

EU researchers developed natural concepts with enzymes to improve food quality

Novel enzymes have been developed in a three-year project of the European Union to improve food quality and processing in a natural way. Enzymes have traditionally been used in the food industry. Discovery of novel enzymes enables their exploitation in the improvement of food texture, which is often difficult to achieve in low-fat and low-calorie products.

So-called cross-linking enzymes can be exploited in the production of dairy, meat and baking products e.g. to improve texture, water-binding and stability. Consumers' attitudes towards new technologies are crucial, and therefore consumer perceptions towards these enzymatic systems were also studied in the project.

The texture of foods has a direct impact on sensory properties and the processing of most foods. Therefore, development of tools to modify the texture is of great interest to the food industry. Enzymatic modification of food components is a natural way to tailor food texture. As a result, less additives and food ingredients are needed to obtain food products with good sensory properties.

Enzymes enable gentle food processing

Enzymatic reactions are very specific and can proceed under mild conditions. Enzymes can thus be regarded as a minimal and natural processing method for food raw materials. By the use of enzymes it will be possible to transform inherently available food components into functional components. This functionality can then be observed as good texture. Enzymes have traditionally been used in the food industry for decades, e.g. in the production of cheese, bread and juices. The discovery and production of novel enzymes also enables their exploitation in the improvement of food texture.

Enzymes - Natural modifiers of food texture

Cross-linking enzymes can glue together biopolymers present in the food matrix via covalent linkages. This cross-linking can happen between proteins, proteins and carbohydrates or between carbohydrates. These protein-protein, polysaccharide-polysaccharide and/or protein-polysaccharide cross-links play an important role in determining the functional properties of these food products. Modification of the number and the nature of such cross-links during food processing offers a means by which the food industry can improve the functional properties of food.

At the moment there is only a limited selection of cross-linking enzymes on the market. Microbial transglutaminase is the most widely used enzyme for food structure modification. It can be used for enhancing bread volume and texture in yoghurt, ice cream, tofu and cheese. It is not, however, optimal for all applications.

The scientists in the CROSSENZ Project have focused their studies on novel oxidative enzymes that are capable of making cross-links in the food matrix. Compared to

transglutaminase they can link food biopolymers in a different way and as a result totally new food textures are obtained. Novel enzymes have been obtained from edible plants and from natural microbes. Efficient production systems of the enzymes using either microbial or plant systems or by extracting the enzymes from, e.g. vegetable by-products have also been developed. Production of the most interesting novel cross-linking enzymes has indicated that their large-scale production is feasible.

Product tasting affects consumers' attitudes positively

Consumer attitudes are crucial when new technologies are developed. Therefore the formation of consumer attitudes to enzymes in food processing was studied in the project. The test persons were confronted with information about how these foods are produced and used. Attitudes towards the use of enzymes in food production in general were fairly neutral, whereas attitudes towards use of GM technology in food production and towards enzymes produced by the use of modern production technologies were more negative. These attitudes are formed by linking the topic of enzyme production to already existing, more general attitudes to nature, technology and industrial food production.

Consumers who tasted products that were improved by using enzymes, including enzymes produced using modern production technologies were clearly positive towards the developed cross-linking concepts. Consumers also developed more positive attitudes towards the use of modern technology in food production and in enzyme production compared to a control group that did not taste the products with improved properties.

Better low-calorie, low-fat products for the market

The novel enzyme technology enables improved textural product features especially to low-calorie, low-fat products. The project consortium will further develop these concepts for different product types.

CROSSENZ Project

The CROSSENZ Project (Novel Cross-linking Enzymes and their Consumer Acceptance for Structure Engineering of Foods) was conducted between 2002 - 2005 with a European Union contribution, within RTD FP5, Key Action 1 "Food, nutrition and health". It was coordinated by Prof. Johanna Buchert from the VTT Technical Research Centre of Finland. The total budget for the project was 2.6 million euros. Project participants represent expertise on enzymology, food science, biochemistry, enzyme production and consumer studies.

Academic project partners: VTT Technical Research Centre of Finland (Finland); Institut National de la Recherche Agronomique INRA (France); University of Limerick (Ireland); Danish Institute of Agricultural Sciences DIAS (Denmark) and Centre for Research on Customer Relations in the Food Sector MAPP (Denmark). Industrial project partners: Danisco (Denmark); CropDesign (Belgium) and Raisio Nutrition Ltd. (Finland).

Further information:

Prof. Johanna Buchert, Project Coordinator
VTT Technical Research Centre of Finland
tel. +358 20 722 5146, johanna.buchert@vtt.fi
<http://crossenz.vtt.fi>