

Algal polyphenols as novel natural antioxidants

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Photo of presenting author, will be inserted by Jette

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Research areas: Antioxidant properties of algal polyphenols

Selected major and/or recent papers:

Wang, T., Sveinsdóttir, K., Magnússon, H., Martinsdóttir, E. (2008). Combined application of modified atmosphere packaging and superchilled storage to extend the shelf life of fresh cod (*Gadus morhua*) loins. *Journal of Food Science*, 73(1), S11–S19 and Wang, T., Jónsdóttir, R., Ólafsdóttir, G. (2009). Total phenolic compounds, radical scavenging and metal chelation of extracts from Icelandic seaweeds. *Food Chem.* 2009, 116(1), 240-248.

The search for naturally occurring antioxidants as alternatives to synthetic products is escalating. Seaweed has emerged as a viable source of natural antioxidants with remarkable and diverse health-promoting properties. The aim of the PhD project is to underpin the potential application of algal polyphenols as novel natural antioxidants to control lipid oxidation and quality deterioration in fish products. The main emphasis has been on the screening for species with promising antioxidant activities, extraction and purification of polyphenols from selected seaweeds and characterization of their antioxidant activities by *in vitro* tests and model studies.

Antioxidant potentials of ten species of Icelandic seaweeds were screened by three *in vitro* assays. *F. vesiculosus* with the highest total phenolic content and the greatest radical scavenging activity and *P. palmata* with strong Fe²⁺ chelating ability have been selected for further studies. *F. vesiculosus* also exhibited potent ACE-inhibitory activity, suggesting that algal polyphenols may have multiple health benefits.

As a safe and environmentally friendly alternative technology, enzyme-assisted extraction of antioxidant ingredients from marine algae was evaluated using eleven commercial enzymes (six proteases and five carbohydrases). The effectiveness appeared to be species and enzyme-dependent. Umamizyme treatment exhibited a superior capacity to enhance the recovery of polyphenols and other hydrophilic antioxidant compounds from *P. palmata*. Less advantage was observed for enzymatic extraction of polyphenols from *F. vesiculosus* and *L. hyperborea* compared with water and organic solvent extraction.

Further studies were carried out to investigate the extraction efficiency of various organic solvent systems and the antioxidant activities of different subfractions of crude ethanol extract from *F. vesiculosus*. Successful fractionation demonstrated that phlorotannin-enriched fraction showed significantly higher DPPH radical scavenging capacity than the other fractions and the original extract. This fraction was subjected to Sephadex LH-20 column chromatography and successive ultrafiltration to better characterize the antioxidant properties of different phlorotannin components. Studies are currently ongoing to determine the antioxidant potential of crude extracts and different fractions to prevent hemoglobin-mediated lipid oxidation in washed cod muscle model system and fish protein isolates. The outcome will provide a necessary basis to enhance and broaden the potential utilization of algal polyphenols in health-promoting functional foods formulations.