Technical Briefing
Fibre – functionality, health benefits & satiety

starches  🌾  flours  🌾  fibres  🌾  proteins
Recently, fibre has caught the attention of marketers and developers. UK product launches with a “High in Fibre” or “Source of Fibre” claim have more than doubled since 2013. There’s no surprise in this as the benefits of fibre are wide ranging. Increasing levels of fibre gives: lower calorie products, significant health benefits, and useful product functionality.

The Scientific Advisory Committee on Nutrition (SACN) has recently recommended that daily fibre consumption should be 30g; a significant increase on the current average UK consumption rate of 18g. This revised recommendation is as a result of the positive results fibre yielded in recent studies looking at the beneficial health impacts of increasing fibre consumption.

What is fibre?

In short, dietary fibre is the indigestible roughage from cell walls of plants. Fibre has three primary mechanisms in the body: bulking, viscosity and fermentation.

Dietary fibre is a subset of carbohydrates called non-starch polysaccharides. Recently, SACN has also widened the dietary fibre definition to include non-digestible oligosaccharides, resistant starch and polydextrose. This is in light of evidence showing the health benefits of these ingredients as well.

Within the dietary fibre subset, there are two main types of fibre; soluble (dissolvable in water), and insoluble (not dissolvable in water). These different types give completely different functionalities in both food applications and in the body during digestion.

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Soluble fibre

Soluble fibres form a viscous paste which can be beneficial when providing functionality in food products as well as for slowing gastric emptying.

Generally, soluble fibres are more fermentable than insoluble fibre.

Soluble fibres are often known as “gums” or pectins in the food industry. These provide stability, thickening and provide textural, structural and mouthfeel enhancement. Typically though, gums can’t be added in large enough quantities to provide a high fibre claim, as they absorb a lot of water and small additions significantly change the properties to the food, adding too much would be alter the product too much.

Soluble fibres are also important in aiding satiety by increasing the thickness and viscosity of the food being consumed. Psychologically, there is a sensory expectation that thick foods are more filling.

Insoluble fibre

Insoluble fibres are also known as partially fermentable fibres, which can further be separated into fermentable insoluble fibre (resistant starch for example) and non-fermentable insoluble fibres. Cellulose too is a non-digestible constituent of insoluble dietary fibre.

Resistant starch is considered a dietary fibre as it is indigestible by humans – a result of the molecular structure which prevents the enzymes from accessing and breaking

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Starch vs cellulose

Both starch and cellulose are comprised of glucose molecules. However, because of the differing structural arrangements of the two compounds only starch is digestible by the human body, and the bond in cellulose cannot be broken down by human enzymes.

Starch has 1-4 linkage of alpha glucose monomers; cellulose has 1-4 linkage of beta glucose monomers.

Figure 1

Cellulose is effectively inert, just absorbing water and only reacting under specific conditions.

Health benefits

Fibre cannot be fully absorbed in the body; starch is the only polysaccharide which can be digested. The small intestine is unable to digest the fibre, in the large intestine some of the fibre is fermented (either partially or completely depending on the type). Typically, soluble fibres have a higher fermentability and insoluble fibres give partial to low fermentability.

Partial or complete fermentation occurs in the large intestine in the body; this only occurs to carbohydrates which are not digested or absorbed in the small intestine. This fermentation of the fibre by the bacterial microflora means that the fibre is acting as a prebiotic, due to the boost in activity of health promoting bacteria in the gut. As the short chain carbohydrates are unable to be digested they are fermented and converted into short chain fatty acids and gases. These short chain fatty acids help in a wide range of health promoting processes.

Insoluble fibre helps undigested food to keep moving through the intestines.

Soluble fibre (beta-glucans and pectin) can help reduce blood cholesterol.

Consuming more fibre is proven to have health benefits in the following areas:

- Reducing cardiovascular disease / heart disease and strokes
- Improving gastrointestinal health and can help reduce chances of certain cancers
- Digestive health benefits; increased fecal bulk which can give a faster transit time and prevent constipation
- Aiding type 2 diabetes management – controlling insulin sensitivity and and GI control
- Increasing satiety and aids in weight control
- Lowering blood pressure

Satiety

Satiety, or the feeling of ‘fullness’, is something manufacturers are increasingly trying to emulate, and fibre can play a significant role in this. Not only does fibre provide satiating effects but it also has a very low caloric content with just 2kcal per gram. By comparison, protein gives 4kcal per gram, fat 9kcal per gram, and carbohydrate 4kcal per gram.

Fibre helps with satiety mechanisms in both the immediate meal, and the following meal intake.

Fibre affects satiety in both physical and sensory aspects. Physically, fibre creates a viscous gel network, and studies show that the texture and viscosity of a meal affects feeling of satiety and the amount of food consumed.

Soluble fibres can provide satiating effects due to the more viscous structures which they give. In simple terms, the higher the viscosity in the stomach, the slower the gastric emptying is and therefore there is a slower release of nutrients. This also helps with increased vitamin and nutrient release.

Moreover, the thicker a product is, the longer it stays in the mouth making the cephalic phase response stronger due to better sensing of nutrients on the tongue. The cephalic phase of digestion is the gastric secretion that occurs even before food enters the stomach. There is an expectation that when you eat thicker and creamier food that it will be more satiating and result in you eating less of it.

Another way that soluble fibres can help with increasing satiety is when they are actually in the stomach. Some of these gums (alginites and gellan gum for example) may gel when they reach the acidic environment in the stomach. Like with what would happen in food, gives the contents of the stomach structure and so therefore slows the rate of gastric emptying. This in turn means there is a longer time period over which nutrients are released, therefore having a positive effect on satiety.

As fibre delays gastric emptying; this might also have effects on the release of hormones which control hunger and satiation. This is because a key factor in satiety is the filling and emptying of the stomach. As the food is digested, satiety hormones are released which continue the feeling of
satiety and controls energy intake. The longer it takes for the stomach to empty, the longer these hormones will be released; this promotes the feeling of satiety for longer as well as increasing nutrient absorption.

Functionality

Fibre does not only provide significant health benefits, but it is widely used as a functional ingredient in food products. Applications include breads and other baked goods, to more surprising products like dressings, soups and drinks.

Importantly, both soluble and insoluble fibres give different functionalities in foods and so can be used either separately or alongside each other.

Gluten free products, especially bread, benefit from the addition of soluble fibres (such as psyllium husk) to provide structure, whereas insoluble fibres (such as bamboo fibre) can open out the texture and provide a lighter, softer loaf. The two in combination need to be used to provide the best possible finished product.

Soluble fibres can also be used to stabilise emulsions and foams, suspend particles in liquids, and add viscosity and texture to a product. Although these are less likely to validate “high levels of fibre” claims, these resistant starches and insoluble fibres are more likely to give a more palatable product due to the less viscous result they’ll give. Hence, insoluble fibre and resistant starches are the more logical choices for producing low calorie foods for satiety and weight management.

Insoluble fibres work uniquely, absorbing water and oil via capillary action. This means that they are extremely process stable as they remain inert under most conditions. Any water or oil which is absorbed can be “squeezed” out but will be taken back up again if left to reabsorb.

Making products with fibre claims

Most often, high fibre claims are restricted to either bakery products or products which are naturally higher in fibre; cereals, rice or pasta.

However, there is an increasing amount of products which are making “High in” fibre claims on products which would not necessarily be associated with it. For instance: sauces, houmous, and other dips and snacks as well as fruit juices. However, again there will be a lot of naturally present fibre in these applications.

Fibre claims are also prominent in products which are more health focused. This is often in conjunction with other health claims such as “High in protein” or “low carbohydrate.”

Fibres are making headway in gluten free applications as well. They are being used an increasing amount for both their health and functional properties.

U&S

We have a wide range of insoluble fibres, derived from wheat, pea, bamboo and oat. The scilia range boosts fibre content, allowing for enhanced nutritional profiles and front of pack “Source of” or “High in” fibre claims.

Our fibres also give considerable functional properties and allow for texture control – ultimately improving overall product quality.

Summary

Fibre is incredibly beneficial for both adding functionality as well as providing a wide range of health benefits. Fibre is great for improving gluten free products as well as producing low energy products.
Starches and Flours
Produced from a range of crops including Tapioca, Wheat, Rice, Sweet Potato, Pea and Waxy Maize.

- Available in ‘cook up’, ‘pre-gelatinised’ and ‘cold water swelling’ formats.
- Heat, pH, freeze/thaw stable versions available with a range of viscosity profiles and a whole palette of textures.
- Thickening, stabilising, fat replacement, sugar reduction, phosphate removal and glazing are only a few of the functions possible.
- Simple, clean and consumer friendly declarations in the following key application areas:
  - Bakery
  - Processed meats
  - Sauces
  - Ready meals
  - Desserts
  - Snacks

Fibres
Produced from a range of crops including Wheat, Oat, Bamboo, Flax and Pea.

- Insoluble fibres with high water binding capacity in a range of fibre lengths, giving full control over the desired texture.
- ‘Source of’ and ‘high in’ claims for fibre and omega 3 achievable.
- Shear, acid, heat and freeze/thaw stable.
- Key application areas:
  - Bakery
  - Processed meats
  - Sauces
  - Performance foods
  - Sports nutrition
  - Snacks
  - Breakfast cereals

Proteins
Produced from a range of crops including Wheat, Pea and Rice.

- A range and variety of protein content.
- Can be used as effective binders and emulsifiers.
- Nutritionally enhance foods and boost amino acids.
- Easy to apply and use in the following key application areas:
  - Processed meats
  - Bakery
  - Sports nutrition
  - Infant formulas
  - Functional foods

Clean & Clear Label
Starches | Flours | Fibres | Proteins

- Non-GM
- Additive free
- Wide range of crops and functionalities
- Allergen free options
- Simple consumer friendly declarations
- Enhanced nutritional profiles
- Quality assured from field to fork
- Fully accredited including BRC, Kosher and Halal approved

All backed up by onsite technical support.