Nutritious and safe kelp ingredients to the food industry - Insights from the SusKelpFood project

Pierrick Stévant[1], Jennifer Mildenberger[1], Cecilie Bay Wirenfeldt[2], Arne Duinker[3]

SUS KELP FOOD

About the project

"The ***SusKelpFood*** project seeks to enable solutions for the sustainable production of safe, nutritious and flavourful ingredients from cultivated kelps for the food industry"

- Develop targeted post-harvest processes to preserve and prepare kelps for food applications
- Document food safety and nutrient profile of kelp ingredients
- Characterize sensory profiles and identify flavor-active substances
- Assess consumer behavior associated with kelp as food and identify potential for a broad distribution on the food market
- Ensure low environmental footprint and socially accepted ingredients from cultivated kelp to the food industry

Case 1: Reducing the iodine content of kelps by Warm Seawater (WSW) treatments while retaining nutrient

WSW treatments were applied to batches (2.5 kg) of *A. esculenta* (45 °C) and *S. latissima* (35 and 45 °C) in 40 L temperature-regulated tanks. Samples were taken during treatments and analyzed for iodine and nutrient content incl. minerals, carbohydrate and vitamin B1.

Highlights

- **WSW treatments at temperatures > 35 °C efficiently reduces the iodine content of kelps**
- 88 % iodine reduction in *S. latissima* treated at 45 °C for 2 min (fig. 1)
- Decrease is only 50 % in *A. esculenta* after 2 min (fig. 1)
- Loss of water-soluble compounds e.g. K, vit. B1 and mannitol occur during treatment
- Relatively to the level of iodine, WSW treatment improves the nutrient contribution of *A. esculenta* to a greater extent compared to *S. latissima* (fig. 2).

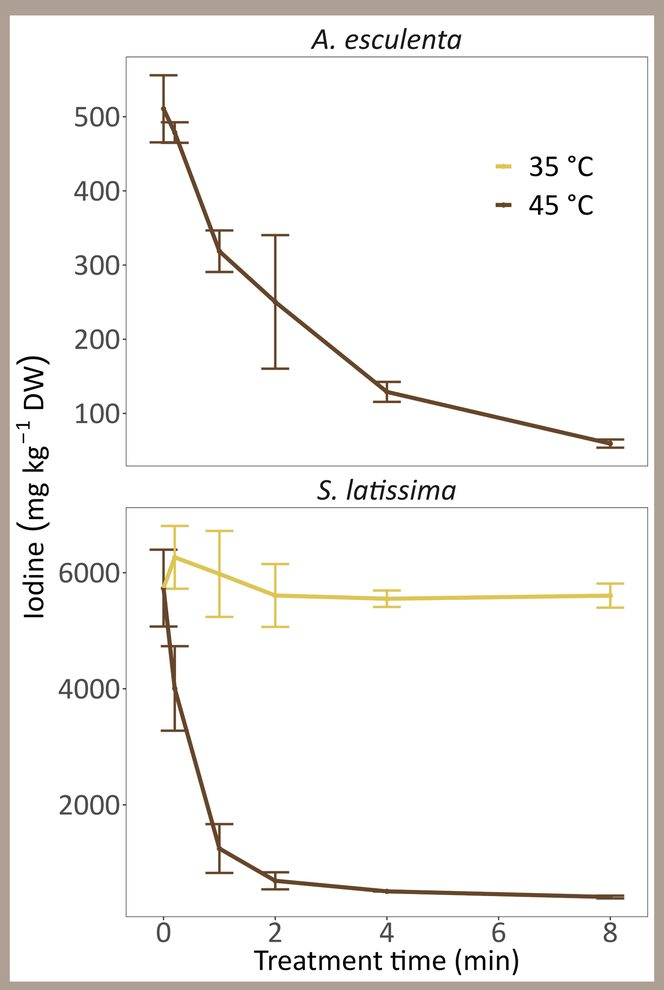

Fig. 1: Iodine content (mean ± st. dev, *n* = 3) of *A. esculenta* and *S. latissima* during warm seawater (WSW) treatment

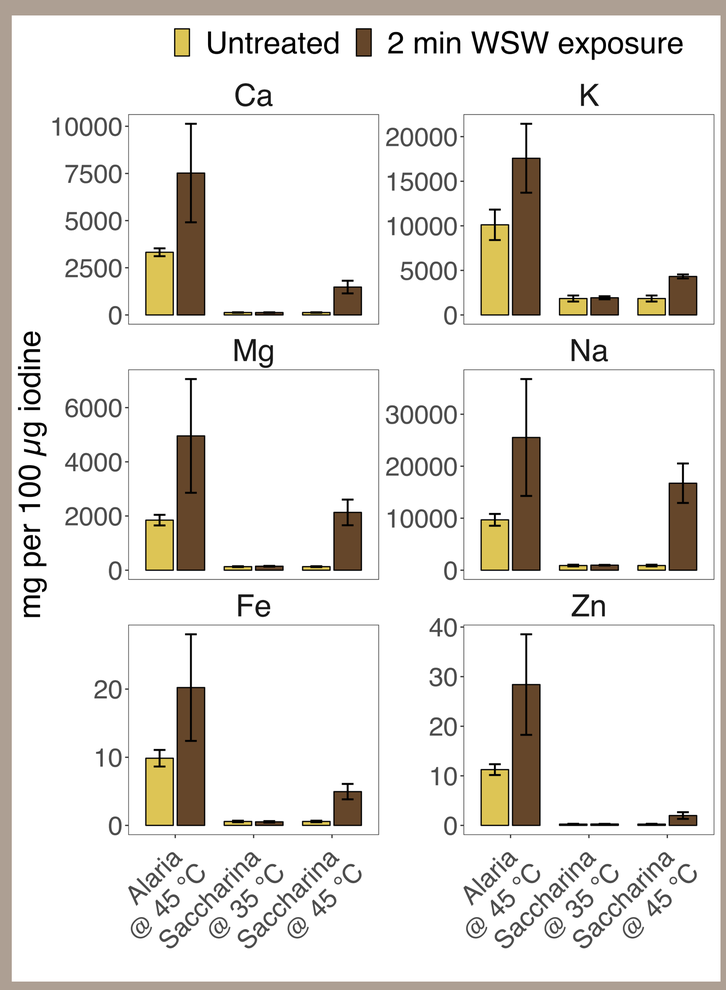

Fig. 2: Mineral contribution of untreated and warm seawater (WSW)-treated *A. esculenta* and *S. latissima* expressed per 100 µg of iodine

Case 2: What is the allergenic risk from consuming kelp? A preliminary study

The occurrence of even limited numbers of biofouling organisms such as fish and shellfish in open sea cultures, may elicit allergic reactions in sensitized individuals. Cultivated kelp samples were collected at different production sites and screened for known seafood allergens (crustacean and mollusc tropomyosin and fish parvalbumin) using standard methods (ELISA assays). The results (fig. 3) were compared to established allergen thresholds from scientific expert panel recommendations (e.g. VITAL 3.0, table 1).

Table 1: Risk assessment for typical seafood allergens from kelp consumption based on measured levels in samples collected across different cultivation sites and Norwegian producers throughout the 2022 harvesting season

	Crustacean tropomyosin	Mollusc tropomyosin	Cod parvalbumin
Allergen threshold [(a)]	0.45 mg [(b)]	0.85 mg [(c)]	1.3 mg [(b)]
Highest conc. measured in kelp samples	3.85 mg kg^{-1}	3.96 mg kg^{-1}	193 mg kg^{-1}
Portion kelp to elicit reaction	116 g	215 g	34 g

[(a)] Calculated from established reference dose of allergen proteins; [(b)] From Vital 3.0 reference doses; [(c)] From Pajno, et. al. 2002. J. Allergy Clin. Immunol. 109, 627–629

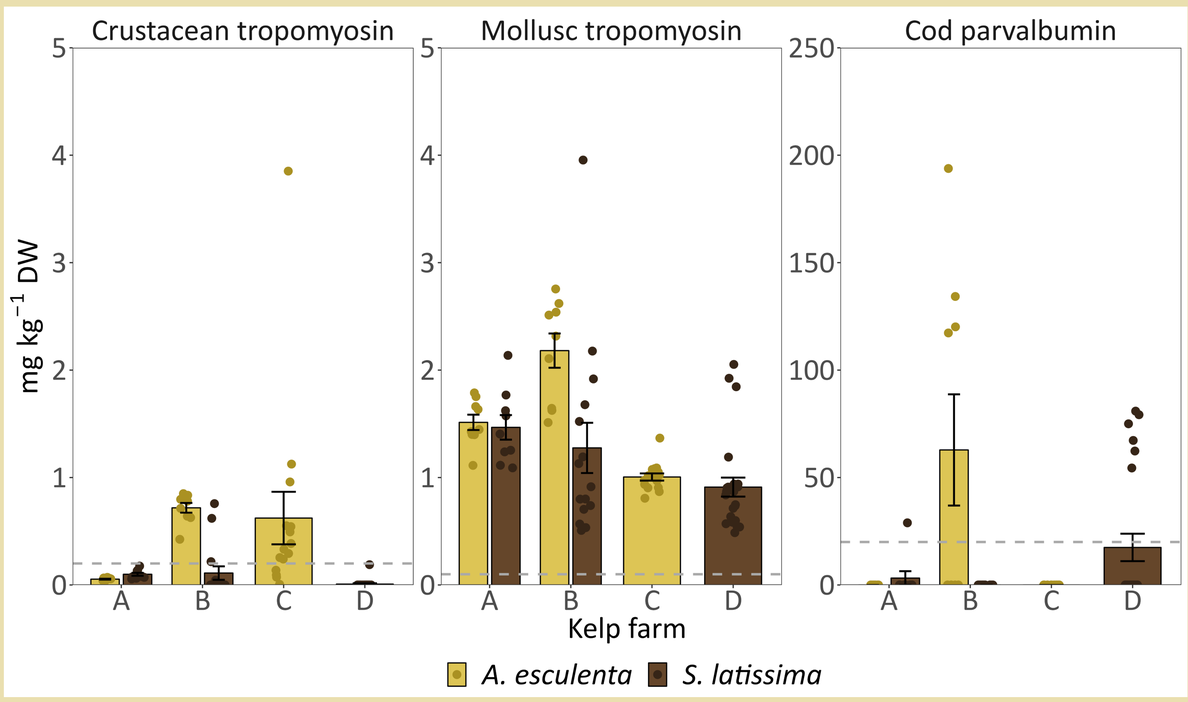

Fig. 3: Detected levels of typical seafood allergens in freeze-dried kelp samples collected across different cultivation sites and Norwegian producers throughout the 2022 harvesting season. The dashed lines represent the limit of quantification for the different allergens analyzed

Highlights

- **Preliminary results suggest that large intakes of kelp are required to elicit allergic reaction linked to seafood allergens**
- Need to collect more data to uncover natural variability
- Correlate data to observed fouling species
- Verification of the results by mass-spectrometry analysis (higher sensitivity).

1 MØREFORSKING
2 DTU
3 Institute of Marine Research

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