**Title: Freshness quality and shelf-life prediction of ready-to-use (RTU) seaweed powders: An accelerated test approach to ensure products and consumers safety**

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**Abstract:** Globally, the growing popularity of ready-to-use (RTU) foods underscores the need to investigate the shelf life of RTU seaweed to ensure year-round quality and safety for consumers. Therefore, the study was designed to predict the shelf-life of RTU seaweed powders (derived from *Ulva lactuca, Gracilaria tenuistipitata*, and *Ulva intestinalis*) using accelerated shelf-life testing (ASLT) combined with a $Q_{10}$-based predictive model to minimize experimental duration and cost. The RTU seaweed powder was prepared and stored at elevated temperatures of 45 °C and 55 °C to simulate temperature-dependent deterioration and to extrapolate stability under normal storage. Proximate composition, total volatile basic nitrogen (TVBN), pH, microbial proliferation, and sensory characteristics were measured fortnightly up to 45 days. Significant ($p < 0.05$) quality changes occurred during storage; however, TVBN values ranged from $9.12 \pm 0.2$ to $21.69 \pm 1.85$ mg N/100 g (below 25 mg N/100 g), indicating very good quality and acceptability to consumers. Sensory attributes remained acceptable, while TVC remained below the WHO permissible limit of $10^5$ cfu/g, with no pathogens detected. Based on $Q_{10}$ modelling assumptions, the RTU seaweed powders are predicted to retain quality for approximately one year under normal conditions. These findings can support small and medium enterprises (SMEs) in labelling best-before dates, aiding producers and informing consumers.

**Key words:** Seaweed powder Blue economy Shelf-life Ready-to-use products ASLT approach

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