Introduction to CyberColloids Seaweed Research

April 2018
Our interest in seaweeds

- CyberColloids been working with seaweed derived ingredients for many years.
- As experts in the hydrocolloids world – routinely working with agar, carrageenan and alginate.
- Combined experience spans the entire value chain from raw material to end use.
- Hydrocolloids industry traditionally wasteful - based on mass extraction of one component.
- We realise that seaweeds have far more to offer than just the hydrocolloid components.
- In 2005 started to look at seaweeds differently.
A new “seaweed for health” focus

• Through Irish national funding and EU funded FP7 projects we have built a knowledge platform on:
  • nutritional benefits of edible seaweeds;
  • bioactives from edible seaweeds;
  • different processing approaches;
  • market for seaweed derived functional foods;
  • application in food and drink products.

• Overall aims to:
  • maximise the use of the whole biomass;
  • multi-stream processing;
  • improved palatability/inclusion for ingredient development.
Building a knowledge base

• Early projects focussed on developing a better understanding of the potential use of seaweed ingredients for health & nutrition.

• In particular issues re. use of edible seaweeds & seaweed derived ingredients:
  • industry & consumer perception;
  • fundamental requirement of palatability (taste);
  • how processing can affect/modify palatability;
  • commercially sustainable sources;
  • regulatory restrictions re. processing – use of kitchen science and approved food use processes.

These projects received Industry Led funding under the Irish Marine Research Sub-Programme 3007-2013 and InterTradeIreland FUSION programme
Our seaweed focussed research


HYFFI Project (2008-2011):

- To produce a range of LMW alginates and agars through controlled depolymerisation.
- To assess and compare the prebiotic potential of these substrates with Inulin – the standard industry prebiotic.

Key findings:

- No evidence for prebiotic potential *in vivo*.
- Prebiotic potential of LMW *Gelidium* – *in vitro*.
- Increases in SCFA production *in vitro* & *in vivo* – evidence that seaweed derived fibres being fermented.
- LMW alginate had significant effect on post-prandial glucose response.
SWAFAX Project (2010-2013):

• Investigated the antioxidant and anti-inflammatory potential of phlorotannin rich extracts from *Ascophyllum nodosum*.

**Key objectives:**

• to develop methodologies for phlorotannin rich extracts from *Ascophyllum nodosum*;

• to screen these *in vitro* for potential antioxidant and anti-inflammatory benefits;

• to evaluate the bioavailability of the phlorotannins *in vivo*;

• to evaluate antioxidant & anti-inflammatory biological activity *in vivo*. 

This project received funding from the European Seventh Framework Program managed by REA - Research Executive Agency  FP/2007-2013
Bioactive phlorotannins (polyphenols)

Key findings in vivo bioavailability study*

- A variety of metabolites were detected in the urine and plasma of 15/24 human volunteers after the ingestion of a seaweed.
- First evidence that seaweed derived polyphenols actually metabolised.
- Some metabolism at 0-8hr after ingestion but most at 8-24hr.

Key findings in vivo intervention study**

- No significant changes in any of the parameters for the study population as a whole – not really surprising.
- Subset of subjects who were obese (n=36/80) a number of significant differences in antioxidant status after an 8 week intervention.
  - differences in peroxide levels; reduction in basal DNA damage
  - 28% reduction in the acute inflammatory marker CRP – n.s.

Unlocking the flavour of seaweed

The TASTE project (2012-2014):

• Aim to develop new healthy flavour ingredients from edible seaweeds with the potential to replace sodium in food products that traditionally contain high levels of NaCl.

• Focussing on 3 commercial viable species:
  - Ascophyllum nodosum;
  - Fucus vesiculosus;
  - Saccharina latissima.

• Using a combination of physical & enzymatic processing to “unlock” the important flavour components.
  - physical pre-processing to open up seaweed structure;
  - enzymatic hydrolysis using commercially available enzymes and seaweed specific enzymes from partner Prokazyme.

This project received funding from the European Seventh Framework Program managed by REA - Research Executive Agency  FP/2007-2013
Unlocking the flavour of seaweed

• Wanted to explore use of whole seaweed;
  • issues with colour, odour and taste;
  • non-specificity of commercial enzymes limited the release of taste enhancing compounds;
  • protein rich extracts – better results but not cost attractive - NaCl extremely cheap ingredient.

• Novel enzyme combination successful.
  • for use on whole seaweed;
  • no odour issues, umami like taste with mouthfeel;
  • limited sensory evaluation;
  • definitely a longer-term commercial opportunity.
The SEAREFINERY project (ongoing)

- Started November 2015 for 3 years.
- Aims is to develop eco-friendly chemical and enzymatic processing technologies to extract and valorise high value-added components such as antioxidants, antimicrobial components and hydrocolloids from cultivated seaweed species in an integrated biorefinery.
- Utilising cultivated brown seaweed species:
  - *Saccharina latissima*;
  - *Alaria esculenta*.
- CyberColloids responsible for developing and optimising extraction protocols for various polysaccharides and antioxidants and their evaluation in different food & cosmetic end products.

This project received funding under the first call for Transnational Research Projects within the Marine Biotechnology ERA-NET.


References


For more information about our research activities see -

www.cybercolloids.net

or contact Ross, Angie or Sarah @cybercolloids.net