Innovative approach to design cereal-based product with low glycemic response

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The aim of this project is to design cereal-based products with low glycemic response, limiting the starch accessibility using structural features such as cells wall, protein network, food texture and their interactions.

State of art: It has been demonstrated that consuming high glycemic index (GI) foods, like bread, is a risk factor for the development of chronic diseases, including type 2 diabetes and cardiovascular diseases.[1] Limiting starch accessibility to α-amylase is one of the main ways to decrease the glucose response and the GI of cereal-based products. The following structural features will be investigated:

- The cell membrane can be considered as the primary barrier for the diffusion of enzymes inside the cells, limiting the contact between starch and the amylolytic enzyme.
- The protein matrix , that embeds starch and may limit, not only the enzyme diffusion, but also water, hence reducing the starch gelatinization.[2]
- The last structural characteristic that could influence the starch bio-accessibility, in bakery products, is food texture. Different textures could influence the structure breakdown and saliva lubrification during mastication, producing different particle size in the bolus.[3]

The interaction between these structural features could potentially modulate the starch digestibility.

Monthly schedule

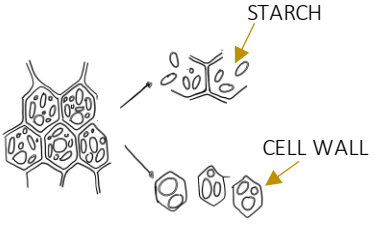
2 4 6 8 10 12 16 18 20 24

Raw material


Peeled rye

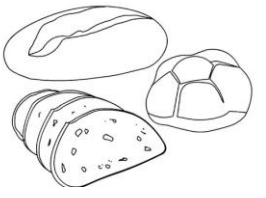

Peeled Durum wheat

Effect of structural features



Cell wall intactness

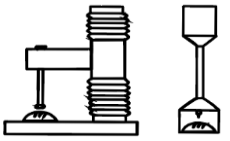
Protein network


Food matrix

Analysis


In *vitro* digestibility


Microscope analysis


Texture analyzer


Oral processing


Clinical studies

1. Fardet, A. *et al.* Parameters controlling the glycaemic response to breads. *Nutr. Res. Rev.* **19**, 18–25 (2020).
2. Capuano, E. *et al.* Role of the food matrix and digestion on calculation of the actual energy content of food. *Nutr. Rev.* **76**, 274–289 (2018).
3. Alam, S. A. *et al.* Effects of structural and textural properties of brittle cereal foams on mechanisms of oral breakdown and in vitro starch digestibility. **96**, 1–11 (2017).

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