AQUA 2024 - Blue Food, Green Solutions; 26–30 August 2024, Copenhagen, Denmark

Tailoring your feeds

EXPLORING THE **DIATOM** Skeletonema costatum AS A FUNCTIONAL INGREDIENT TO **BOOST** ATLANTIC SALMON MUCOSA **HEALTH**

Ana Teresa Gonçalves[1,2]*
Bernardo Carvalho[2]
Rui Rocha[3]
Soraia Santos[2]
Hugo Pereira[2]
Jorge Dias[1]
Luís Conceição[1]

*Email: anagoncalves@sparos.pt

Sparos Lda.
Olhão (Portugal)
www.sparos.pt

GreenCoLab
Faro (Portugal)
www.greencolab.com

Riasearch
Murtosa (Portugal)
www.riasearch.pt

Acknowledgments:
This work is supported by the Horizon Europe project LOCALITY, funded by the European Union under Grant Agreement ID 101112884. Bernardo Carvalho is the recipient of a Ph.D. Scholarship supported by FCT (ref. 2022.12615.BDANA)

Funded by the European Union

INTRODUCTION

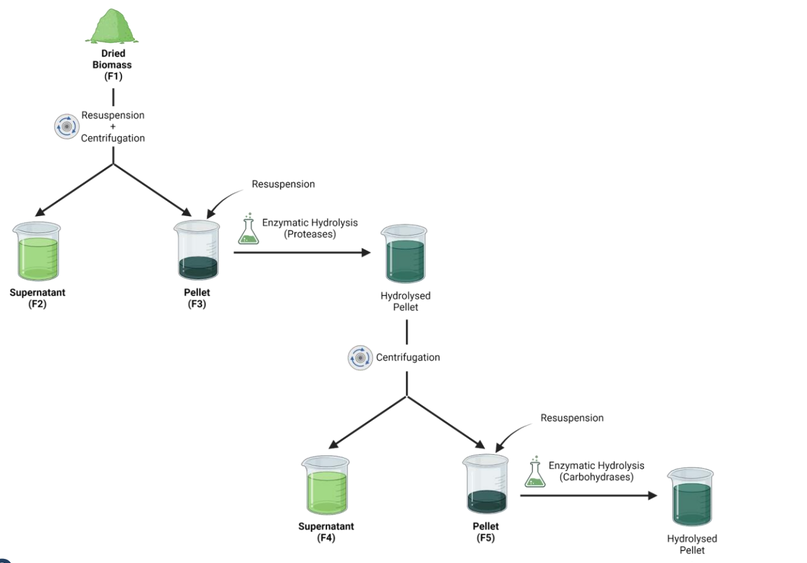
Diatoms such as *Skeletonema costatum* have immunostimulatory and anti-inflammatory properties and have high potential for **nutraceutical applications in aquaculture**

Salmons require extra support to **cope with immune insults** such as sealice outbreaks, and **mucosal health is a strategic target** for higher performance

This study explores the **effects of the diatom** *Skeletonema costatum* and biorefinery fractions as an **intestinal mucosa health** booster for Atlantic salmon, on an **Ex Vivo Screening Platform**

METHODS

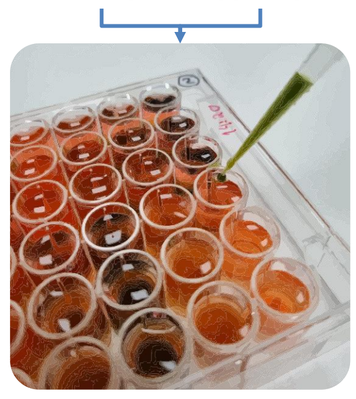
1



Stepwise biorefinery pipeline for *Skeletonema costatum* fractioning

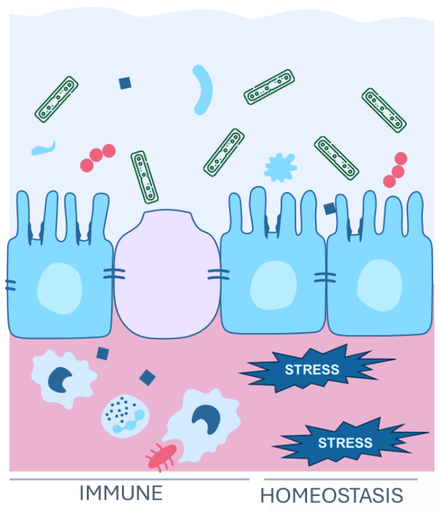
2

MID-INTESTINE
ANTERIOR POSTERIOR



EX VIVO Screening Platform

3



RT-qPCR

IMMUNE RESPONSE

COX2, *IL1B*, *IL8*, *TGFB*

CD3, *CD8*

HOMEOSTASIS

STRESS *SOD*, *CAT*, *HSP70*

RESULTS AND DISCUSSION

		IMMUNE						HOMEOSTASIS		
		COX2	*IL1B*	*IL8*	*TGFB*	*CD3*	*CD8*	*SOD*	*CAT*	*HSP70*
MID INTESTINE ANTERIOR	F1	0,4	0,5		0,7	0,9	0,7		0,8	0,8
	F2	1,9	1,5	1,9	1,2	0,8	0,5	0,9	0,9	
	F3	0,5	0,4		0,8	0,8	0,7	0,7	0,5	0,5
	F4	0,6	0,8	1,6	1,6	1,2		0,8		1,3
	F5	0,5	0,5		0,7	0,8	0,8	0,7	0,8	0,7
	F6	0,7	1,0	1,4	1,1	1,2	1,2	0,8	0,9	1,1
	F7	0,3	1,1	1,1	0,6	0,9	0,5		0,7	0,6
MID INTESTINE POSTERIOR	F1	1,2	1,0		0,6	0,7	0,8	0,9	0,6	0,7
	F2	1,3	2,4	1,1	0,9	1,1	1,1	1,1	1,0	1,1
	F3	1,1	1,1	0,8	0,5	0,6	0,4		0,7	0,7
	F4	2,0	4,2	1,4	1,3	1,3	1,2	0,9	0,9	1,2
	F5	1,2	2,6		0,6	0,8	1,2	0,9	0,7	0,7
	F6	1,2	3,5	1,3	0,9	1,7	1,5	1,1	0,8	1,2
	F7	1,2	2,1	0,9	0,7	1,3	1,1	1,1	1,2	1,2

UP 4,2 3 2 — 0,7 0,5 0,3 DOWN

Fig. 1: Heatmap of the relative expression of immune and stress-related genes in the explants of anterior and posterior sections of Atlantic salmon's mid-gut after exposure to diatom's fractions. Values in black indicate difference from CTRL p<0,01

Fig. 2: Discriminant analysis of the response to different fractions in the posterior section of the Atlantic salmon's mid-intestine. Blue dots indicate groups' centroids. Group F4 is significantly separated from all other groups.

- *Skeletonema* fractions have **immunomodulatory properties** mainly in **acute immune response** markers.
- Effect differs along mucosal sections indicating stronger immunostimulation in posterior part of the mid-intestine.
- Tissue homeostasis is stable.

- Soluble fraction after protein hydrolysis - F4 - seems **more bioactive**, mainly due to higher expression of immune-related genes.
- Insoluble fractions have limited impact as health boosters, and **other functions** will be **investigated** on the *ex vivo* platform.

CONCLUSIONS

- *Skeletonema costatum* **functional properties** in salmon's intestinal mucosa are **enhanced by biorefinery**, with interesting immunomodulatory potential;
- Mucosa **acute responses are boosted** but are tissue-specific requiring dedicated studies.