Antioxidant And Antimicrobial Activity From Six Species Of Edible Irish Seaweeds

Sabrina Cox
Technological University Dublin, sabrina.cox@tudublin.ie

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Antioxidant and antimicrobial activity from six species of edible Irish seaweeds
Sabrina Cox*, Nisreen Abu-Ghanam and Shilpi Gupta
School of Food Science and Environmental Health, Dublin Institute of Technology, Cathal Brugha Street, Dublin 1, Ireland

Introduction

- Seaweeds are macroalgae which are macroscopic plants of marine benthos. Based on nutrient and chemical composition seaweeds are classified as Rhodophyta (red algae), Phaeophyta (brown algae) and Chlorophyta (green algae).
- Irish haricots 32,800 tonnes of seaweed per year with an annual turnover of €15 million.
- Seaweeds are a known source of bioactive compounds such as antiviral, antimicrobial and antinflammatory as they contain secondary metabolites characterized by a broad spectrum of biological activities.
- Seaweeds are exposed to light and high oxygen concentrations which result in free radicals and other strong oxidizing agents being formed however, seaweed suffer some serious photodynamic damage which implies that their cells have protective mechanisms and compounds.
- Seaweeds are a relatively unexplored resource in Ireland thus investigation into this plentiful resource could provide a promising alternative and natural source of bioactive compounds, nutraceuticals and functional foods.

The main objective of this work was to investigate and evaluate the antioxidant and antimicrobial activity of six species of edible Irish seaweeds.

Materials and Methods

Three species of Phaeophyta, two Rhodophyta and one Chlorophyta were used in this study.

Results and Discussion

Extracts from six species of edible Irish seaweeds were screened for antioxidant and antimicrobial activity.

Antioxidant Analysis

- All six species of seaweed exhibited antioxidant content using the Folin-Ciocalteau method for determination of phenolic content (Fig. 1).
- Himenthalia elongata showed the highest content of phenolics (155.3 gallic acid units).
- Palmaria palmata showed better scavenging capacity than Palmaria palmata and Enteromorpha spirulina.
- Himenthalia elongata showed highest antioxidant activity giving 50% reduction of DPPH radical at 1µg/ml and 100% inhibition at 100µg/ml.
- Palmaria palmata had an EC50 of 21µg/ml and Enteromorpha spirulina gave the lowest level (79µg/ml).

Antimicrobial Analysis

- All antimicrobial properties of seaweed extracts against two species of gram- and gram- food pathogenic and food spoilage bacteria are displayed in Fig. 3.
- Brown seawed had the highest antimicrobial activity.
- Himenthalia elongata gave 100% inhibition of all bacteria at 12.8µg.
- All extracts inhibited growth of bacteria except Chondrus crispus which increased the growth of the studied bacteria.
- This may have been due to high levels of polysaccharides in the extract which supported bacterial growth.
- All effective extracts had highest impact at inhibiting Listeria monocytogenes.

Conclusion

- The most effective concentration of seaweed extracts were analysed kinetically over 24 hours (Fig. 4).
- Himenthalia elongata was most effective against all bacteria inhibiting bacteria from the first hour, followed by Laminaria saccharina and Laminaria digitata.
- Palmaria palmata and Enteromorpha spirulina increased the lag phase (averages 2 and 4 hours respectively) after which growth increased.
- Chondrus crispus increased the overall growth of the bacteria higher than the control treatment.

References


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