Fibres and process

3 questions to Stefano Renzetti…

Background

He has a MSc and a PhD in **food science.**

Position and scientific activities

He is **a senior scientist and project leader** at Wageningen University & Research in the Netherlands. His research activities focus on **cereal constituents** (structural and physico-chemical properties of starch, proteins and fibres, and their techno-functionality in cereal processing) and **food structuring** in bakery applications (ingredients interactions and physico-chemical transformation during processing). **Functionalisation of cereal ingredients** for **improving nutritional composition** of food, including starch metabolism, are among is interests.

Stefano Renzetti received the Harald Perten prize in 2018 for his contribution to the furtherance of cereal science and technology towards practical applications.

- **Incorporating more fibre into a finished product: what does it change in organoleptic terms? Taste, colour...**

Dietary fibre is a heterogeneous group of components, largely varying in molecular structure, composition and size, and in solubility. Hence, the effect on finished product quality is specific to the type of fibre source. Furthermore, additional aspect as whether the fibres are isolated or present as part of a fibre-rich ingredient, their concentration in the processed food and the specific type of application play an equally important role on sensory properties of the finished product. In general, soluble fibres increase viscosity of the water phase, which is function of size and concentration. This can has consequences on texture and mouthfeel. In bakery applications, these fibres can also interact with gluten and starch during processing, affecting gluten development and the baking behaviour, which has consequences on the finished product structure and texture. On the other hand, insoluble fibre can hold much water which will also result in a thickening effect. Their effect on finished product quality in terms of structure and texture will depend very much on their hydration behaviour, since the water held by the insoluble fibres are not available for the hydration of other ingredients or food components.

With regards to colour and flavour, soluble fibres containing a reducing-sugar end contribute to Maillard reaction, with browning and aroma formation. Otherwise the contribution of fibres to colour and flavour is mainly related to molecules associated to the fibres.

While incorporation of fibres clearly alters structure and texture and requires adaptations in the food formulation and preparation, some of the functionalities of fibres are also key to improve product quality and stability. Thickening and gelling behaviour of some fibres are useful to stabilize the structure of dispersions, emulsions and foams. The water binding properties can help in stabilizing food that are subjected to freeze-thawing and to extend textural stability, e.g. by reducing staling and maintaining moistness in bakery applications. However, in these cases the level of incorporation is rather limited in relation to potential nutritional benefits. Another promising use of fibres is for sugar and fat replacement, which has the nutritional advantage of reducing undesired ingredients with health promoting ones.

From a technological perspective, there are a lot of advances currently being made in understanding fibre functionality in food, which holds promise for a more substantial incorporation into products to obtain both nutritional and technological benefits.

- **Are the fibres altered or modified during the different technological processes?**

Fibres properties can be modified with typical food processing technologies. That can be by means of chemical, mechanical (e.g. shear), thermal treatment and by action of enzymes and microbes. These modifications can result from both processing raw materials into ingredients as well as during preparation of processed food. Most often, these treatments result in a depolymerization mechanism, thus affecting the ratio of soluble/insoluble fibres, their molecular weight distribution as well as the amount of free sugars. Mild processing technologies such as mechanical and thermal treatments and microbial fermentation are nowadays particularly of interest to modify the physico-chemical properties of fibres to increase their functionality and incorporation in food products.

- **What are the particularities of resistant starch in terms of food processing?**

Resistant starches are generally used by replacing a portion of a starchy ingredient like flour in the formulation. The advantage of using resistant starches compared to other fibre sources, e.g. bran, is that they have lower water binding capacity, bland flavour and white appearance. Therefore, the reformulated products can be closer to the original one compared to the use of other fibre sources. Nevertheless, addition of resistant starches always requires some adaptations in the formulation, as for instance in bakery application. Higher water levels are often needed and the intrinsic differences in the starchy ingredient they replace can inevitably affect texture. Despite the adaptations, effects on product quality such as a decrease in volume and changes in crumb texture of breads or in processability of dough and texture in biscuits can be observed. For these reasons, the level of incorporation must be adapted to the applications to maintain an acceptable product quality. This is an important aspect to consider with regards to achieving targets in dietary fibre enrichment. Compared to other dietary fibre sources, the level of resistant starch content in the end product is affected by the processing conditions and will be application specific. In this context, the use of resistant starches such as those rich in amylose may be preferred as once gelatinized, high amylose starches can form high amounts of type III and type V resistant starch. Thus, several types of resistant starch may coexist in the end product.

Overall, there is currently a lot of exciting research performed and developments made in better understanding how formulating and processing of starch-rich matrices can be optimized to increase the amount of resistant starch in food products.

Want to know more? Check out how we've build a solid scientific basis around fibres thanks to our expert associates: https://lifywheat.com/en/home/#resistant-starch