



Compendium of Innovations 23–25

by Joint Master Progamme in Marine Biotechnology students





Academic Research Integration

Academic Research Integration (ARI) is a research-based component of the EU-CONEXUS Joint Master Programme in Marine Biotechnology, where students collaborate on a shared, interdisciplinary research project.

Designed by professors from various specialisations, these projects offer students the opportunity to apply academic research and/or design skills in a practical context. Collaboration across different fields and institutions encourages transversality, allowing each student to contribute their expertise to a truly multidisciplinary joint effort.





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Fucoxanthin Extraction from Phaeodactylum Tricornutum

Introduction

Fucoxanthin, a marine carotenoid, offers anti-cancer, anti-inflammatory, and anti-ageing benefits. This project aims to develop a sustainable, scalable, and high-purity extraction process from Phaeodactylum tricornutum, addressing commercial barriers of cost and environmental impact.

Methodology

The workflow for this project combined enzymatic pre-treatment with ultrasound-assisted extraction using green solvents. The process included centrifugation, filtration, and quantification via spectrophotometry and HPLC for purity confirmation.

Conclusion

This project establishes a sustainable protocol for fucoxanthin extraction from Phaeodactylum tricornutum with strong commercial potential in food, cosmetics, and pharmaceuticals. Future steps include industrial scaling of the

process and further testing to determine antioxidant and anti-inflammatory properties for inclusion in innovative skincare formulations.







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Aquaculture Worm Eradication Solution through Oceanic Microalgae Exploration (AWESOME)

Introduction

With the global population expected to reach 9.7 billion by 2050, the importance of ensuring food security is critical. Aquaculture offers a sustainable solution, but fish are vulnerable to helminths – parasitic worms that disrupt nutrient absorption, causing organ dysfunction, immunosuppression and mortality. Treatments used today rely on synthetic compounds that are unsustainable and potentially toxic. Looking to change that, the AWESOME project explores marine microalgae as a safer, more sustainable anthelmintic alternative.

Methodology

The project combined virtual screening and bioinformatics analyses with biomass production, compound extraction and purification. Anthelmintic efficacy was tested in vitro and validated in vivo. Nine work packages were launched across three universities and one industry partner.

Conclusion

AWESOME aims to improve global food security, aquaculture productivity, and marine biotech research. The team behind this project anticipates high public engagement, academic

impact, and potential for industrial application through patent development and anthelmintic implementation. Future steps include industrial scaling of the process and further testing to determine antioxidant and anti-inflammatory properties for inclusion in innovative skincare formulations.





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InvaValor: Rugulopteryx okamurae. A Biorefinery Approach for Sustainable Management of an Invasive Algae

Introduction

Rugulopteryx okamurae, an invasive brown alga, is disrupting ecosystems and threatening biodiversity along the southern coast of Spain. InvaValor has found a solution for turning this threat into an opportunity by applying a biorefinery model to produce high-value products like alginate and biofertilisers. This approach also helps to mitigate ecological impact.

Methodology

The workflow was split into three stages. The first one involved seasonal sampling and biochemical profiling using HPLD and MS. The second stage involved the extraction of alginate and polyphenols followed by composting of residual biomass. The third stage included the development of controlled cultivation systems with optimised growth parameters and life-cycle assessments.

Conclusion

By integrating environmental monitoring, biorefinery development and cultivation systems, InvaValor transforms an ecological threat into a valuable resource for the blue

bioeconomy. Results, including optimised alginate extraction and high-quality biofertiliser, also highlight the potential for sustainable product development that supports circular economy goals.







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Marine-derived Antimicrobials for Resilient Innovative Solutions in Aquaculture For Eliminating Saprolegnia parasitica.

Introduction

Saprolegnia parasitica affects fish health and causes significant economic loss in aquaculture, particularly in salmonids. This project explores bioactive compounds from marine microorganisms as alternative treatments for S. parasitica infection through bioinformatics screening of molecules that mimic Tyrosine-O-Sulfate (TOS), a molecular structure critical for pathogen docking.

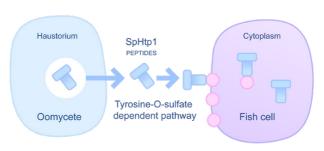
Methodology

The workflow was split into 6 stages: bioinformatics screening, collection and preservation of marine microorganism samples, compound extraction and characterisation, in vitro assays, in vivo testing (zebrafish and trout), and pre-commercial development.

Conclusion

Identified marine compounds showed antifungal efficacy in vitro and in vivo tests, offering a promising, eco-friendly

solution to control S. parasitica, improve fish health, and significantly benefit the aquaculture sector.





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BlueFeedEU: Sustainable CO₂-Based Fish Feed for Aquaculture

Introduction

BlueFeedEU is pioneering sustainable aquaculture by developing fish feed from a CO₂-based co-culture of microalgae and cyanobacteria. The project aims to address environmental concerns and reduce fishmeal dependency. It also aligns with Horizon Europe goals on food systems and climate resilience.

Methodology

The workflow was divided into three phases: lab-scale development (co-culture optimisation, nutritional profiling), pilot upscaling (bioreactor testing, biomass yield), and full-scale testing (feed trials, granulate refinement, market validation).

Conclusion

BlueFeedEU developes a scalable, ecofriendly fish feed solution that enhances protein levels whilst reducing CO₂ emissions and fishmeal use. It promotes biodiversity, supports education in sustainable fish feed production, and fosters industry collaboration and public engagement.





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Engineering Marine-Derived Mycosporine-Like Amino Acids (MAAs) for Sustainable Sunscreen Production

Introduction

MAAs are natural UV-absorbing compounds found in marine organisms, offering an eco-friendly alternative to chemical sunscreens. However, current sources of these compounds lack scalability. This project aims to engineer Saccharomyces cerevisiae to produce MAAs derived from Porphyra/Pyropia yezoensis, paving a way for cost-effective and sustainable industrial-scale sunscreen solutions.

Methodology

The project included five phases: genome sequencing and annotation, gene annotation and comparative analysis, host strain optimisation, inoculum preparation, pilot scale fermentation, and isolation and purification.

Conclusion

The engineering of Saccharomyces cerevisiae for the production of mycosporine like amino acids from Porphyra (Pyropia) yezoensis offers a scalable, cost-effective MAA production method with low environmental impact. It not only supports marine-friendly sunscreen alternatives but also contributes to understanding MAA biosynthetic mechanisms.



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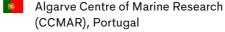
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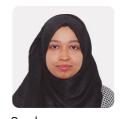
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