



HEALTHGRAIN

EXPLOITING BIOACTIVITY OF EUROPEAN CEREAL GRAINS FOR IMPROVED NUTRITION AND HEALTH BENEFITS

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New and improved gluten free foods developed for patients with Coeliac Disease

A wide range of gluten free cereals have been studied in detail as part of the HEALTHGRAIN project of the European Union, and their impact on product quality has been assessed. Enzyme technology, bioprocessing as well as high-pressure processing technology have been successfully applied to improve the quality, safety and nutritional attributes of gluten free cereal products.

In genetically susceptible individuals, the ingestion of gluten and related proteins triggers an immune-mediated enteropathy known as Coeliac Disease (CD). Recent epidemiological studies have shown that 1 in 100 people worldwide suffer from CD. Such a rate establishes CD as one of the most common food intolerances. Coeliac patients eating wheat or related proteins such as hordeins (barley) or secalins (rye) undergo an immunological response, localized in the small intestine, which destroys mature absorptive epithelial cells on the surface of the small intestine.

Currently, the only way that CD can be treated is the total lifelong avoidance of gluten ingestion. Therefore, CD sufferers have to follow a very strict diet and avoid any products which contain wheat, rye or barley. Some authors also include oats. Avoidance of these cereals leads to a recovery from the disease and significant improvement of the intestinal mucosa and its absorptive functions. Coeliac patients are not in position to eat some of the most common foods such as bread, pizzas, biscuits or drink beer.

Due to the unique properties of gluten, it is a big challenge for food scientists to produce good quality gluten free products. The majority of products currently on the market are in general of very poor quality. Therefore part of the HEALTHGRAIN project focused on the development of nutritious and tasty gluten free breads.

The areas covered during the project were a detailed characterisation of gluten free cereals and the assessment of these cereals as potential ingredients for gluten free breads. The characterisations ranged from a detailed chemical characterisation to rheological evaluation of the resulting doughs, structural properties of the doughs and breads using advanced microscopic methods as well as pilot-scale baking trials and sensory evaluation. Novel methods to improve the quality of gluten free cereal products were also covered; one example being the use of specially selected Lactic acid bacteria with properties such as antifungal activity, exopolysaccharide production and enzyme production. The use of specifically selected Lactic acid bacteria can significantly improve the quality and shelf-life of gluten free breads.

One of the major problems associated with gluten free products is their texture. Part of the project was therefore to investigate the influence of a range of enzymes such as transglutaminase, glucose oxidase and protease on a wide range of gluten free cereals. It was shown that enzymes can play an important role in improving the structure of gluten free bread, but the enzymes showed different interactions with the various gluten free flours.



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Novel processing such as high pressure processing was also introduced as a means to create ingredients for gluten free cereal products. The impact of HP was investigated on the major polymers found in gluten free flours, such as starch and protein was also performed. The results revealed that starch gelatinisation and protein network formation at pressures ≥ 350 MPa was obtained while a weakening of protein structures was observed at lower pressures. Addition of HP-treated gluten free batters to bread resulted in improved volume and decreased staling at 200 MPa, while higher pressures did not improve oat bread quality.

The work was conducted by the research team of Professor Elke Arendt, University College Cork, Ireland. Part of the Nutritional analysis of the gluten free flours was conducted by the team of Professor Jan Delcour, KU Leuven, Belgium.

The EU Integrated Project HEALTHGRAIN

The HEALTHGRAIN project has substantially strengthened the scientific basis for a new generation of cereal based products with enhanced health benefits. The project also has formed a network of research organizations, industries and organizations communicating to consumers that will continue as the HEALTHGRAIN Forum.

*Results of the project will be presented in
the HEALTHGRAIN Conference on May 5-7 in Lund, Sweden:
www.healthgrain.org*

University College Cork (UCC) is an educational institute that serves a large area in the southern region of Ireland, where it provides undergraduate and postgraduate Degrees across all the major disciplines. UCC has been the Irish centre for education and research in Food Science since 1929, and is now recognised as a major national resource for expertise in Food Science and Technology. In the past number of years the University has made very significant resource commitments to develop research in the broad area of "Food and Health".

Key references:

Arendt, EK and Dal Bello, F (eds) (2008). *Gluten-free Food and Beverages*. Academic Press – Elsevier. ISBN978-0-12-373739-7.

Arendt, EK and Dal Bello, F (eds) (2009). *Science of Gluten-free Food and Beverages*. AACC Publishers, New York. ISBN 978-1-891127-67-0.

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