NTNU
Norwegian University of Science and Technology

BIOREFINING OF BROWN SEAWEEDS

"Sequential extraction of four polysaccharides from fresh *Saccharina latissima* and *Alaria esculenta*"

Paulina S. Birgersson
Paulina.s.birgersson@ntnu.no

Laminaria hyperborea
(Stortare)

Refining process

→

Alginate

20 - 40 % dry weight

Laminaria hyperborea
(Stortare)

Wild growing

Low growth rate
(perennial)

0.25-0.50 NOK/kg

Alaria esculenta
(Butare)

Saccharina latissima
(Sukkertare)

High growth rate
(anual)

→ Feasible for cultivation

5-25 NOK/kg

Demands

- Greater valorization
- Polysaccharides of good quality
- Keep production cost down
- Environmentally sustainable

Laminaria hyperborea

Minimal valorization
(fucoidan)

Pre-treatment

Ca-Alginate → Na-Alginate

Biomass

Alginate

20 - 40 % dw

No valorization

Alaria esculenta

Saccharina latissima

Hot water extraction

Fucoidan

~ 5 % dw

Laminarin

~ 0 - 25 % dw

Ca-Alginate → Na-Alginate

Alginate

~ 20 - 40 % dw

Bleaching

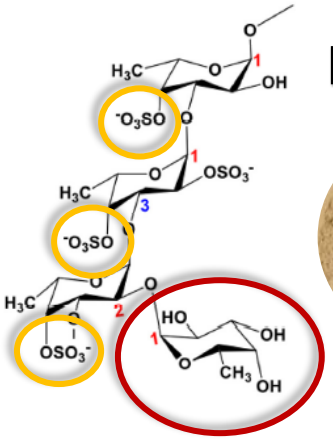
Cellulose

~ 5 % dw

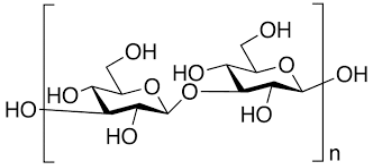
Why are we intrested in extracting these polysaccharides?

Several reported bioactivities

- High molecular weight, heterogenous structure
- Low molecular weight, β-1,3-glucan

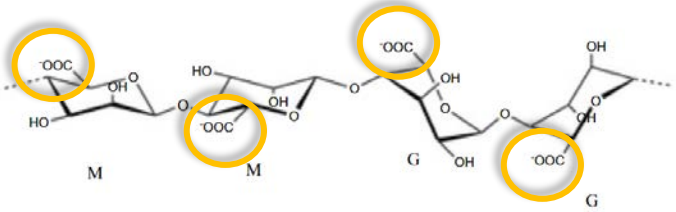


Fucoidan

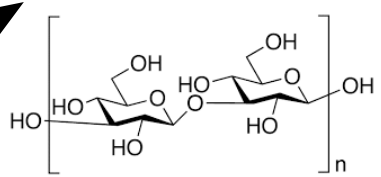


Laminarin

Alginate



Cellulose



- High stiffnes and strength, low weight, recyclable

- *L. hyperborea* – Higher G-content
- *S. latissma/A. esculenta* – Easier to extract

Alginate

Greater valorization

Cellulose

Fucoidan

Laminarin

Alaria esculenta

Saccharina latissima

Hot water extraction

Fucoidan
~ 5 % dw

Ca-Alginate → Na-Alginate

Laminarin
~ 0 - 25 % dw

Alginate
~ 20 - 40 % dw

Parameter evaluation of fucoidan/laminarin extraction

→ High molecular weight alginates with good gel-forming properties

→ Adequate yield of fucoidan and laminarin

Polysaccharides of good quality

Gels formed by unfiltrated alginate from *Alaria esculenta*

Alaria esculenta

Saccharina latissima

Keep production cost down and ↓ CO_2-emission

Fresh material instead of frozen or dried

+ perform conversions at low T when possible

Multi-cascade polysaccharide extraction

Environementally sustainable

Mild acid, alkali and bleaching

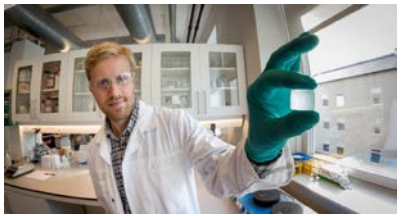
Future possibilities?

Acknowledgement

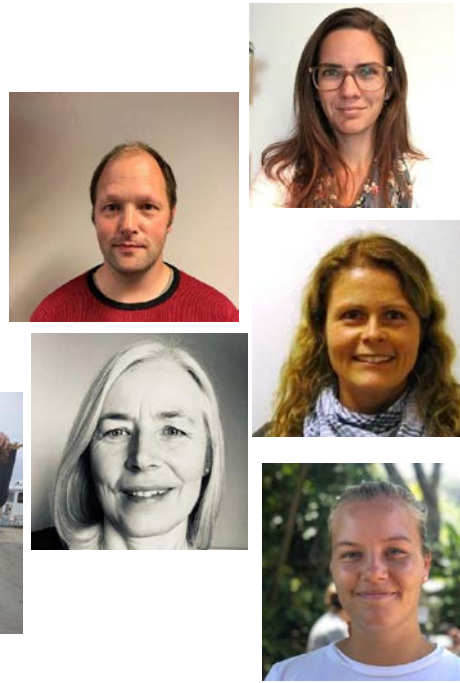
NTNU
Norwegian University of Science and Technology

SINTEF

Finn L. Aachmann



Øystein Arlov



Paulina.s.birgersson@ntnu.no