24th International Seaweed Symposium
19th-24th February 2023 (Hobart, Tasmania)

BlueBio MINERVA

Go to visit our website

Marine Innovation using Novel Enzymes for waste Reduction and Valorisation of Algal biomass

Fanny Lalegerie[1], Sofiia Tretiak[1], Stephen Jackson[2], Alan Dobson[2], Sarah Hotchkiss[3], Rósa Jónsdóttir[4], Mattias Berglin[5], Zoë A. Popper[1] and Dagmar B. Stengel[1]

1. Botany and Plant Science, School of Natural Sciences, Ryan Institute, University of Galway, Ireland (Project Lead); **2.** School of Microbiology, University College Cork, Ireland; **3.** Cybercolloids, Carrigaline, Co. Cork, Ireland; **4.** Matís, Iceland and UNA Skincare, Iceland; **5.** RISE, Sweden

• WHAT IS MINERVA?

MINERVA ("*Marine Innovation using Novel Enzymes for waste Reduction and Valorisation of Algal biomass*") is a project funded by the BlueBio-CoFund supported by the Marine Institute and aims to **valorise underutilised seaweed biomass sustainably produced** across Europe, to develop new **high-value products and reduce waste** in current processes. It strives to add value to brown algal biomass presently used at low efficiency, based on principles of waste reduction and 'food first' for new products within the blue bioeconomy. Novel, environmentally friendly algal compounds have be developed to address identified consumer needs in **food, cosmetics, biomedical and aquaculture industries**. This has been achieved via 1) new extraction methods aiding **purification of bioactives,** and 2) **omics-based approaches on unexplored marine microbial sources** to develop new enzymes for application to a wide range of marine biomass.

• OBJECTIVES

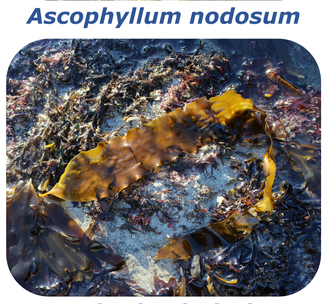
MINERVA objectives are to **enhance and maximise the role played by marine algae** in the European bioeconomy, by developing new processes and products to achieve **improved integration of algae-based products** in our daily lives - supporting **sustainability** and creation of marine-based jobs particularly in coastal remote regions - and diversify/improve the quality of life of EU citizens.

1. **Valorise underutilised seaweed biomass sustainably produced across Europe**
2. **Reduce waste in current processes**
3. **Develop new high-value products**

PROJECT APPROACH

Sustainable sourcing / optimisation of algal biomass (WP2)
(Brown and red macroalgae, wild-harvested or cultivated)

Ascophyllum nodosum



Saccharina latissima

+ niche species

BIOREFINERY (WP2)

Optimized extraction processes / waste reduction (WP4)

Use of marine microbes as a source of novel enzymes (WP3)

Development of high-value products
(in collaboration with industrial partners from Ireland, Iceland and Sweden)

+ Management (WP1)
Communication / dissemination (WP9)

- **New seaweed products for food (WP5)**
- **Antifoulant development for aquaculture (WP6)**
- **Cosmetics applications (WP7)**
- **Biomedical applications (WP8)**

• Examples of some PRELIMINARY RESULTS

WP2

Assessement of the chemical composition (*i.e.* phenolics, pigments; antioxidant and antimicrobial activities) of 9 brown and 10 red macroalgal species, collected in Ireland at different seasons. Results highlight specific and seasonal variations.

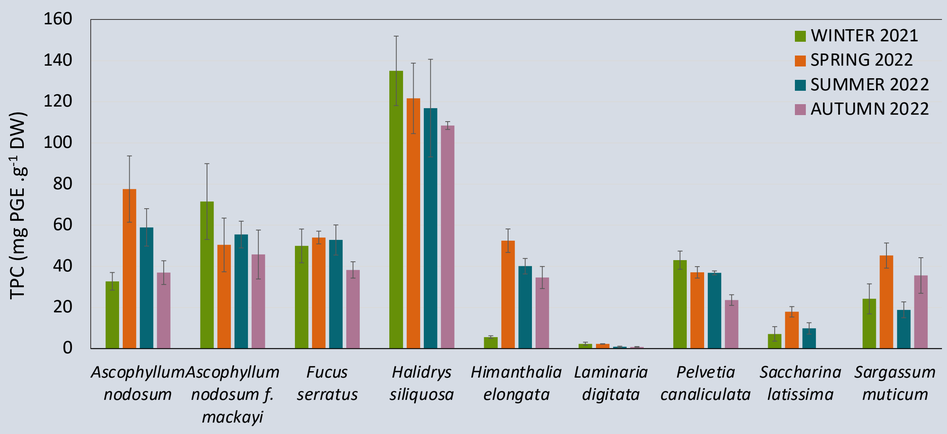


Figure 1. Total phenolic content (TPC) in brown macroalgae collected in Galway Bay (Ireland) at 4 different seasons. Results are expressed in mg (phloroglucinol equivalent (PGE)) per g dry weight (DW).

WP5

Brown seaweed fibres with the texture functionality of sodium alginate have been produced, and the evaluation in targeted foods is ongoing. Preliminary findings: commercially interesting gelling functionality; good water binding properties; some replacement potential for Na alginate; colour is limiting in certain applications.

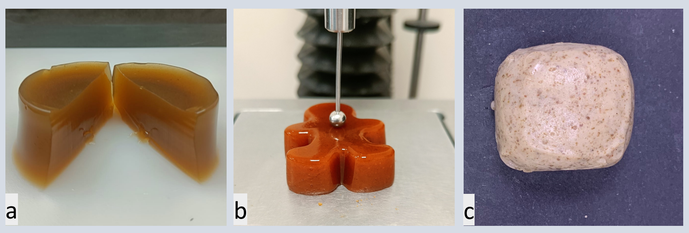


Figure 2. Pictures of gel obtained from (a) *Ascophyllum nodosum.* Fibers were added in (b) restructured pepper gels and (c) fish balls for evaluation.

WP6

An study is underway to evaluate the antifouling activity of algal polysaccharides, added to formulated paint. The settlement and accumulation of marine organisms is monitored over time on shipping nets.

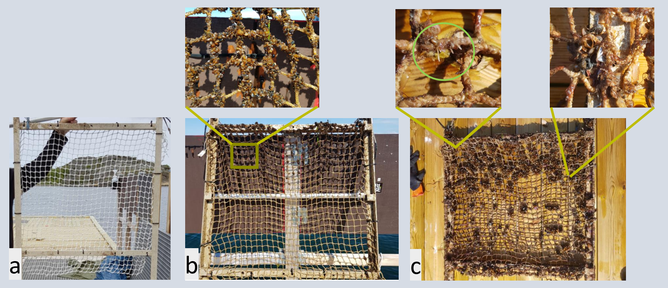


Figure 3. Biofouling accumulation of uncoated aquaculture net. Photographs are taken after 1 (a), 3 (b) and 4 (c) months of immersion at Kristineberg (Sweden) test site. Close-up photographs show bryozoa/mussel and encircled new unknown hydroid/bryozoa.

Foras na Mara Marine Institute

This research is co-funded by the Marine Institute with the support of the Irish Government, and received a networking and marine research communication awards.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 817992.