

**ABSTRACT:**

Red algae have a lot of importance in food, medicine, and industrial. Commercial use of this sea alga and its development requires the correct identification and the knowledge of its life cycle. Algae contain different types of secondary metabolites like phenolic acid and flavonoids which has an antioxidant effects and these properties could be applied for medical and therapeutic purposes. The purpose of this research is to investigate the antioxidant and antibacterial effects of two species of red micro alga of *gracilaria* genus in order to check their medicinal and therapeutic effects. To do this, first samples was collected and then their identification was performed using morphological (based on the appearance and cell features observed by the light microscope) and Genetic (amplification of *Cox1* gene using PCR and phylogenetic analysis using sequencing results) methods. Results of *Cox* gene sequencing in these two species using specific primers showed 97 and 90% homology with available sequence in GenBank database for *edulis* and *sp* respectively. After receiving sequence, the analysis of the phylogenetic was done. Extracts of the samples macro alga of *gracilaria* is done using two solvent (methanol and n-Hexane). Then the antioxidant activity and their antibacterial properties were investigated. According to the results of the phylogenetic analysis, in any of the *edulis* species, the *Cox* gene was very conserved and belongs to the Persian Gulf species. This gene had little changes during the development of the *sp* species, and is very close to the *gracilaria sp philippines*. Extraction of DNA was done by phenol chloroform, CTAB and changed CTAB methods. Quality and quantity investigation of data, showed the purity and high amount of the extracted DNA using the changed CTAB method compare to the other two methods. Extraction from *Gracillaria* macroalgas were performed using two solvents (methanol and n-Hexane) and methanol extracts was more effective on antioxidant and antibacterial activity. The results showed that the antioxidant activity of the extracts was followed the dose-response curve. Methanol extract of the species *sp* and *edulis* and N-hexan extract of these species inhibited DPPH equal to 50% free radicals at 261.5, 315.4, 566.5  $\mu\text{g/ml}$  concentrations respectively. Investigation of minimum inhibitory concentration of these extracts versus three tested bacterial samples was variable from 156  $\mu\text{g/ml}$  to 625  $\mu\text{g/ml}$ . So that methanol and N-hexan extracts extracted from *sp* species showed maximum inhibitory effects of 156  $\mu\text{g/mL}$ . The lethal concentration of these extracts were recorded in the range 156 to 1250  $\mu\text{g/mL}$ . So that methanol and N-hexan extracts of *sp* species showed the highest antimicrobial activity of 156  $\mu\text{g/mL}$ .

**Keywords:** *Gracilaria*, molecular identification, red alga, antioxidant



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