



Project no.
036302

Project acronym
EU-FRESH BAKE

Project title
Freshly Baked Breads with Improvement of Nutritional Quality and Low Energy Demanding for the Benefit Of the Consumer and of the Environment

Instrument: **Specific Targeted Research Projects**

Thematic Priority: **5, Food Quality and Safety**

Deliverable Reference
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Title: **Brochure on nutrition results obtained during the project**

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Dissemination Level		
PU	Public	PU
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

EU-FRESHBAKE project NUTRITION RESULTS

Background

This project aims at taking benefit of refrigeration to improve the availability for the consumer of fresh bread with enhanced nutritional and textural quality. It concerns the **BAKE OFF TECHNOLOGY (BOT)**, which consists in producing bread from industrial refrigerated or frozen or non frozen bakery goods and to retail them in downtown baking shops OR to make them available in supermarket for domestic baking. So far, BOT has concentrated its efforts on production of plain white breads with low nutritional value. The nutritional and organoleptic qualities of bread can be improved by taking benefit of refrigeration if specific enzymes and ferments and specific process are used. In addition, most processes and technologies used in the BOT is energy demanding. This project is aiming at improving the industrial practice versus energy consumption and also in taking benefit of refrigeration to improve the availability for the consumer of fresh bread with enhanced nutritional and textural quality of bread. At the same time, it will aim at promoting and helping the ongoing rise of the BOT, which needs to be adapted to the needs of the consumer for products with improved nutritional quality and health benefit.

Three kinds of bread were investigated: conventional (wheat, gluten containing), organic and gluten-free.

Wheat Bread

Different technologies of baking and formulations have been tested during the project. The following baking methods have been used: conventional (fully baked, non-frozen), partially baked and frozen, fully baked and frozen and unfermented frozen dough. The tested breads were based on white and whole meal flour and contained additionally various ingredients: dietary fibers, resistant starch, sourdough powder, fresh sourdough, whey proteins, gluten flour, and Freshbake xylanase.



Preliminary tests made with animals showed that differentiated technologies of baking process did not affect the nutritional value of breads. In all experimental breads limiting amino acid was lysine which is typical for cereal products. Addition of dietary fiber to the breads baked by conventional or partially baked and frozen methods, decreased total digestibility of proteins. Technology of baking and addition of different ingredients (dietary fiber, whey proteins) did not affect the concentration of total cholesterol, HDL cholesterol and triacyloglycerols in serum of experimental animals.

- Human Study (Glycaemic Index)

The significant reduction in glycaemic indices were found, when the appropriate process (partially baked and frozen) together with the particular ingredients were used. The ingredients depended on flour used for baking. Namely, fibers and sourdough powder were used for baking of white flour breads, while fresh sourdough and whey proteins - for whole meal flour breads. The obtained glycaemic indices were low (below 55 %) for all above mentioned breads.

	PBF white flour + Fibers	PBF white flour + Medea Sourdough powder	PBF whole meal + fresh sourdough	PBF whole meal + fresh sourdough + whey proteins
GI ±SEM	52.68±7	42.61±4	49.93±5	43.84±5

Glycaemic indices (%) of partially baked and frozen white wheat and whole meal breads (PBF). Results are shown as a mean ± SEM.

- Nutrition Quality Index

Nutrition quality in terms of protein, dietary fibre, available carbohydrates and sodium content was not affected by the bread making process but was significantly improved by innovative formulations. In white wheat breads, the energy provided by protein was less than 12 %, and dietary fibre content was less than 3 g per 100g. However, white wheat bread enriched with resistant starch (10 g/100g flour) could be claimed as a “source of fibre”, while bread with added oat fibre (7.5 g/100g flour) and inulin (2.5 g/100g) blend could be claimed as a “high fibre” bread according to EU regulation (1924/2006) on nutrition and health claims made on foods. Wholemeal wheat breads contained more protein and dietary fibre, and less available carbohydrate, in comparison to white bread. Wholemeal breads could be claimed as the “natural high fibre” breads and as the “source of proteins”. In the recipe, salt addition was

reduced from 2 g/100g flour to 1.5 g/100g flour but the sodium content was still too high to claim reduced sodium content. In all bread samples, fat content was low (≤ 1 g/100g) as well as saturated fat (≤ 0.30 g/100g).

Organic Bread

The different process were tested: (1) partially baked and stored at ambient temperature used as a control; (2) partially baked and stored at ambient temperature with increased water content; (3) partially baked and stored at frozen temperature. Additionally, the tested breads contained ingredients such as durum wheat flour and vital wheat gluten. Preliminary tests made with animals showed that two different storage conditions, i.e. at ambient temperature or frozen storage did not affect the nutritional value of breads. Additionally, modified baking technology did not affect protein quality, lipid profile nor minerals content in animal study. However, an addition of durum wheat flour to the bread increased concentration of calcium in serum of rats.

– Human Study (Glycaemic Index)

Among all tested organic breads, the biggest reduction in glycemic response has been shown by an incorporation of durum wheat flour into partially baked breads stored at ambient temperature. Neither the application of freezing treatment to bread, nor wheat gluten incorporation to organic breads gave considerable decrease in glycemic index.

- Nutrition Quality Index

All tested bread samples could be claimed as a “source of protein” since more than 12 % of the energy value of the fresh bread sample was provided by wheat protein. Also, all breads were “source of fibre” since they contained more than 3 g of fibre per 100 g, and bread with durum wheat flour contained more than 1.5 g fibre per 100 kcal. Fat content in breads was low but sodium content was high.



Gluten Free Bread

Different technologies of baking and formulations have been tested during the project. The following methods have been used: conventional (fully baked, non-frozen), partially baked and frozen, fully baked and frozen, and unfermented frozen dough. Basic formulation of gluten free dough has been enriched with two different ingredients, i.e. amaranth flour and grinded flax seeds.

Preliminary tests made with animals showed that different technologies of baking process did not affect the nutritional value of breads, however, differentiated formulations and addition of new ingredients had impact on nutritional value. Breads supplemented with both amaranth flour and flax seeds were considerably richer in proteins, fat, dietary fiber, and ash. This resulted in higher gain of body mass in animal study. What is more, the content

of calcium and magnesium was significantly increased in serum of rats fed with rolls enriched with amaranth or flax seeds. Only rodents fed with flax seeds enriched breads had significantly lower total and LDL cholesterol in serum in comparison to rodents fed with not supplemented breads.

– Human Study (Glycaemic Index)

The results of glycemic index study showed that partially baked and frozen gluten free, non-enriched breads and all supplemented products (with amaranth flour or flax seeds) irrespectively of the baking technology had moderate glycemic indices, whereas fully baked non frozen gluten free breads (without amaranth or flax seeds) had high glycemic responses.

– Nutrition Quality Index

Gluten free bread enriched with amaranth flour had increased dietary fibre content (more than 3 g/100g and 1.5 g/100 kcal) and could be claimed a “source of fibre”, while bread enriched with flax seed meal contained more than 6 g fibre per 100 g and 3 g per 100 kcal of fresh bread, and could be claimed as a “high fibre”. All bread samples were poor source of protein as the energy provided by protein was less than 12 %. Protein enrichment of gluten free bread should be well planned due to possible allergies to milk and soy proteins.

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