

The TASTE Project



The application of edible seaweeds for taste enhancement and salt reduction

The main objective of the TASTE project was to develop new and healthy flavour ingredients from edible seaweeds (*Ascophyllum nodosum*, *Saccharina latissima*, and *Fucus vesiculosus*) using innovative processing solutions and to apply these new ingredients in a range of salt reduced foods. Thus, offering novel approaches to meeting salt reduction targets for a group of SME's in the food sector. CyberColloids participated as an SME in this project, taking the role of industrial coordinator.

Background

Sodium replacement and natural flavour enhancement are key drivers in the food industry today and in both cases, there is a global push towards the development of products with a “natural”, “free from” and “inherently healthy” image. New and interesting ingredients from natural sources are being sought across all sectors of the food industry. Seaweed derived flavour products have traditionally, and are still, widely used in Asian products but interest in other parts of the world is building rapidly. Edible seaweeds represent a rich source of flavour components with potential for use in sodium replacement strategies, hence the interest from the TASTE project consortium of SMEs.



CyberColloids have been working with seaweeds and seaweed derived ingredients for many years.

The CyberColloids team has expertise that spans the entire seaweed value chain.

The company recognises the real potential to develop new and innovative ingredients from edible European seaweeds.

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The seaweed species chosen for this project were supplied by SME partner Aleor (www.aleor.eu). All are recognised as edible species in Europe and are available in commercial quantities either from wild harvested or aquaculture biomass. All are naturally high in important flavour components such as minerals & trace elements and proteinaceous components including amino acids and glutamates.

	Ascophyllum nodosum	Saccharina latissima	Fucus vesiculosus
Minerals	18.5	24.3	22.3
Protein	10.4	22.6	15.1

Content of important flavour components in seaweeds before processing (% dry weight)

As the project progressed, *Ascophyllum nodosum* and *Saccharina latissima* were seen to have more potential and these 2 seaweeds were taken through to the end of the project.

Key project outcomes

A range of physical pre-processing and enzymatic techniques were investigated with the aim of “unlocking” the flavour potential of the seaweeds. Enzymatic hydrolysis of the key seaweed components - polysaccharides and proteins - was carried out using commercially available, food approved enzymes. Hydrolysis was also carried out using a range of new enzymes that were designed to target the seaweed specific carbohydrates. These were provided by Icelandic partner Prokozyme (www.prokozyme.com).

One of the key aims of the project was to treat the seaweed holistically and to process the

whole seaweed rather than to develop specific, possibly costly, flavour extracts. NaCl is a very cheap ingredient and thus difficult to replace on a cost basis. For any new seaweed derived ingredient to be successful, it would need to be functionally and cost effective.



Seaweed being processed to “unlock” the flavour

Whole seaweed ingredients are known to be limited in application on account of their typical organoleptic qualities (seaweed taste & odour) but also in terms of their texture & colour. We found that, in some cases, processing with commercially available enzymes did not significantly improve some of these qualities. Possibly due to a lack of specificity.

However, the use of seaweed specific enzymes produced flavour ingredients with superior sensory profiles that were not perceived as “typical” of seaweed and even had desirable umami and mouthfeel attributes.

Assessing the sensory profile of new flavour ingredients and salt reduced products in which they had been applied, was one of the most challenging aspects of the project. In the early stage of the project, partners Calaf Nuances (www.calafnuances.com) and Frutarom Etol (www.frutarom.com) led the consortium in developing a specific flavour language for seaweed and the necessary sensory tools to

evaluate changes in the sensory profile of seaweed ingredients and products.



Learning a new seaweed flavour language

Once the ability to evaluate and communicate changes in sensory profile was embedded within the team, work could begin on assessing the potential to use new seaweed flavour ingredients to reduce salt - or more specifically NaCl - in selected foods.

Sensory evaluation was carried out by experienced panels at both RTD partners, Matis (www.matis.is) and Fraunhofer-Gesellschaft (www.ivv.fraunhofer.de) and also at the SME premises. One of the key challenges faced was to overcome cultural and regional differences in the perception of certain descriptors. For example, the “fishy” taste for Icelandic panellists being quite different from both Spanish and German perceptions.

For ethical reasons, the bulk of the food applications research and sensory evaluation work was carried out using seaweed ingredients that were produced using food approved enzymes. The ingredients were tested in a range of salt reduced foods including Frankfurter sausages, specifically for partners Scheid

(www.scheid.de) and the German market, fish cakes, bread and soups/sauces, as chosen to suit the commercial needs of the other SME participants.

Of vital importance to the development of commercially viable new seaweed ingredients, was to precisely understand the full requirements of all SME partners. Not only in terms of taste but also other potential functionality, product characterisation and behaviour (e.g. colour, solubility, behaviour in presence of other ingredients) and of course, cost. Replacing salt in foods is not just an issue of taste as salt also provides important functionality that impacts on both the quality and safety of food products. For example, salt is used as a processing aid and/or preservative. Removal of salt is therefore not necessarily straight forward.

The flavour ingredients that were developed from *Ascophyllum nodosum* and *Saccharina latissima* were rich in important flavour components. Both contained low Na levels but were high in other flavour important minerals such as K, Ca, Mg, Zn and Fe.

	Ascophyllum nodosum	Saccharina latissima
Minerals	15.5	15.9
NaCl	0.87	0.75
Total protein	9.5	17.5
Glutamic acid	1.91	2.19
Alanine	0.51	1.33
Aspartic acid	0.89	1.38

Content of important flavour components in final seaweed flavour ingredients (% dry weight)



In addition to CyberColloids, four other European SMEs participated in this project:

Aleor;
Calaf Nuances;
Scheid & Prokazyne.
Large flavour company Frutarom Etol were also involved.



The R&D component of the project was carried out by Matis & Fraunhofer-Gesellschaft.



The content of important amino acids, in particular alanine and aspartic acid and glutamic acid comprised approximately 35% and 28% of the total protein content in the *Ascophyllum* and *Saccharina* ingredients respectively. This is high in comparison to other umami rich foods like tomatoes and shiitake mushrooms which typically contain <1.5% glutamic acid (% dry weight).

Despite this, success in application was variable and was heavily dependant on the nature of the food matrix, salt reduction target and other functionality required. Although salt reduction targets were achieved in some applications, overall performance of the seaweed flavour ingredients was not deemed to be of sufficient commercial standard. In addition, no flavour enhancing potential (beyond that contributed by the sensory profile of the seaweeds themselves) was observed.

However, during the final stages of the project, flavour ingredients were produced for sensory evaluation using the seaweed specific enzymes. These ingredients were far superior in sensory profile and exhibited significant flavour enhancing properties. They also had the desirable umami and mouthfeel attributes that were expected, but not delivered by the commercial enzyme ingredients.

Potential for future research

The scientific advances in enzyme production, that occurred very late in the project, were recognised by the SME group to show commercial potential. As such, the group maintains a positive outlook towards further development of seaweed derived flavour ingredients and have agreed to pursue further research opportunities to advance the work that has been carried out under the TASTE project.



The TASTE project seaweeds, *Ascophyllum nodosum*, *Saccharina latissima* & *Fucus vesiculosus*.

More information

Please see the CyberColloids website www.cybercolloids.net for more information on our seaweed focussed research & activities and for a list of our relevant publications.