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Physical and oxidative stability of high-fat fish-oil emulsions added algae-based stabilizers from *Saccharina latissima*

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Abstract

The protection of long-chain (LC) omega-3 polyunsaturated fatty acids (PUFAs) against oxidation when added into food matrices could be achieved by the development of fish-oil delivery emulsions and by the addition of antioxidants.

Commercial alginate, a brown algae polysaccharide, in combination with sodium caseinate (NaCas), is widely used by the food industry to stabilize emulsions. Moreover, previous studies have reported that laminarin and fucoidans, both brown-algae polysaccharides, show antioxidant activity.

In this work, alginate (NaAlg), fucoidan, and laminarin were extracted from the brown alga *Saccharina latissima* and examined for their stabilizing properties. The potential of these polysaccharides in preventing lipid oxidation and in maintaining the physical stability of 70% (w/w) fish oil-in-water emulsions were studied. The polysaccharides were formulated in different concentration (0-0.63%, w/w) together with NaCas (0.23%, w/w) into the aqueous phase. The physical (e.g. creaming, droplet-size distribution, and apparent viscosity) and oxidative (peroxide value and secondary oxidation products) stability of the emulsions, were evaluated during 12 days of storage in the dark at 20˚C.

Results showed that the antioxidant activity of fucoidan, laminarin and NaAlg derived from *S. latissima* in emulsion systems was only observed for laminarin and for some concentrations of NaAlg. It was found that laminarin was the most promising polysaccharide to enhance the oxidative stability of the emulsions. However, the physical stability of the emulsions added laminarin was poor at low concentrations. Hence, it can be recommended to use laminarin extracts for stabilizing 70% (w/w) fish oil-in-water emulsions both physically and oxidatively at a concentration of 0.30% (w/w) together with 0.23% (w/w) NaCas.