



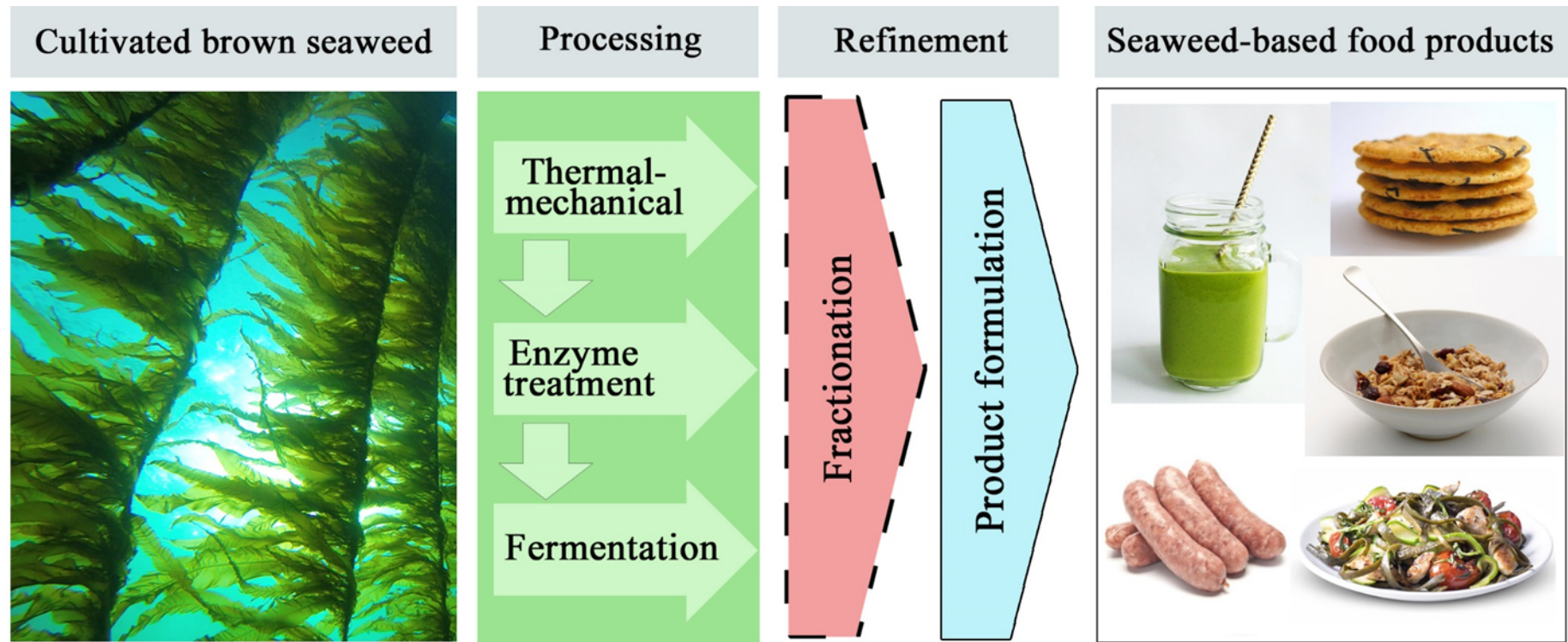
ProSeaFood

Innovative processing of seaweed for novel, healthy food products and ingredients

Øystein Arlov, Ph.D.
Project coordinator
SINTEF Industry

SIG Seaweed 2019
27 & 28 November 2019, Trondheim, Norway





- **Thermal-mechanical processing:** Stabilization and removal of undesired compounds
- **Enzymatic processing:** Improved digestibility and nutrient availability, new flavours
- **Fermentation:** New flavours, increased nutrients and health-promoting synbiotics

- **Separation** in protein-, carbohydrate- and mineral-rich fractions

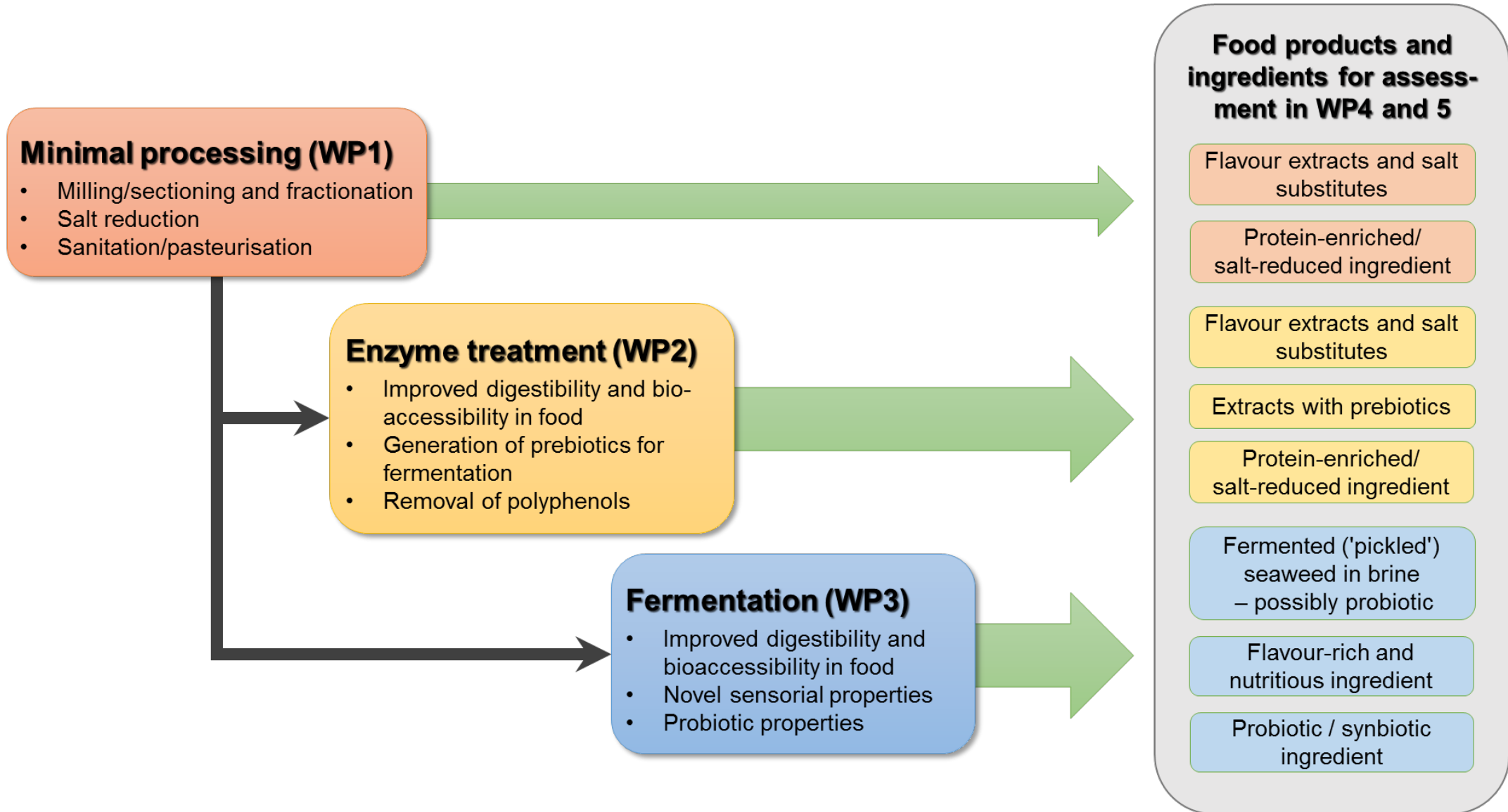
- Evaluation of physical, rheological and sensory properties
- Food safety and health benefits

Safe, tasty, healthy and sustainable food ingredients

- Bakery and vegetarian-based products
- High content of digestible protein and carbohydrates, dietary fibre, and minerals

Generation of ingredients from various stages of processing

- Diversity in product types and markets





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Partner

SINTEF (NO)

Lund Uni (SE)

Seaweed Energy Solutions (NO)

Matís (IS)

AINIA (ES)

Desarrollos Panaderos Levantinos (ES)

Grupo La Caña

Main role

Management, fermentation and enzymatic processing

Fermentation and characterization of probiotic effects

Seaweed cultivation, harvest and pre-processing

Fermentation, enzymatic processing

Characterization of ingredients, prototype development

Product development

Product development

Preliminary results and findings

WP 1: Minimal thermal-mechanical processing



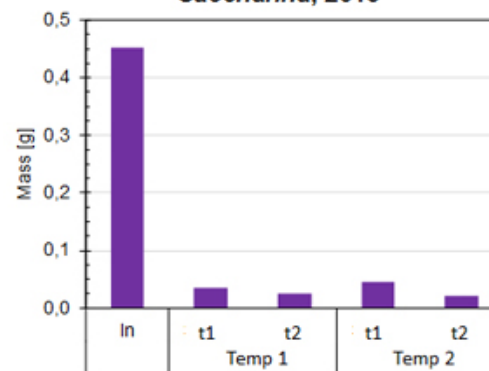
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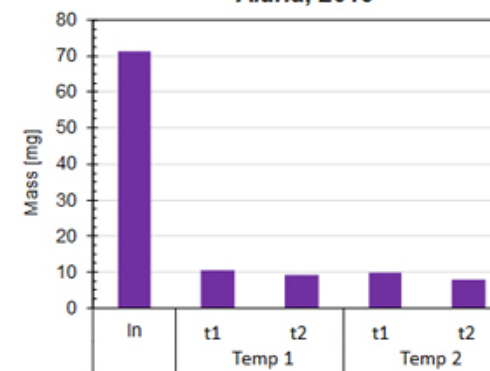
SINTEF



Saccharina, 2019



Alaria, 2019



Lowering of salts and iodine through blanching

- Optimization of conditions and scaling

Preliminary results and findings

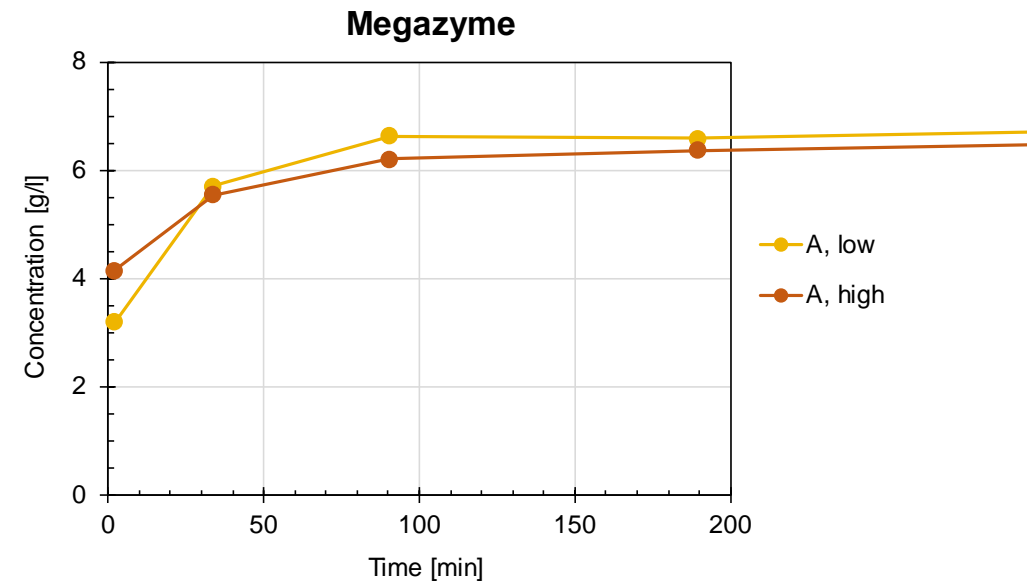
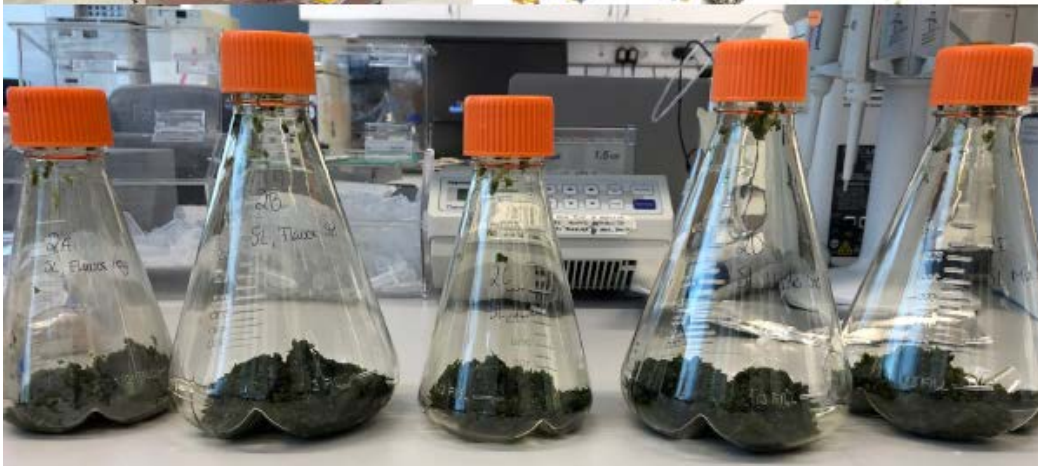
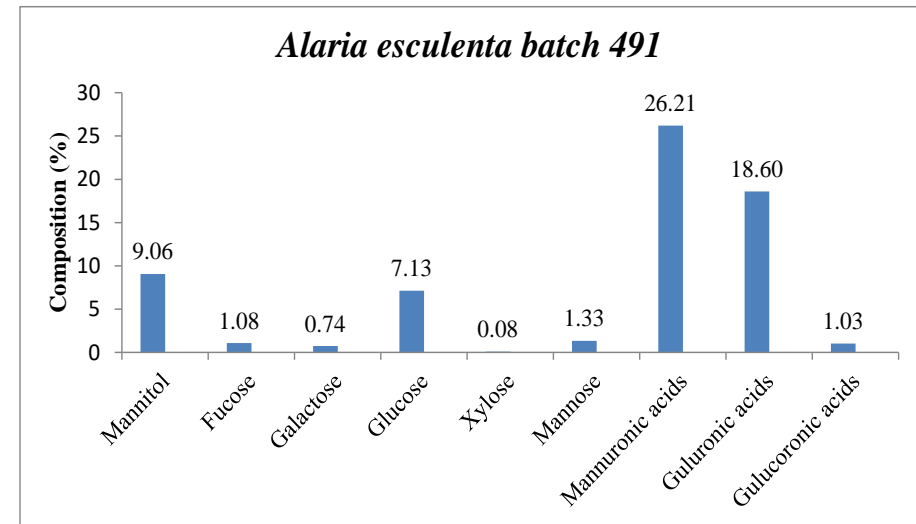
WP 2: Enzymatic processing and biomass fractionation



LUND
UNIVERSITY



SINTEF

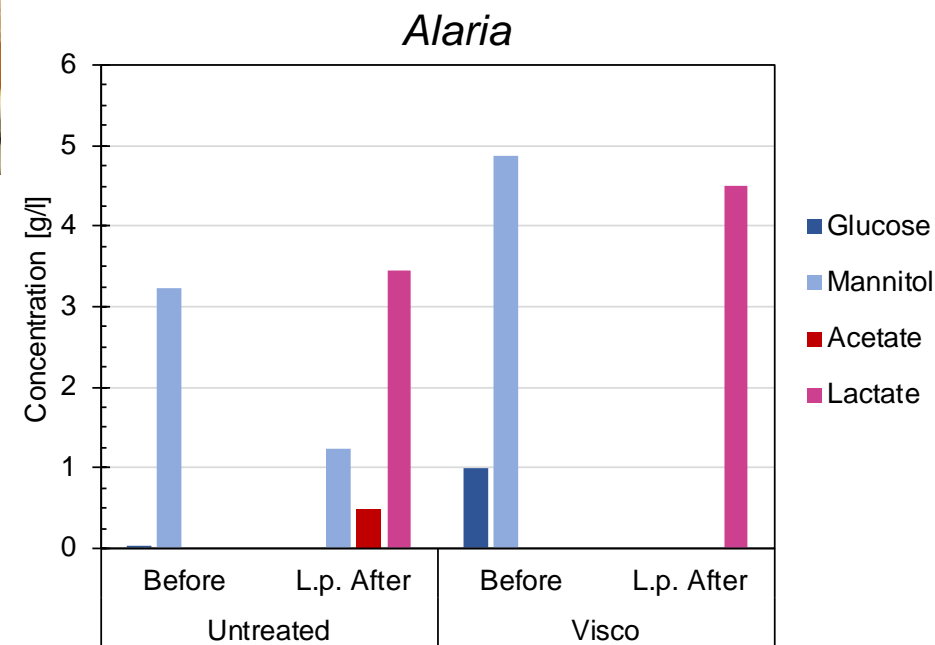
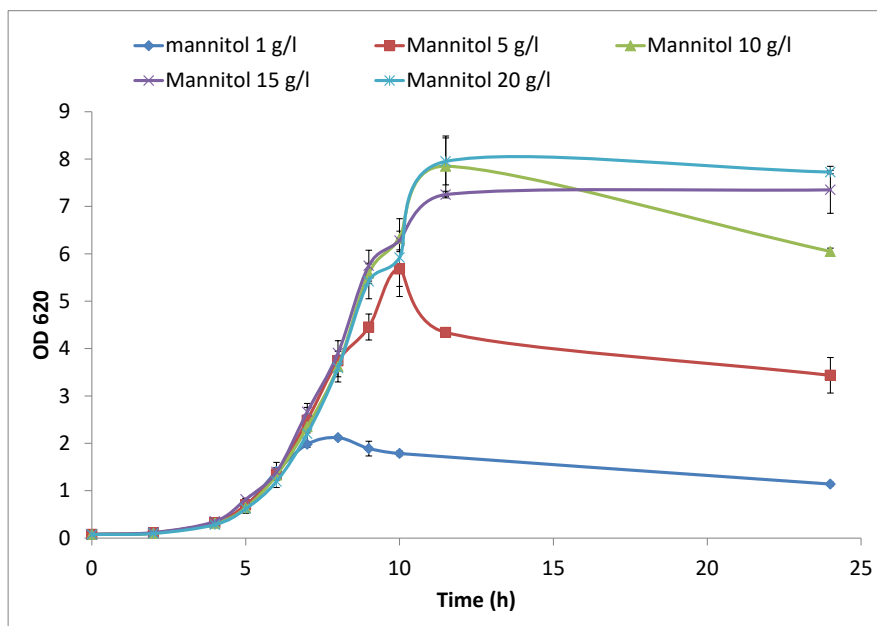


- Targeting structural polysaccharides (texture, flavor, prebiotics, digestibility) and proteins (flavor)
- Enhance fermentation by generation of oligo/monosacchrides and free amino acid/peptides

Preliminary results and findings

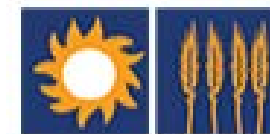
WP 3: Fermentation

- Screening of probiotic bacteria growing on native seaweed components + components released from enzyme treatment
- Fermentation of extracts and milled seaweed



Preliminary results and findings

WP 4: Properties as food ingredients

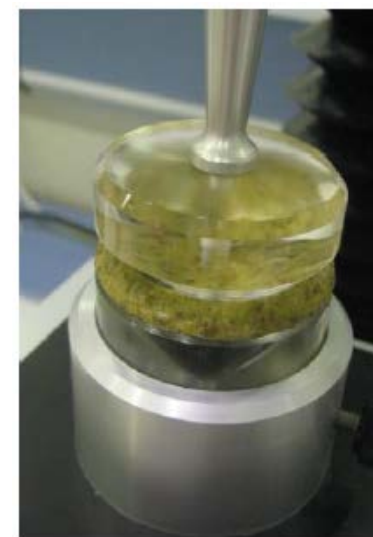


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	Wet matter				
	C	S	A	S 30°	S 60°
Humidity (g/100g)	72,5	75,9	73,9	77,6	75,6
Fat (g/100g)	18	14,6	16,8	11,7	14,1
Protein (g/100g)	1,7	1,5	1,6	2,2	2,1
Carbohydrates (g/100g)	2,6	1	2,1	2,1	1,8
Energy(Kcal/100g)	186	151	173	131	150
Dietary fiber (g/100g)	3,4	4,8	3,6	4,1	3,7
Total polyphenols (mg a. gálico/kg)	505	396	528	369	427
Sodium (g/100g)	0,297	0,35	0,336	0,449	0,409
Magnesium (mg/kg)	329	394	470	547	471
Potassium (mg/kg)	4693	6615	5086	5553	7683

- Focus on vegetarian and vegan markets: Vegetable-based products and bakery goods
- Multiple prototypes developed
 - Nutritional characterization
 - Sensory characterization (taste, smell, appearance etc.)
 - Technological characterization (firmness, moistness, etc.)



Preliminary results and findings

WP 5: Food safety and health

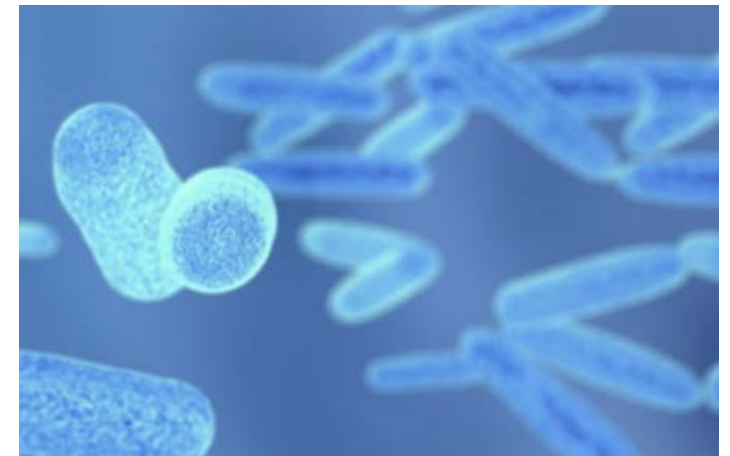
- Quality control of raw material and iodine removal
- Safety of starting materials and processed ingredients
- Shelf life and evaluation of conservation methods

Examination (cfu/g)	Blanched 30°C 10' <i>S. latissima</i>	Blanched 60°C 30'' <i>S. latissima</i>
Total viable counts	<10	<10
Yeast and moulds	<10	<10
Enterococcus	<10	<10
Total coliforms	<10	<10
Escherichia coli β -glucuronid.+	<10	<10
Staphylococcus coag+	<10	<10
Bacillus cereus group	<10	<10
Salmonella spp	Not detected	Not detected



Develop and commercialize therapeutically effective probiotic supplements targeting the gut microbiome, designed using scientific and pharmacologic methods, for management of gastrointestinal, autoimmune and metabolic conditions.

- Collection of 150 food derived probiotic lactobacilli strains - ImmuneBiota™
- Screening platform & know-how



Evaluation of health benefits from processed seaweed

Upcoming activities

- Iodine and salt removal in industry-scale processing
- Marketable prototype(s) identified
- Full characterization of nutrition bioavailability, digestibility
- Evaluation of probiotic properties in processed ingredients
- Product conceptualization and large-scale trials
- Results publication



Communication and dissemination

News stories



Home / Tecnolimentalia / Tendencias y consumidor / Tendencias: Aumenta el interés industrial en las algas como



Son muchas las evidencias científicas que demuestran que la incorporación de algas marinas y/o aislados de algas marinas en las matrices alimentarias puede ejercer un efecto positivo sobre las características nutricionales, organolépticas, de textura, saludables e incluso de mejora de conservación de los alimentos y bebidas. En el artículo profundizamos en este tema y avanzamos como ejemplo el proyecto europeo ProSeaFood.

Conference and seminars



Newsletter and social media

PROSEAFOD Innovative processing of seaweed for novel, healthy food products and ingredients

2019 Newsletter

Project overview

The primary objective of the "ProSeaFood" project is to apply advanced processing methods to increase the digestibility and nutrient availability of brown seaweeds. This will be achieved through employing enzymes and fermentation to increase nutritional availability and remove inedible or potentially harmful substances, and to introduce novel sensory properties. Based on the processed ingredients, the project will further develop innovative food products that are nutritious, tasty and have well-documented effects on consumer health.



The Consortium

- SINTEF Industry (NO)
- Lund University (SE)
- Seaweed Energy Solutions (NO)
- Matis (ES)
- Desarrollo Paradisos Levantinos (ES)
- Grupo La Caña (ES)
- AINIA (ES)

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Harvest and pre-processing

- 40 tonnes Saccharina latissima and Alaria esculenta harvested at Freya in April-May 2019 by SES for distribution to research partners and customers
- Conditions for iodine reduction are being optimized and adapted toward large-scale processing
- Seaweed biomass has been pre-treated using various thermal and chemical procedures, and distributed to project partners for characterization and evaluation in product prototypes



Fermentation and enzymatic processing

- Enzymes for taste enhancement and as pre-treatment for fermentation has been evaluated in lab scale experiments at SINTEF
- Lab scale fermentation with lactic acid bacteria and yeast has been performed on milled fresh *A. esculenta* at SINTEF
- Screening of probiotic bacteria growth on seaweed carbohydrates ongoing at Lund

Product development and characterization

- Multiple prototypes of bakery products and vegetable-based products have been prepared by AINIA, incorporating processed *S. latissima* and *A. esculenta*
- The prototypes have been characterized with respect to nutritional content and sensorial properties (taste, smell, texture).
- Further studies will additionally focus on the shelf life of developed products, emphasizing microbial stability and maintenance of sensorial properties



Upcoming events

- 2019 September 4th-6th: Conferen: Seaweed Applications – Opportunities and Challenges, Indery, Norway <https://www.sintef.no/en/events/seaweed-applications-opportunities-and-challenges-2019/>
- 2019 November 28th-29th: SUSFOOD2 project mid term seminar, Ghent, Belgium
- 2020 January: ProSeaFood project meeting, Granada, Spain

Project administrator: Håvard Skjella, Research Manager, SINTEF Industry, Dept. of Biotechnology and Nanomedicine, hvard.skjella@sintef.no

Project duration: 04 / 2018 — 03 / 2021

SKÅNSKA DAGBLADET

FREDAG 6 NOVEMBER 2019 PRENUMERATION FÖRETAGSANNONSERING PRIVATANN

Gastronomiska institutet i Norge har serverat mat på tång. Foto: TT

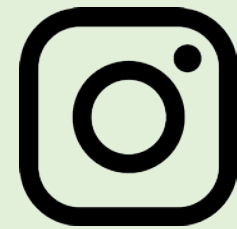
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Att äta tång kan vara bra för magen

Joakim Stierna 0704-142656



Web site



@proseafood_project



@ProSeaFood1

ProSeaFood representatives at SIG Seaweed 2019



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Maren Sæther
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Solutions



**The Research Council
of Norway**