
COST actions on food and health

Lectures

L3.1

Health effects of bioactive components in plant foods; results and opinion of the EU-COST 926 action: “Impact of new technologies on the health benefits and safety of bioactive plant compounds”

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This paper reviews the main results of EU-action: “COST 926: Impact of new technologies on the health benefits and safety of bioactive plant compounds”. The action’s aim was to ensure that maximum benefit for public health and competitiveness of the food and related industry is gained from the application of new technologies in cellular and molecular biology in the study of bioactive components in fruits and vegetables in relation to disease prevention.

The project was organized in four topics:

- Recently introduced molecular tools
- Gene expression and disease
- Phytochemicals and gene expression
- Bioavailability of phytochemicals including the effect of processing

The action published a dozen review papers dealing with the bioavailability and health effects of: carotenoids, flavonoids, glucosinolates, phytoestrogens, tannins and phytic acid. The main findings of these reviews will be presented. New research technologies (‘omics’) enable us to address these issues by monitoring patterns of gene expression in humans and to provide essential molecular biomarkers of early disease. By combining such data with knowledge of the dietary exposure and bioavailability of the most effective compounds it will be possible to predict the most effective dietary sources and to properly evaluate the potential role of many phytochemicals for human health in food products. The further use of ‘omics’ research will result in an enormous increase of our knowledge of the effects of phytochemicals on human health. Individual variation between humans will be addressed in more detail to allow for personalized nutrition. Effective delivering of important phytochemicals to consumers will require the optimization of supply chains ‘from farm to fork’. The current supply chains result in a large variability in levels of selected phytochemicals in plant products that are consumed. Developing new cultivars with optimized profiles of phytochemicals should be combined with improved food processing in industry

and preparation by the consumer to optimize the bioavailability of the selected compounds.

COST926 website: www.ueb.cas.cz/COST926/.

L3.2

Good Guys and Bad Guys produced by Maillard reaction: how to promote healthy processing and cooking

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Processing is essential for producing foods which are microbiologically safe, have increased nutritional quality and reduced levels of potentially toxic compounds. Food processing fits with the European style of life, by increasing the shelf-life of products. In many food items, such as baked or roasted products, thermal treatment is indispensable for determining the specific nutritional and sensory properties, in particular texture, flavour and colour. Recent data have indicated that thermal treatment may induce the formation of health-promoting components, such as antioxidants and antimicrobial agents, which have not been studied in detail so far. On the other hand, processing may also lead to the formation of heat-induced contaminants, such as mutagenic heterocyclic amines and acrylamide, particularly in fried potatoes and grilled meat, respectively. Since these food products have to be heated, to reach the acceptance by consumers (organoleptic profile) and governance (safety profile), best processing condition have to be found for improving the formation of added value compounds, while minimising formation of the harmful ones. Among the various reactions occurring in heated foods leading to the formation of new compounds the so called Maillard Reaction (MR) involving carbohydrates and proteins, but also oxidized lipids has a major role. The heat-induced formation of putative harmful compounds formed in the course of MR, like heterocyclic aromatic amines or acrylamide give rise to the question whether MRPs are tasty but toxic. From an evolutionary perspective, humans have been cooking for a relatively short period. It seems questionable whether humans have adapted to a broad range of chemically different MR products. Among the many compounds which are formed upon thermal treatment of foods two raised many concerns in the last few years: acrylamide and heterocyclic amines. Their concentrations in foods depend of raw material composition, processing parameters, technology and cooking practices. The other side of the coin: heat treatment of food causes the formation of health-promoting compounds. Many studies have demonstrated that imidazole, pyrrolinones, and furfurals are

MR products with antioxidant activity present in coffee, bakery and other food products. In bread crust a huge amount of a protein-bound pyrrolinone known as pro-nyl-lysine, able to modulate liver enzyme activity was identified. Recent studies pointed out that in many food items the main responsible of the antioxidant activity is the brown high molecular weight hydrophilic fraction called melanoidins. The physiological effects of melanoidins have been only partially elucidated thus far: some of them behave as dietary fibre and their antioxidant activity along the gastrointestinal tracts could explain some of the epidemiological evidence associated to melanoidins-rich foods such as coffee.

L3.3

Strategic Integration Of Consumer Dynamics And Product Property Kinetics: making a profit with product quality

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New models describing the change in time of product attributes like colour, taste or metabolite content can be used to predict the product quality in the supply chain if all environmental factors like temperature and relative humidity are known in advance. However this knowledge is useless when the demand for certain traits is not known. Consumer science can be used to determine the preference of certain consumer groups at one point in time, but that only tells us about the optimum situation. By studying the dynamics of consumer responses to marketing practices like promotions and to certain experiential attributes in combination with the concomitant variance often found in batches of these products, it becomes possible to integrate the consumer response and the product 'quality'. This allows calculating how the profit of innovations leading to higher quality or the investments in certain marketing techniques will be distributed among the chain participants. Quality distribution models for tomatoes are used to integrate with one consumer dynamics model to show the generic possibilities of this technique and the applicability in strategic discussions among chain partners for joint investments in innovation and marketing.

Keywords: Tomato, acceptance period, dynamic consumer response, modelling.