QLIF subproject 5:

Processing strategies

Photo: BLE

Development of a framework for the design of low-input processing strategies that guarantee food quality and safety

Organic processing standards already prohibit the use of many chemicals, additives and preservatives, which are used in the processing of conventional foods. Yet, there are frequent discussions of the underlying principles on organic food processing regarding such aspects as environmentally friendly processing, minimal use of additives, sensory quality, and transportation. It is therefore essential to develop a framework or code of practice, which can be used to determine whether novel processing strategies are compatible with organic processing standards and principles as well as consumer demands and expectations in relation to quality characteristics of processed food.

In the present subproject part of the research comprised an assessment of alternative sanitising protocols under controlled laboratory conditions in the processing of fresh cut lettuce and mixtures of fresh-cut-vegetables. During these studies it was found that, with regard to ecological aspects, ozone is a good alternative to the existing disinfectants, such as chlorine, in the organic field. Further research concerned an assessment of processing technologies that may improve the nutritional composition of dairy products, such as increased content of conjugated linolenic acids (CLA).

Towards a framework for the design of minimum and low-input processing strategies, which guarantee food quality and safety

Processing strategies for organic foods
Organic processing standards prohibit the use of chemicals, many preservatives and other food additives which are widely used in the processing of conventional foods. However, there are frequent discussions as to the underlying rationales and criteria used to allow some processing methods and additives but not others. There is also evidence that consumers of low-input and organic foods have specific expectations with respect to quality characteristics of processed food. It is therefore essential to develop a framework/code of practice, which can be used to determine whether novel processing strategies are compatible with organic processing standards and/or principles and consumer demands and expectations.

QLIF subproject 5 addressed these issues through three targeted research efforts.

Processing for food quality and safety
The first research area focused on the development of a consolidated framework/code of practice for the evaluation of minimum and added-value processing strategies in organic and low-input food production and processsing with respect to food quality and safety. The specific aims were:

- to identify the different underlying principles proposed for organic and minimum-processing and low-input food processing
- to analyse current approaches and concepts in organic food processing
- to identify differences in processing standards/regulations in Europe in order to identify areas for harmonisation and revision and further development

Photo: BLE

Photo: University of Helsinki

The main results of the research show that there is an importance of clear principles and related criteria for the evaluation of additives and processing methods. In the mind of consumers additional principles are present, when compared with the present rules. The gap between consumer expectations and the given rules (EU Regulation 2092/91, IFOAM Basic Standards, Codex Alimentarius Guidelines) can cause problems. Thus, it is important to build a solid link between the regulations and consumer perceptions. The principle of carefulness/careful processing might be helpful for the communication between manufactures/retailers and consumers. Generally, other means instead of new state rules are recommended (e.g. code of practice).

Replacement of chlorine for cut vegetables
The second research area comprised an assessment of chlorine replacement for fresh cut vegetables. The focus was on the use of alternative sanitising protocols under controlled laboratory conditions in the processing of fresh cut lettuce and mixtures of fresh-cut-vegetables. This was followed by microbiological assessments and sensory evaluation after different storage temperatures. The aim was to evaluate the disinfection methods under commercial conditions and to develop guidelines for the use of acceptable processing strategies for fresh-cut-vegetable products.

During the studies it was proven that, with regard to ecological aspects, ozone is a good alternative to the existing disinfectants, such as chlorine, in the organic field. Thus, the

results of the pilot test could be proven in industrial application and basic data for a specific application were obtained and are available. However, basic data for a general application as disinfectant are not yet available and research in this field is needed. In addition, the fact that ozone makes a chemical reaction does not comply with the council regulation (EC) No 834/2007 of June 2007, but with the use of all allowed and existing disinfectants, a chemical reaction is occurring.

Photo: Organic Denmark

Nutritional composition of dairy products
The third research area was devoted to an assessment of processing technologies that may improve the nutritional composition of dairy products. Issues treated were related to:

- comparison of fatty acid profiles and CLA (conjugated linolenic acids) content between organic, low-input and conventional processed dairy products
- shelf life analyses: identify differences in product stability and sensory quality
- evaluation of novel processing procedures which maintain or increase the CLA content of dairy products.

CLA in organic and processed dairy products
During the studies it was found that organic dairy products show higher levels of CLA than standard products (influenced by diet of cattle). Further, the normal processing procedures of dairy products and storage do not affect the content and isomer profile of CLA in dairy products. Thus, in commercial fermented dairy products like yoghurt, cheese, and butter made from fermented cream, the fermentation has no effect on the CLA content.

Oxidation processes related to shelf life
Conventional butter and PUFA/CLA-enriched butter (diet of cows supplemented with sunflower seeds) were produced at the ALP pilot plant twice (May 2006 and September 2006).

Using different methods to assess oxidation (GC-O, sensory method, holistic method) it was found that enrichment of CLA by diet of cattle (oilseed) has an influence on quality of milk products. For butter this included nutritional-physiological advantages and softer texture. Aroma extraction dilution analysis was performed to identify the most potent odorants in UFA/CLA butter and in conventional butter. The quantification of the most potent odorants of UFA/CLA and conventional butters was performed using stable isotope dilution assays.

Processing procedures to enhance CLA
Processing procedures to enhance the CLA content in dairy products were tested during the experiments. One technique tested was based on the use of reported micro-organism strains with high CLA-producing potential. Yet, a methodology to measure unesterified CLA as produced by micro-organisms in fermented products could not be firmly established and therefore the potential for CLA enhancement could not be properly evaluated.

As another type of procedure, selected physical separation process enables CLA enrichment. And such physical enrichment processes are accepted by international organic farming and food groups. The test results showed that a higher CLA content was found in the olein fraction in both types of butter. However, while a CLA enrichment of 32.5 percent was obtained in the olein fraction for conventional anhydrous butterfat, alpine butter shows only 15.3 percent enrichment. Given the costly and complex process involved, this is low, and furthermore too small to achieve any decisive positive impact on human health.

Photo: ICROFS

QLIF subproject 5: Development of a framework for the design of minimum and low input processing strategies, which guarantee food quality and safety

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Selected publications

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About QLIF

The Integrated Project QualityLowInputFood aims to improve quality, ensure safety and reduce costs along the organic and low-input food supply chains through research, dissemination and training activities. The project focuses on increasing value to both consumers and producers using a fork-to-farm approach. The project is funded by the European Union and runs from March 2004 to March 2009. The research involves thirty-one research institutions, companies and universities throughout Europe and beyond.

QLIF comprises seven subprojects on:

1) Consumer expectations and attitudes
2) Effects of production methods
3) Crop production systems
4) Livestock production systems
5) Processing strategies
6) Transport, trading and retailing
7) Horizontal activities

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Information on partners and subprojects is found at the project website **www.qlif.org**. The website also holds the library for project newsletters and serves as entry to Organic Eprints, where more than 100 publications from the QLIF project are available: http://orgprints.org/view/projects/eu_qlif.html

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