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## Objectives

Seaweed as a source of functional additives with health beneficial properties is gaining interest. Edible seaweeds have a long history of use in the diets of Pacific and Asian cultures compared to those of Europe.

The **antioxidative activity** of extracts from different types of **underutilized Icelandic** seaweed will be explored and their potential application as natural antioxidant and functional ingredient to enhance the **quality** and **nutritional value** of new seafood based products.

The aim of the studies was to evaluate the efficiency of different extraction technique, characterize the antioxidant compounds in the seaweed extracts and screen for antioxidative activity using different antioxidant activity assays.

## Materials and Methods

Water and 70% aqueous acetone extracts were prepared from brown algae (*Fucus vesiculosus*, *F. serratus*, *Ascophyllum nodosum*, *Laminaria hyperborea* (new and old growth), *L. saccharina* (new and old growth), *L. digitata*, *Alaria esculenta*), red algae (*Palmaria palmata*, *Chondrus crispus*) and green algae (*Ulva lactuca*) and total amount of polyphenols was determined. Antioxidant activity was evaluated by 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging capacity, Oxygen Radical Absorbance Capacity (ORAC) and ferrous ion chelating capacity.



*Ascophyllum nodosum*



*Laminaria saccharina*



*Laminaria digitata*

## Results and Discussions

For most seaweed species, 70% aqueous acetone was more efficient to extract the polyphenols from the seaweed compared to water (Figure 1). Brown algae generally contained higher levels of polyphenols (phlorotannins) than red and green algae. The highest polyphenol content was found in Fucaceae.

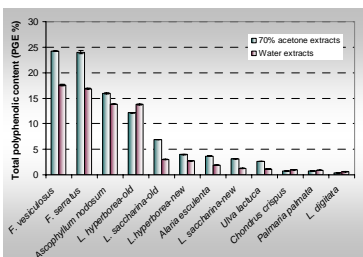


Figure 1. Total polyphenolic content of various seaweed extracts.

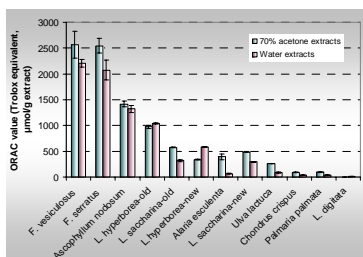


Figure 2. Oxygen Radical Absorbance Capacity of various seaweed extracts.

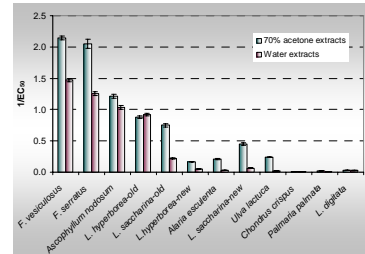


Figure 3. DPPH- scavenging capacity of various seaweed extracts.

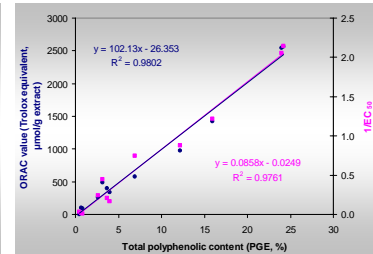


Figure 4. Correlation between total polyphenolic content and ORAC value or 1/EC<sub>50</sub> values (DPPH) in 70% acetone extracts from various seaweed.

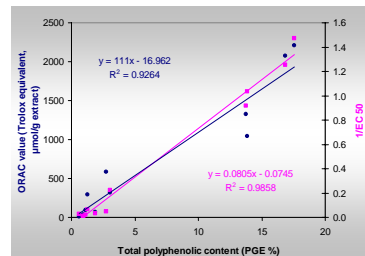


Figure 5. Correlation between total polyphenolic content and ORAC value or 1/EC<sub>50</sub> values (DPPH) in water extracts from various seaweed.

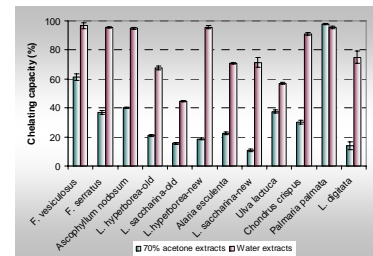


Figure 6. Ferrous ion chelating capacity of various seaweed extracts.

70% aqueous acetone extracted more compounds with peroxy radical scavenging capacity (Figure 2) and DPPH- radical scavenging capacity (Figure 3) than water. Significant differences ( $p < 0.05$ ) in antioxidant activities among different seaweed species were observed.

High correlation ( $R^2 > 0.92$ ) was found between the total polyphenolic contents of the seaweed extracts and their antioxidant activities evaluated as ORAC value and DPPH- scavenging capacity (Figure 4 and Figure 5), suggesting an important role of polyphenolic compounds as potent radical scavengers.

The water extracts exhibited higher ferrous ion chelating capacity (Figure 6) but no correlation was found with total polyphenolic content. Other components such as polysaccharides, pigments, proteins or peptides may also contribute to the observed chelating activity of the extracts.

## Further studies

Fractionation and characterization the antioxidant compounds in the seaweed extracts is in progress. Evaluation of their antioxidant efficiency in different model system (i.e. liposomes, lean fish mince and fish protein isolates) will be carried out. Potential application to enhance oxidative stability, flavor quality and nutritional value of seafood products will be investigated.

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