

Upgrading biomass research at CyberColloids

April 2024



CyberColloids – who are we?



- CyberColloids Ltd is an independent, business driven, research and product development group
- Specialising in hydrocolloids, fibres and texture ingredients
- Focusing on food, nutrition and industrial applications

CyberColloids – who are we?



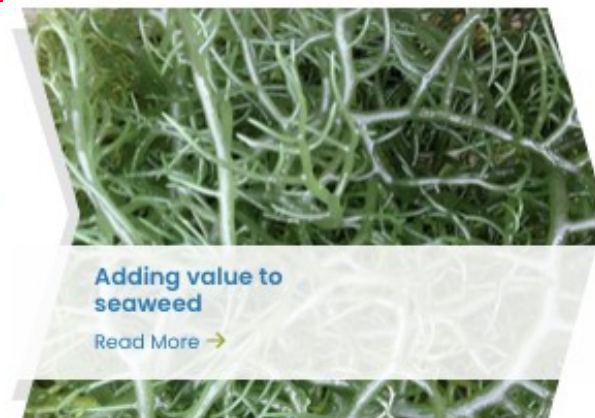
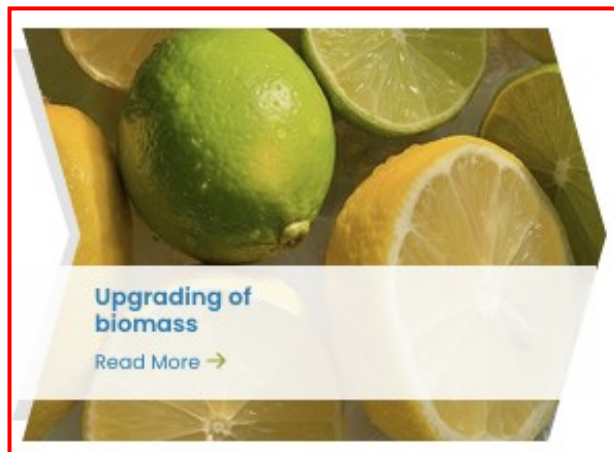
- Started in 2002 by 4 ex Unilever scientists
- SME – 8 personnel plus Associates
- Dedicated lab in Carrigaline, Ireland & offices in UK
- Global foot print – customers from China to USA and Norway to South Africa
- Multinationals to family companies
- Active participant in EU & nationally funded research

What do we offer?



- Complete contract research & business solutions service from -
 - raw material sourcing and basic research
 - process & product development
 - demonstration & scale up
 - final application testing
 - strategic business advice

Our core services



Upgrading biomass



- CyberColloids has a particular interest in finding innovative or value added uses for different raw materials & by-products from food processing
- This includes the development of new processing methodologies and products with targeted functionality and/or health & wellness application
- Development of new functional fibre ingredients and plant based proteins is a key focus



Functionalised fibres

Functionalised fibres



- Functionalised fibres are food texture ingredients that are primarily used for their high water binding capacity
- But also for viscosifying, gelling, fat mimetic and emulsification properties
- Our processes target the different insoluble and soluble fibre fractions *e.g.* cellulose, pectin to promote different functionalities

Different biomass sources we have worked on



Fruits

Vegetables

Cereals & Oil seeds

Pulses

Seaweed

Citrus, Apple
Berries

Potato, Carrot,
Root crops, Sugar
beet,
Brassicas

Oat, Flax

Pea, Chickpea

Various red &
brown seaweeds

Whole fruits, by-
products from
juicing and pectin
extraction (peel,
pomaces)

By-products from
processing (peels)
&
out-graded/surplu
s whole veg

Waste oat hulls
By product from
oil extraction
(seed cakes)

Typically
by products from
other processing

Whole seaweeds
& residues from
hydrocolloids
extraction

Process
development
Functional
assessment
Food applications

Process
development
Functional
assessment
Food applications

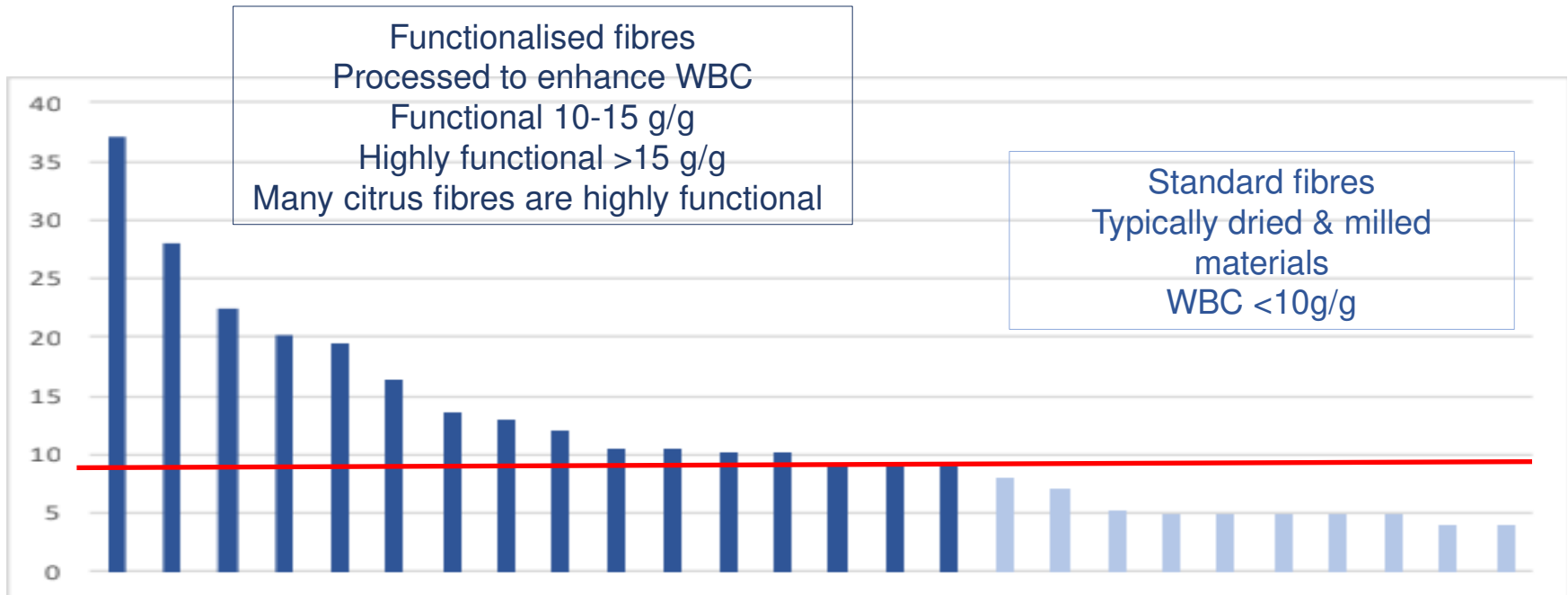
Process
development
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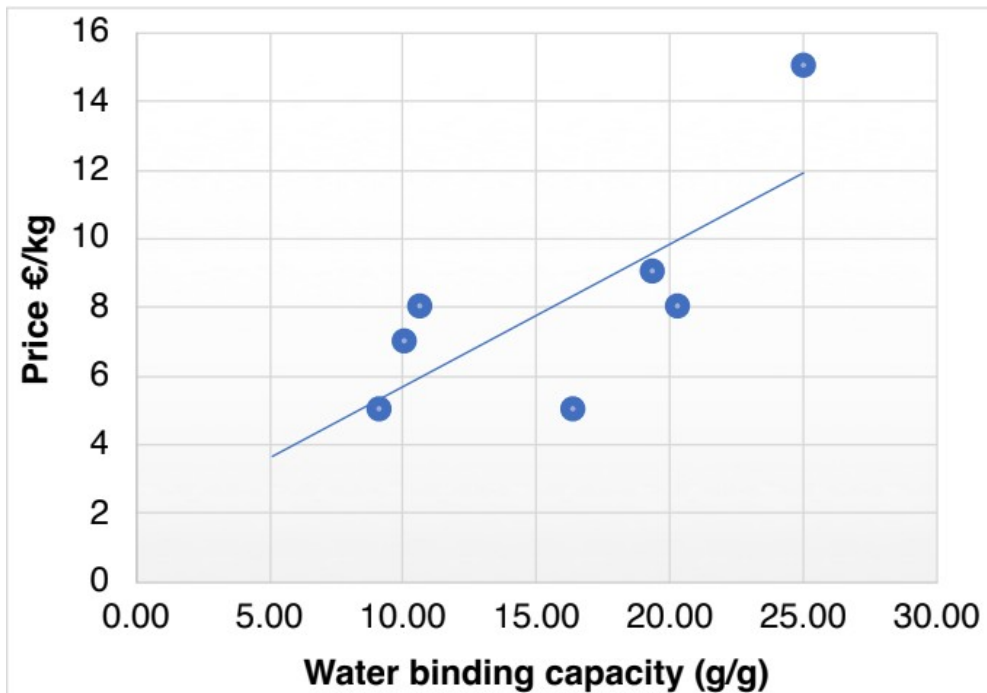
Improving water binding capacity (WBC)

- Improving WBC can lead to a wider range of end use application and better market price
- Fibres with a WBC of $\sim 10\text{g/g}$ or more (red line) are commercially interesting



Value creation – pricing generally reflects functionality

- In 2022, indicative pricing for standard fibres was in the range €1.50-€4/kg but functionalised fibres was in the range €4-€15/kg
- It is difficult to get a consensus on Global Market size as the functionalised fibre sector is not defined, current estimates for citrus fibres alone range from US\$400 million to US\$700 million



Note that pricing is indicative & dependent on supplier, volume & shipping

Markets & end use



- Functionalised fibres have wide application:
 - bakery including gluten free options
 - snacks - cereal/granola bars & fruit snacks
 - dairy including ice cream and desserts
 - soups, sauces & dressings
 - beverages
 - processed meat & fish products
 - plant based, vegan & vegetarian products
 - sweets and confectionery
 - nutritional foods & meal replacement drinks
 - clean label & free from/reduced products



Plant based proteins

New sources of plant based protein



- As a consequence of the global shift away from traditional sources of protein towards a more plant based diet, we have engaged in more projects that have focused on plant based proteins
- Including extraction, functional assessment and food applications research

Different biomass sources we have worked on



Potato

Oil seed cakes
Canola, Flax seed

Pulses & grains

Red & brown
seaweeds

Whole potatoes with
possibility for other
product stream - starch
and/or potato fibres

By-products from oil
extraction

Lupin, Fava bean
Pea, Lentil, Quinoa
Amaranth

Whole seaweeds &
residues from
hydrocolloids extraction

Extraction
Functional assessment
Food applications

Extraction
Functional assessment
Food applications

Functional assessment
Food applications

Extraction

Please see our website for more information on -

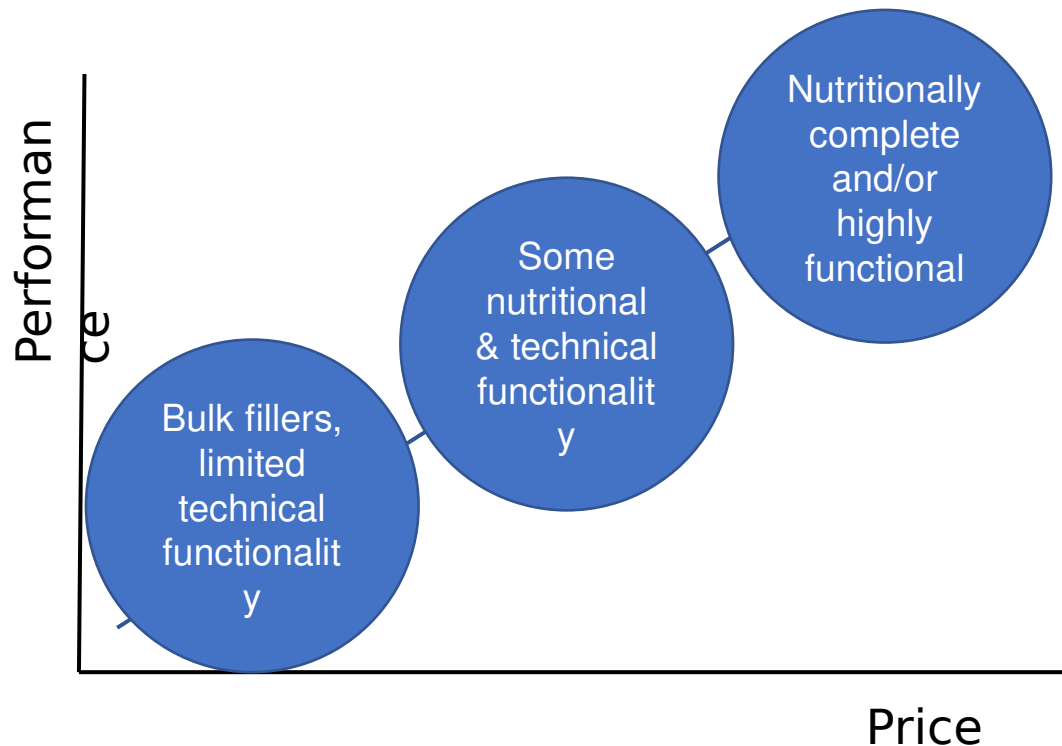
Potato protein -

<https://cybercolloids.net/scoping-potential-food-waste-in-the-irish-fruit-vegetable-supply-chain/>

EU funded Protein2food project - <https://cybercolloids.net/texture-solutions-for-plant-based-foods/>

Value creation

- From a market perspective, there are **5 key attributes that define the value of a protein ingredient**: (i) content/purity; (ii) nutritional quality; (iii) technical functionality; (iv) sensory profile and (v) marketing story
- All five impact on value (price) and potential for application



Current estimates for the Global market for plant based proteins range from US\$20 billion to US\$40 billion

Food applications research with plant based proteins



Texture in vegan fish & seafood



Improved melt profile in vegan cheeses



Optimisation of non dairy formulations



Funded and collaborative research

Creating healthier food options for Welsh school children
SBRI funded project update

CyberColloids has embarked on a new technical research investigation in collaboration with Welsh partners Penreole, based in Gwynedd and the Biocomposites Centre, Bangor University in the fight against childhood obesity in Wales. The project aims to develop new functional food ingredients from surplus food industry resources in Wales and use them to replace high calorie ingredients such as fat, in the kinds of food that are particularly enjoyed by Welsh school children. Wales, like the rest of the UK and Europe, generates thousands of tonnes of surplus fresh food resources such as apples, that never make it to the supermarket shelves because they are out-of-grade, surplus to requirements or are processed and only partly utilised. These surplus materials are a rich source of natural fibre components and have many beneficial nutritional properties.



In this project we are targeting the potential to utilize these fibres to provide textural functionality that allows for the reduction of high calorie ingredients in 11% more fat than recommended levels and not enough fibre. Recent statistics show that more than a quarter of reception year school children in Wales are particularly at risk. By targeting school menu items, we aim to relieve some of the burden placed on providing nutritious food in the home. Our apple fibres are being produced from Welsh apple pomace and processed using different techniques at the Biocomposites Centre, Bangor University.

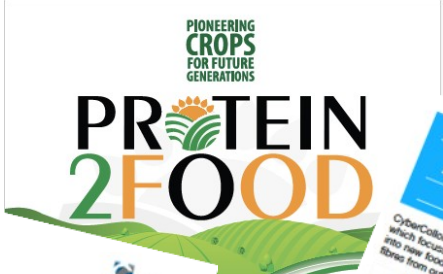
This project is overseen by Welsh Government's Food and Drink Division and supported financially through the Innovate UK and Welsh Government Small Business Research Initiative.

Coping potential food waste in the Irish fruit & vegetable supply chain



Project focus
Minimising food waste in the Irish agriculture priority for the EPA. The global fruit and veg and supply chain generates a large amount of waste. However, relatively little is recycled. This knowledge probably only extends to the pre-consumer stage of the supply chain. What is potentially lost from the Irish fruit and vegetable supply chain is significant.

With support from EPA Green Fund, CyberColloids has embarked on a project to explore the potential to utilize surplus food from the Irish fruit and vegetable supply chain in the production of functional food ingredients. The project aims to explore the potential to utilize surplus food from the Irish fruit and vegetable supply chain in the production of functional food ingredients. The project aims to explore the potential to utilize surplus food from the Irish fruit and vegetable supply chain in the production of functional food ingredients.



TACKLING FOOD LOSS IN IRELAND: NEW FOOD FIBRES FROM VEGETABLE WASTE

Food loss & waste: a global issue
The global food system has become a primary objective for policymakers worldwide as we grapple with the challenge of feeding a growing population in a world where the majority is expected to live in a hot or semi-arid climate. Addressing the global problem of food loss and waste is critical to ensuring a sustainable and secure food future.

Food loss refers to the difference between the potential yield of the food crop and the amount of food that is actually consumed. It includes losses at all stages of the food supply chain, from production to consumption.



Protein-rich, high quality, protective, high quality, protective, high quality, protective

Expected Outcomes

- Develop a range of functional food ingredients from vegetable waste.
- Improve the protein content of these ingredients.
- Reduce the environmental impact of their production.

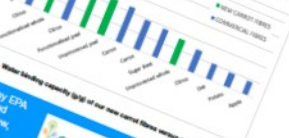
A New Look at Carrot Waste
CyberColloids research project update



CyberColloids has just completed its second EPA Green Enterprise funded project which focused on the upgrade of Irish vegetable processing and supply chain waste into new food ingredients. The specific focus was on the production of functional fibres from out-of-grade & 'wanky' carrots and carrot peels.

Expected Outcomes

- Develop a range of functional food ingredients from carrot waste.
- Improve the protein content of these ingredients.
- Reduce the environmental impact of their production.



This research was supported by EPA Green Enterprise funding and Waterford County Council. Moushfiyah Foods Ltd, Waterford.



Carrot



Swede



Strawberry



Apple



Tomato



References



- Hotchkiss (2015). Food texture and nutrition: the changing roles of hydrocolloids and food fibres. *Wellness Foods & Supplements*. No. 1. April/May 2015. Page 36-39
- Hotchkiss & Trius (2016), Functional Food Fibres and their use in healthier fat reduced formulations. Monographic special issue: *Food: Free from*. *Agro FOOD Industry Hi Tech* – vol. 27(3) – May/June 2016
- Hotchkiss & Trius (2016). Food Fibers: Creating Healthy Texture Systems. *Hydrocolloid Innovation. The World of Food Ingredients*. March 2016

Please contact us

- If you would like more information about our fibre & protein research activities then please visit our website - <https://cybercolloids.net/upgrading-of-biomass/>
- Contact us via our website - <https://cybercolloids.net/contact-us/>
- Or directly – mariel@cybercolloids.net



About

Our Services

Information

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The Experts in Independent Hydrocolloid R & D

CyberColloids Ltd is an independent, business driven, research and product development group specialising in hydrocolloids, fibres and texture ingredients and focusing on food, nutrition and industrial applications.

[Overview of Services →](#)

