

Original Communication

Effects of solar radiation on phycobiliproteins of marine red algae

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ABSTRACT

Three strains of marine red algae, *Callithamnion byssoides* Lyngbye, *Ceramium rubrum* (Huds.) Ag., and *Corallina officinalis* Linnaeus, isolated from Patagonia, Argentina in February 2002, were tested for the presence and the type of phycobiliproteins. Changes in their specific pigment content were monitored over a period of 36 h during alternating light/dark cycles under total solar radiation (without filter) or only the PAR component of solar radiation (under a 395 nm cut-off filter). Phycoerythrin (PE) was found to be the predominant accessory light harvesting phycobiliprotein in all three red algae. Phycocyanin (PC) was present only in *Ceramium rubrum* whereas allophycocyanin (APC) was not detected from all the red algae tested so far. There was a decline in the amount of PE and PC during light periods and an increase during dark periods in all the red algae showing a circadian rhythm of the phycobiliprotein destruction and resynthesis. Although the pattern of the rhythm was similar in both samples receiving either total (unfiltered) solar radiation or only PAR, the degree of bleaching of phycobiliproteins was more pronounced, and there was less recovery in the samples that received unfiltered solar radiation.

INTRODUCTION

The majority of seaweed species belong to the

Rhodophyta (red algae) and are major biomass producers in marine ecosystems particularly in coastal regions [1]. Red algae are economically very important due to the presence of agar and carrageenan in their cell walls. These are gelling compounds and are used in food products and in scientific research. In Asia, red algae are important sources of food; one of the most popular seaweed food products is a red seaweed *Porphyra* called nori, which is used in sushi wraps and other Japanese dishes. The high vitamin and protein content of this food makes it attractive, as does the relative simplicity of cultivation, which began in Japan more than 300 years ago [2]. Some rhodophytes are also important in the formation of tropical reefs; in some Pacific atolls, red algae have contributed far more to reef structure than other organisms, even more than corals. These reef-building rhodophytes are called coralline algae, because they secrete a hard shell of carbonate around themselves, in much the same way as corals do [3].

Phycobiliproteins are a family of accessory light harvesting macromolecules that function as components of the photosynthetic apparatus in prokaryotic cyanobacteria and several groups of eukaryotic algae including the red algae, cryptomonads and glaucophytes [4-6]. Phycobiliproteins may constitute 60 % of the soluble proteins of the cell and their main function is to trap light energy in the 495 to 650 nm wavelength range and transfer it to chlorophyll *a* of

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