Natural Products From Seaweeds

Sustainable extraction of phenolic compounds from brown seaweeds by water-rich natural deep eutectic solvents

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Background and motivation

PhD and Postdoc background in extraction and utilization of marine natural products

The SEAS project motivated me to explore sustainable micro/macro-algal biomass for industrial applications. My focus is on overcoming the challenges of extracting natural products from seaweeds, optimizing green extraction processes, and applying these natural products in the pharmaceutical and food sectors.

Project description

Brown seaweeds are an abundant, sustainable source of phenolics that offer promising industrial applications. These phenolic compounds are traditionally extracted using organic solvents. However, such methods pose various environmental and operational challenges, including safety concerns, toxicity, and lengthy processes. As an alternative, the use of water-rich natural deep eutectic solvents combined with ultrasonic-assisted extraction improves phenolic extraction efficiency.

Aims

- Develop and advancement of sustainable extraction
- Water-rich natural deep eutectic solvents as an eco-friendly alternative to toxic solvents
- Increase extraction efficiency of polyphenols
- To promote eco-friendly production processes in seaweed biorefinery

Main questions

- What sustainable, eco-friendly extraction techniques can be employed to obtain marine natural products while minimizing environmental impact?
- How can we evaluate the limitations of traditional extraction methods and advance towards adopting greener, more sustainable extraction practices?

Marine sustainability

This project advances marine sustainability and the blue bio-economy in seaweed biorefineries by implementing green extraction techniques that minimize environmental impact. Utilizing water-rich natural deep eutectic solvents makes extraction more sustainable by reducing toxic chemical use, saving energy, and improving efficiency. This cleaner production approach supports seaweed biorefineries and promotes the responsible use of marine resources, driving innovation in marine-derived products for the food, health, and feed industries.

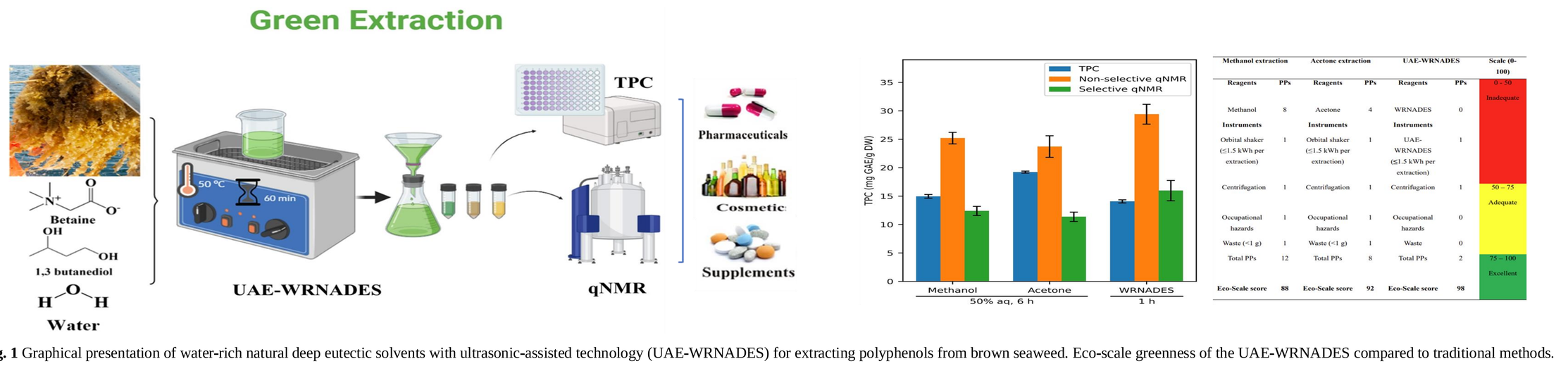

Fig. 1 Graphical presentation of water-rich natural deep eutectic solvents with ultrasonic-assisted technology (UAE-WRNADES) for extracting polyphenols from brown seaweed. Eco-scale greenness of the UAE-WRNADES compared to traditional methods.

Highlighted results (and/or activities)

Scientific publications: 1. Liaqat Zeb*, Anne Sophie Gerhardt, Benjamin Alexander Johannesen, Jarl Underhaug, Monica Jordheim*, Ultrasonic-Assisted Water-Rich Natural Deep Eutectic Solvents for Sustainable Polyphenol Extraction from Seaweed: A Case Study on Cultivated *Saccharina latissima*. ACS Sustainable Chemistry & Engineering, 2024. DOI: 10.1021/acssuschemeng.4c06736
2. Green Extraction of Antioxidants from Brown Algae *Ascophyllum Nodosum* by Water-Rich Natural Deep Eutectic Solvent. (In Preparation)

Workshops: ECR science communication workshop with Honorary Doctor Prof. Christopher A.-L. Jackson. 5.21.2024, University of Bergen, Bergen, Norway.
SEAS Writing Bootcamp: 5-7 May, 2024, Fotlandsvåg, Osterøy, Bergen, Norway.

Industrial collaboration: Ocean Forest Lerøy AS and Alginor

Supervisory team

Monica Jordheim, Associate Professor, Head of Bioresources and Pharmaceutical Chemistry research group, Department of Chemistry, UiB.

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