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A preliminary study on antioxidant and antimicrobial activities of phycoerythrin from different *Gracilaria* species

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ABSTRACT

In the present study, phycobiliproteins from *Gracilaria* species collected from Manapad, Thondi and Pamban coasts of Tamilnadu were extracted using 0.1 M phosphate buffer and quantified. The crude (dialysed) and purified (DEAE cellulose 52) phycoerythrins obtained from three species of *Gracilaria* viz., *G.corticata, G.edulis* and *G.crassa* were evaluated for their antioxidant properties. Among these three species, *G. corticata* recorded maximum antioxidant activity of 264.9±10.2 µg/ml ascorbic acid equivalents and maximum DPPH free radical scavenging activity of 76.4±7.8 µg/ml ascorbic acid equivalents with 22.9±1.9 % scavenging effect. Phycoerythrin (dialysed crude) from *G. corticata* was also found to have antimicrobial activity, inhibiting the growth of *Pseudomonas aeruginosa* and *Staphylococcus aureus*. However, no activity was found against *Escherichia coli, Klebsiella pneumoniae* and *Acetobacter*.

Introduction

The Indian subcontinent is having long coastline of 7516 km and 2.0 million km^2 exclusive economic zone (EEZ) (Subba Rao,2000) harbouring marine plants, which include marine macroalgae (seaweeds) (Subba Rao and Mantri,2006). Red seaweeds are found abundantly in east and west coasts of India (Silas *et al.,* 1986; Senthilkumar *et al.,* 2013a) and they are named because of their red colour appearance and produce reddish pink colour pigment called phycoerythrin. Phycoerythrin is a major light-harvesting pigment of red algae. R-Phycoerythrin (R-PE) is an oligomeric protein of 240 kDa with 6α (about 20kDa), 6β (about 20 kDa) and 1γ (about 30 kDa) subunits (Denis *et al.,* 2009).

Phycobiliproteins are natural pigments obtained from red seaweeds. Phycocyanin, allophycocyanin and phycoerythrin constitute phycobiliproteins. Phycoerythrin is being used as fluorescent tag in medical diagnostics because of unique spectral properties (emission and excitation). Phycocyanin and phycoerythrin mainly constitute phycobiliproteins, that are water soluble pigments. Crude phycobiliproteins contain phycocyanin and allophycocyanin in lesser amounts whereas phycoerythrin is available in large amounts and it is responsible for the reddish pink colour of red seaweeds. Phycoerythrin pigment is sensitive to light, temperature and pH and can be stored in dark condition at 0±5 °C. R-phycoerythrin (R-PE) is commonly used as a fluorescent label in immunology and cell biology (Oi *et al.,* 1982; Kronik, 1986) and in flow cytometry (Hardy, 1986; Wilson *et al.,* 1991). It is also used as a natural food colorant (Qian *et al.,* 1991; Mille-Claire *et al.,* 1993; D'Agnolo *et al.,* 1994; Sudhakar *et al.,* 2014) and as a marker in gel electrophoresis and isoelectro focusing (Araoz *et al.,* 1998). It has also been shown that it could be used as a measure of peroxy radical damage (DeLange and Glazer, 1989). Generally phycobiliproteins are largely

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