WP1 presentations, Lisbon meeting

Aspects related to decision support tools and Integrated Pest Management in food chains

Prof. Pasquale Trematerra, University of Molise, Campobasso, Italy

There are a number of tools available for pest management in food chains, but often the effectiveness of these approaches and how best to integrate them into a coherent and effective Integrated Pest Management (IPM) programme are not well understood. As a result, insecticide treatments based on an economic threshold are not typically performed and control strategies are often applied preventively, even when using tactics that do not have any residual effect.

Food Quality models

Prof. Ilija Djekic, University of Belgrade, Zenum, Serbia

I would like to present our research based on “Food Quality models”. The presentation will focus on models related to food quality such as sensory analysis, consumer science and preference mapping. Besides this quality dimension, the presentation will give some idea on calculating an overall total quality index when using some other quality parameters like colour, texture profile, etc. Literature review shows that there are two main constraints in obtaining a single score able to describe in a concise way the total quality: (i) the fact that quality parameters are evaluated using different units, and (ii) it is hard to define which parameter, can be considered more important than the others. Finally I would like to present an interesting quality model called “quality function deployment” that can be used.

Cereal solid foams processing and modelling

Dr. Guy Della Valle, INRA, Nantes, France
Dr. Kamal Kansou, INRA, Nantes, France

The « Materials Processing & Behavior » Group at INRA « Biopolymers Interactions & Assemblies » (BIA) focuses its activities on starchy products, foods and non-foods, envisioned as cellular and composite solids (bread, biscuits, extruded foams) at different structural scales, through various modelling approaches: phenomenological, mechanical, numerical and knowledge integration.

Mathematical modeling and simulation of food processing operations

Prof. Ferruh Erdodgu, Ankara University, Ankara, Turkey

The current focus of my research group and my colleagues are about the process modelling of microwave and radio frequency processes. Besides, the studies about to improve the conventional processes (like canning - sterilization and thawing of frozen food products) are still evolving.

Integrative Predictive Modeling for Food Safety and Quality

Prof. Cristina L.M. Silva, Universidade Católica Portuguesa, Porto, Portugal

To produce food with the required quality and safety, the whole chain has to be taken into consideration. From post-harvest/slaughter to processing, storage and distribution, the understanding of how physical, chemical and/or microbial parameters affect foodstuffs is crucial in order to control and predict conditions assuring its quality. The outcome should be shelf-life extension, with reduced environmental impact and consequently better food security.

The use of predictive modeling as an integrative tool takes into consideration the holistic approach to food safety and quality. A few case studies will be presented together with the advantages of using integrative predictive modeling in terms of food safety, quality and security.

Mechanics of Foods

Dr. Maria Charalambides, Imperial College London, United Kingdom

This talk will summarise food engineering research activities at Soft Solids research group, Imperial College. Studies on deformation and fracture in foods are performed with the aim to produce predictive models for industrial scale processing (e.g. cutting, extrusion, sheeting) or oral processing (first bite models). Emphasis is also given on the effect of structure on the bulk properties. The studies can be used in product design and optimisation.

Analysing heat and mass transfer in meat products from process operations to digestion

Jason Sicard, INRA, Clermont-Ferrand, France

We are using numerical methods to solve heat and mass transfer partial differential equation systems in order to predict meat products properties. Our studies take place from carcass chilling and meat transformation up to digestion. Studied processes are largely conventional, such as heat treatment, marination, salting and drying. Those deterministic models provide outputs to be linked with microbial growth or chemical kinetics models. We are also studying and creating models regarding human digestion.

Design of nanosized bio-based structures for food applications

Dr. Miguel Cerqueira, International Iberian Nanotechnology Laboratory, Braga, Portugal.

I work with the development of bio-based/edible structures for food applications, such as gels, films and coatings, packaging materials, encapsulation systems at nanoscale (particles and fibres). At this moment we are trying to relate the nano- and mesoscale characteristics (using techniques such as X-ray, SAXS, FTIR, Raman, AFM, SEM, TEM) to the properties of the developed structures. Finally, we want to use mathematical models to relate them in order to predict some of the final properties.

ASPA Group: Analysis and Simulation of Agrifood processes

Neus Sanjuán, ASPA Group, Universitat Politècnica de València, Spain

ASPA Group develops mathematical models to predict process behaviour, energy consumption and product quality. Models are based on general laws, statistical methods and also black box models (e.g. neural network). ASPA has also experience in environmental modelling through LCA and the use of LCA in Multiple Criteria Decision Making.

Physics-based modeling of food related processes on various scales

Prof. Heiko Briesen, Technical University of Munich, Freising, Germany

Depending on the phenomena to be studied there is a huge range of time and length scales that govern the corresponding food processes. Similar as experimental techniques act on those different scales also modeling and simulation techniques must be selected to reflect upon the scales of interest. The presentation will briefly highlight some of those simulation techniques form molecular to plant scale and exemplify their use.

Soft modelling of food: processes, properties, digestion and pathogens

Dr. Kristian H. Liland, Nofima – Norwegian institute of food, fisheries and aquaculture, Ås, Norway
Dr. Ingrid Måge, Nofima – Norwegian institute of food, fisheries and aquaculture, Ås, Norway

At Nofima there are many groups working with various aspects of marine and land based bio production, mainly directed toward the Norwegian industry. Some of the key foci of the data analysis group are process analytical technology in food and biproduct processes, modelling and mapping of food properties from spectroscopic measurements and imaging, analysis of sensory and consumer trials, and analysis of gut microbiota, food spoilage and pathogenic bacteria. Multivariate data modelling is a corner stone of our analyses. We employ and develop a larg host of different methods tailored for different demands.

Modelling of heat and mass transfer in food processing: solid foods

Dr Aberham Feyissa, Technical University of Denmark, Linby, Denmark

The primary research goals directed toward better understanding of the solid food processes, the **development of mechanistic, physical based mathematical models** that can be utilized for prediction, controlling and optimizing of the food production systems. Currently, our research is focused on modelling and simulations of heat and mass transfer during the processing of solid foods (baking, roasting, cooling and heating etc) and the resulting transformations, developing novel technologies (e.g., ohmic heating) for fast heating, and uncertainty and sensitivity analysis in the food processing .