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ORIGINAL PAPER

Antioxidant and cytotoxic activities of sulfated polysaccharides from five different edible seaweeds

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Abstract

In recent times, there has been a growing interest in the exploration of antioxidants and global trend toward the usage of seaweeds in the food industries. The low molecular weight up to 14 kDa sulfated polysaccharides of seaweeds (*Portieria hornemannii*, *Spyridia hypnoides*, *Asparagopsis taxiformis, Centroceras clavulatum* and *Padina pavonica*) were evaluated for in vitro antioxidant activities and cytotoxic assay using HeLa cell line and also characterized by FTIR. The high yield (7.74% alga dry wt.) of sulfated polysaccharide was observed in *P. hornemannii* followed by *S. hypnoides* (0.69%), *C. clavulaum* (0.55%) and *A. taxiformis* (0.17%). In the brown seaweed *P. pavonica,* the sulfated polysaccharide yield was 2.07%. High amount of sulfate was recorded in the polysaccharide of *A. taxiformis* followed by *C. clavulaum, P. pavonica, S. hypnoides* and *P. hornemannii* as indicative for bioactivity. The FTIR spectroscopic analysis supports the sulfated polysaccharides of *S. hypnoides, C. clavulatum* and *A. taxiformis* are similar to agar polymer whereas the spectral characteristics of *P. hornemannii* have similarities to carrageenan. The higher DPPH activity and reducing power were recorded in the polysaccharide of brown seaweed *P. pavonica* than the red seaweeds as follows: DPPH activities: *S. hypnoides* > *A. taxiformis* > *C. clavulatum* > *P. hornimanii*; Reducing power: *A. taxiformis* > *P. hornimanii* > *S. hypnoides* > *C. clavulatum.* The polysaccharide fractions contain up to 14 kDa from red seaweeds *P. hornemannii* and *S. hypnoides* followed by brown seaweed *P. pavonica* exhibit cytotoxic activity in HeLa cancer cell line (and are similar to structural properties of carrageenan extracted from *P. hornemannii*). The low molecular weight agar like polymer of *S. hypnoides* and alginate like brown seaweed *P. pavonica* showing better in vitro antioxidant activities that are capable of exhibiting cytotoxicity against HeLa cell line can be taken up further in-depth investigation for nutraceutical study.

Keywords Seaweeds · Sulfated polysaccharides · Antioxidants · Cytotoxic assay · HeLa cell lines

Introduction

Marine macroalgae (seaweeds) are the only resource for industrially important polymers such as agar and carrageenan from red seaweeds; alginate, fucoidan and laminarin from brown seaweeds. These polymers are extracted only from few seaweed species that meet certain industrial applications. This seaweed sulfated polysaccharides possess a variety of biological activities and immunomodulatory activities to mitigate associated negative effects including inflammation [1]. These polysaccharides have been used in food industries as gelling agents, thickening, and stable excipients for control release of drugs [2]. Recently, in a test of antiviral effectiveness against the virus which causes COVID-19, an extract from edible seaweeds substantially outperformed remdesivir, the current standard antiviral agent used to combat the disease. Further Heparin, a common blood thinner, and a heparin variant stripped of its anticoagulant properties, performed on par with remdesivir in inhibiting SARS-CoV-2 infection in mammalian cells [3]. Beside, this seaweed hydrocolloids have great economic importance because of their various bioactive (anticoagulant, antiviral, anticancer, antioxidant, antitumor,

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