SeaHealth$_{UCD}$

Issue 45: January, 2024: This e-bulletin is aimed at personnel in fisheries and aquaculture, at fish packers, processors, distributors, retailers and finally, consumers.

SEAWEED: - a wonderful & precious resource

Previous issues of SeaHealth-ucd highlighted the potential of seaweed (*Ascophyllum nodosum* powder) as an antioxidant dietary fibre with potential as a food ingredient, pharma product and possible application to type-2 diabetics (Issue 34); also use of *Asparagopsis taxiformis* as a methane scavenger (Issue 35) with potential for reducing emissions in livestock production. The current e-bulletin highlights some additional research on seaweeds and their diverse properties and applications.

Seaweed fermentation

A review of seaweed fermentation has indicated that it can be used to make novel food and nutraceutical products that demonstrate high bioactivity and sensory quality (Reboleira *et al*., 2021). Many procedures for extracting compounds from seaweeds give low yields, are not cost effective and use organic solvents. However, seaweeds are a highly fermentable substrate (as indicated by their use in biofuel production) and careful selection of cultures and processing conditions result in microbial-driven cell wall degradation that is cost-effective and environmentally friendly. Fermentation research on algae to date has shown potential to yield novel compounds from both marine and microbial origin, including bioactive peptides, polysaccharides, phenolic compounds, enzymes and organic acids. These products can have application as a food resource, as functional ingredients and as nutraceuticals while addressing sustainability within a circular economy. Future research will involve large scale screening of different seaweed species and microorganism combinations followed by assessing the bioactivity and sensory properties of the fermentation products.

Microalgae: Sustainable alternative for human health improvement

This recent review features a flow chart showing microalgae harvesting and utilisation both as wet and dry biomass (Gohara-Beirigo *et al*., 2022). It shows a range of steps i.e. cell disruption, removal of nucleic acids, deodorisation, extrusion, protein/lipid extraction, freeze-drying and encapsulation. Key compounds listed include bioactive peptides, essential amino/fatty acids, bioactive pigments, polysaccharides, carotenoids, vitamins and their application as ingredients in cereal, dairy, soup and a wide range of other food products. Potential health benefits arising embrace ocular and cardiac disease prevention, mental health improvement, anti-cancer activity, anti-obesity action and anti-inflammatory effects. In spite of the above 'positives' microalgae

biotechnology still has significant challenges re cost-effective large scale cultivation of biomass (Sutherland *et al*., 2021) and also factors such as available light, pH, contaminants and extraction of high value-added compounds (Chew *et al*., 2017). Partnerships have evolved between companies producing microalgae and food companies with the aim of using microalgae-based ingredients rich in proteins and micro-ingredients in products suitable for vegetarians and vegans.

Enriching the content of nutritional compounds in seaweeds

Abiotic stressors have been used in integrated aquaculture to enhance/enrich the content of nutritional compounds in seaweeds (Ashkenazi *et al*., 2022). This involves using nutrient-rich fish effluents in seaweed cultivation tanks together with exposure to high irradiance, nutrient starvation and high salinity (abiotic stressors). This gave increases of 25% (per day) in seaweed biomass and also significant increases in protein, starch and mineral content of the seaweed within a couple of days. The authors concluded that their research has resulted in tailored production of enriched functional seaweeds that can be used in the food and health industries.

Edible seaweed-based films

Seaweed-based polysaccharide films based on agar, alginate, furcellaran and carrageenan have potential as edible films due to their good barrier and film forming properties (Ebrahimzadeh, *et al*., 2023). Incorporation of essential oils (e.g. rosemary, cinnamon, oregano) into the films confers extra benefits as the oils are bioactive functional materials with strong antimicrobial, UV-light barrier and antioxidant properties. The essential oil activated seaweed-based films/coatings are highly effective for improving shelf life of meat, fish, fruits, and other food products. Safety of seaweeds, essential oils and legal aspects must also be considered as seaweeds may accumulate heavy metals, and essential oils may cause allergic reactions in some individuals.

References

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The previous 44 issues of Seahealth-ucd can be viewed at:
https://www.ucd.ie/foodandhealth/eventsandoutreach/seahealthucd/

Compiled by Adjunct Professor Ronan Gormley of the UCD Institute of Food & Health, School of Agriculture & Food Science, University College Dublin, Belfield, Dublin 4. More information from ronan.gormley@ucd.ie