

Effect of storage conditions on quality of aquatic biomass powders from fish side-streams enriched with natural antioxidants

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Globally, one third of the food produced for human consumption is wasted every year. Aquaculture and fisheries contribute 35% of total food losses and waste. Marine biomasses are rich in bioactive compounds that can be used as value-added ingredients in different applications. Due to their high content of unsaturated fatty acids, highly susceptible to oxidation, the effectiveness of incorporation of alternative antioxidants from natural sources as to ensure their quality and stability has been the focus of research.

Salmon filleting residues were used for the preparation of fish-based lyophilized powders. In half of the samples, a rich in carnosol/carnosic acid antioxidant, naturally extracted from rosemary, was added to prevent the powders from lipid oxidation at a concentration of 150 mg_{carnosol/carnosic acid/kg lipids} which is the maximum allowed concentration according to the EFSA regulations. Samples were packed in multilayer pouches (PET12/ALU80/PE80) and accelerated shelf-life tests were performed at a temperature range of 20-50°C and water activity range of $a_w=0.11-0.53$. The efficiency of antioxidants was determined in terms of lipid oxidation (peroxide value, p-Anisidine, K_{232} , K_{270}), colour and sensory characteristics of the products.

Fish powders were rich in fish oil (64.6%) and, DHA and EPA represented about 20% of fatty acids. Increasing both temperature and water activity resulted in increased lipid oxidation constant rates, up to 1.5-fold at constant $T=20^\circ\text{C}$, and up to 2-fold at constant $a_w=0.22$, respectively. The addition of antioxidant in powders inhibited primary and secondary oxidation ($k_{\text{without,antiox}}=0.85 \text{ d}^{-1}$, $k_{\text{with,antiox}}=0.25 \text{ d}^{-1}$ at 20°C and $a_w=0.22$), resulting in an increase in the estimated shelf-life up to 45 d. Both high temperature and a_w resulted in more intense color changes over storage time.

Fish industry side-streams are rich sources of ω -3 fatty acids, suitable for further valorization as food ingredients. The incorporation of rosemary antioxidant could significantly control oxidative degradation of the developed fish powders and increase their shelf-life up to 50%.

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