Physical and oxidative stability of n-3 delivery emulsions added seaweed-based polysaccharide extracts from Nordic brown algae Saccharina latissima

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Abstract

Enriching foods with long-chain (LC) n-3 polyunsaturated fatty acids (PUFAs) requires a delivery emulsion system, which is both thermodynamically and oxidatively stable. The antioxidant and stabilizing properties of three types of polysaccharide extracts from brown algae Saccharina latissima with mixed composition of polysaccharides (SA: 98% Sodium alginate, SF: 90% alginate and 9% fucoidan, SL: 14.5% fucoidan, 9.5% laminarin and co-extracted non-polysaccharides) were evaluated. SA, SF, SL and REF (added commercial sodium alginate) all showed in vitro ferrous ion chelating ability in the order: SA(99%)>SL(78%)>REF(31%)>SF(16%). The difference in antioxidant activity between SA, REF and SF appeared related to structural differences of alginate (M/G ratio). A storage trial was conducted using 70% (w/w) fish oil-in-water delivery emulsions added sodium caseinate (NaCas) (0.23 wt%) as emulsifier in combination with SA, SF, SL or commercial NaAlg (REF) in different concentrations (C1=0.1, C2=0.2 C3=0.3 and C4=0.4 wt%). A control with only NaCas were included (CON). The physical (e.g. creaming and droplet-size distribution) and oxidative (peroxide value and volatiles) stability of the emulsions, were evaluated (12 days, dark at 20@C). Acceptable physical stability (creaming index, CI) was found for, REF (all concentrations), SF=0.2 wt% (C2), SL and SA=0.3 wt% (C3) and 0.4 wt% (C4). In general, the oxidative stability decreased by adding REF, SA and SF (except for REF at C1), as prooxidant activity was observed. However, SA showed antioxidant activity against formation of 2-ethylfuran. SL showed antioxidant activity in decreasing formation of volatile compounds in emulsions when added in concentrations above 0.2 wt%.

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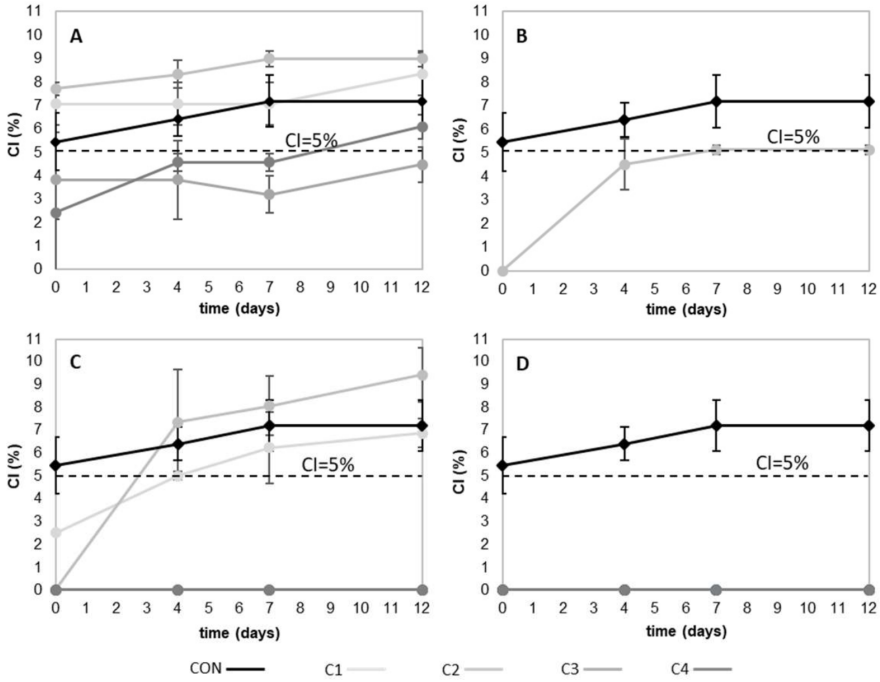

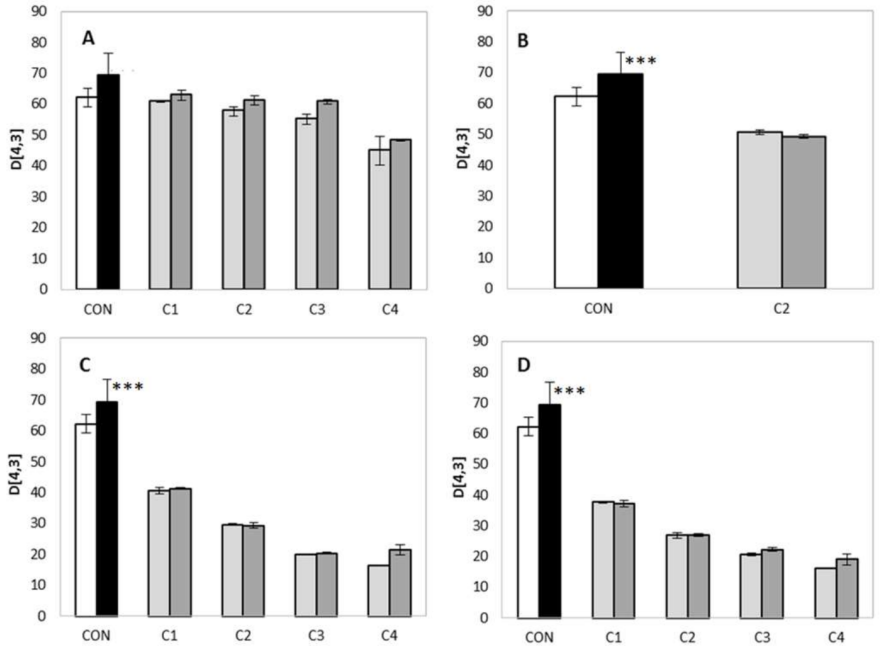

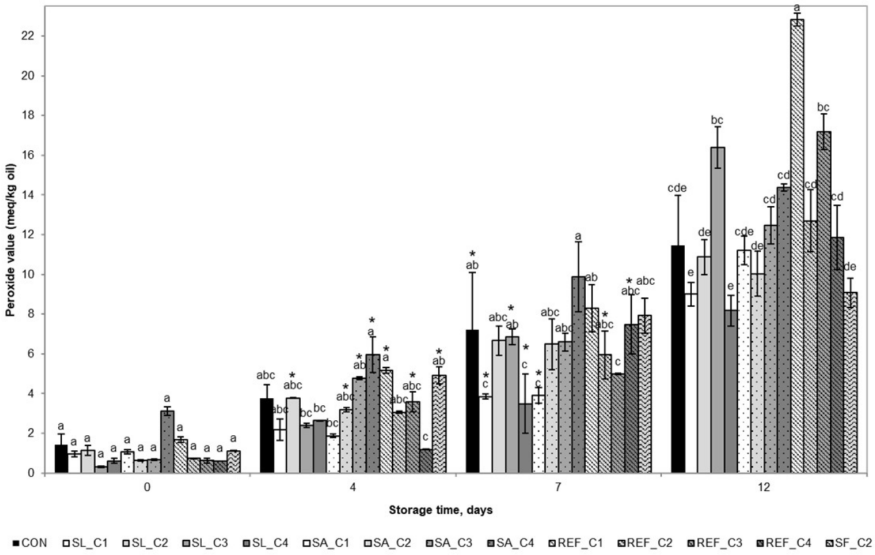

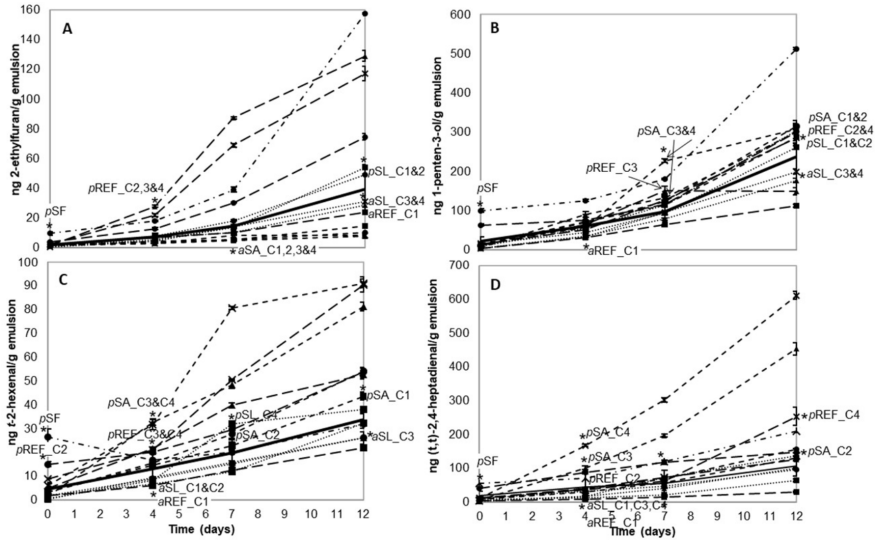

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