVR) for 32h under laboratory conditions. We examined lipid peroxidation (MDA), antioxidant enzyme activities (SOD, CAT, GPx and GST), chlorophyll a (Chl a), carotenoid pigments (CPs), mycosporine-like amino acids (MAAs), and expulsion of zooxanthellae. Our results revealed that corals exposed to UVR had relatively low levels of carotenoids and antioxidant enzyme activities compared to those exposed to PAR, as well as lower CPs/Chl a ratios. Although MAAs and CPs are rapidly produced as non-enzymatic antioxidants in response to UVR in corals, these were not sufficient, even in the dark phase of the experiment, to mitigate the damage caused by formation of reactive oxygen species (ROS), which caused breakdown of the symbiotic relationship between the zooxanthellae and the host animal to an extent 33 times greater than in the PAR treatment. In this study, it could be possible to distinguish that, parallel to the short-term adjustments, such as the amount of pigment in the algae or the sensitivity of the photosynthetic response reported in other species of coral, P. capitata exhibits at the enzymatic level a series of responses oriented to resist the effects derived from the propagation of ROS and, thus, to adapt to and maintain its reproductive capacity in shallow oceanic environments that commonly exhibit high UVR levels. Nevertheless, as a result of the inappropriate location of the artificial intercommunication structure of the Juluapan Lagoon with respect to the arrecifal area of study and therefore of the tides influence, other variables, such as the changes in short-term in turbidity, sediment inputs, nutrients, temperature and osmolarity, can act in combination and cause irreversible damage. The implementation of a management plan for the coralline reefs of the Mexican Pacific coast is required. Rev. Biol. Trop. 58 (1): 103-118. Epub 2010 March 01.

Keywords

Antioxidants, carotenoids, corals, oxidative stress, MAAs, UVR, lipid peroxidation, Pocillopora capitata, photosynthetically active radiation, SOD, CAT, GPx, GST, chlorophyll a, reactive oxygen species.