

Third International Symposium on Sourdough—From Tradition to Innovation

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The application of lactic acid bacteria (LAB) in bread-dough fermentations (sourdough fermentations) has experienced a renaissance in the baking industry during the past decade because of the peculiar sensory properties of sourdough breads, their increased shelf life, and their nutritional value, as well as their image as natural, traditional food products. The exploitation of the metabolic potential of sourdough LAB is therefore a growing field for value-added applications in bread production. The



transfer of traditional sourdough fermentation to contemporary industrial bread production requires an in-depth knowledge of the properties of the fermentation microorganisms, the influence of their metabolic properties on bread quality, and the design of process parameters to control their activity in industrial processes.

The most recent developments in sourdough applications from an ecological, biochemical, molecular, nutritional, and consumer point of view were the topics of the Third International Symposium on Sourdough, held in October 2006. The symposium continues the series of symposia held in Verona, Italy, in 1996 and in Brussels, Belgium, in 2003. More than 120 professionals from industry and academia attended the 4-day symposium, organized by the Department of Plant Protection and Applied Microbiology, University of Bari, Italy, and by Cereals&Europe, the European section of AACC International. Several keynote lectures provided an overview of important developments in the areas of sourdough microbiology and sourdough applications; these were complemented by oral presentations and a poster session with more than 35 contributions. Several keynote lectures are published in the journal *Food Microbiology* (vol. 24, issue 2, April 2007). The symposium took place in Bari, a lively city in the Apulia region of Italy, which boasts a rich and diverse tradition of sourdough breads, among other dishes that render the Apulian gastronomy one of the most fascinating, irresistible, and healthy in Italy.

The first session focused on the functional properties of wheat components in baking applications. Herbert Wieser, Germany,

provided an overview of the chemistry of gluten proteins, their structural features involved in polymer formation, and novel insights into gluten modifications during sourdough fermentations.

The second session, on the biodiversity, genomics, and biochemistry of sourdough LAB, was opened by Luc de Vuyst, Belgium, who reported on recent studies on the biodiversity of microorganisms in sourdoughs. High-quality analyses of marker gene sequences and multilocus sequence analysis allow the rapid

taxonomic identification of microbial isolates and have led to the characterization of several new species of LAB, e.g., *Lactobacillus hammesii*, *L. spicheri*, and *L. rossiae*. Additional molecular methods (amplified fragment length polymorphism, randomly amplified polymorphic DNA, species specific PCR) have been shown to be highly suitable for identification of isolates at the strain level and for monitoring the dynamics of the microbial population during sourdough fermentations. Rudi Vogel, Germany, discussed the use of functional genomics for the identification and exploitation of the metabolic traits of *L. sanfranciscensis*, a key sourdough bacterium, that determine its competitiveness and its beneficial effect on bread quality attributes. A combination of a genome preview approach, proteome analysis, and HPLC methods for metabolic flux analysis enables a global approach for improved understanding of strain competitiveness, bacterial stress response in industrial fermentations, and aroma formation from peptides, amino acids, or lipids.

The session on biochemistry and physiology of sourdough yeasts and LAB was introduced by two keynote lectures on the physiology of LAB and yeasts. Michael Gänzle, Canada, presented novel insights into the metabolites of *L. sanfranciscensis* and other key sourdough LAB that influence bread quality. Recent work has characterized several oxidoreductases that influence dough and bread properties through the reduction of disulfide bonds in gluten proteins as well as the reduction of lipid oxidation products. Moreover, the characterization of exopolysaccharide production by sourdough LAB enables the fermentative production of hydrocolloids at the dough stage as well as the enrichment of bread with prebiotic oligo- and polysac-

charides. Elisabetta Guerzoni, Italy, highlighted flavor formation from yeasts and lactobacilli. Remarkably, the formation of flavor volatiles by sourdough yeasts is induced by acid stress as well as cross-exposure of yeasts to LAB. The accumulation of esters of long-chain fatty acids seems to be associated with phospholipase activation and cell membrane damage.

The session on process technologies and innovations was introduced by four keynote speakers who provided an industrial perspective on the development and application of sourdough and sourdough products. Paola Carnevali, Italy, presented research and development efforts by Barilla G&G, Italy, for application of a liquid sourdough to improve the organoleptic profile of industrial breads. Stephan Capelle, Belgium, reported on the application potential of a dextran-producing strain of *Leuconostoc mesenteroides* marketed by Puratos Group, Belgium, to improve the volume and texture of wheat and rye breads. Markus Brandt, Böcker GmbH, Germany, provided an overview of the production and application of dried and pasty sourdoughs with a long shelf life for convenient use in baking applications. These products combine the advantages of the biological fermentation process, with respect to flavor and shelf life, with the convenience of direct production of baked goods. Nicolas Bord, Lallemand, France, discussed issues pertaining to the selection and large-scale production of bacterial starter cultures for use in baking applications.

The session on texture, flavor, and aroma included the keynote lectures of Elke Arendt, Ireland, and Peter Schieberle, Germany. Elke Arendt discussed the effect of LAB and their metabolites on the texture and staling of bread. Organic acid production and the concomitant drop in pH modulate the protease and amylase activities of the flour and thus delay bread staling. Moreover, specific metabolic activities, such as exopolysaccharide production, have the potential to replace the more-expensive hydrocolloids used as bread improvers. Bread texture optimization is particularly challenging in the formulation of gluten-free bread for consumption by celiac patients; novel approaches to improving the textural quality of gluten free-bread by sourdough fermentation of nontoxic flours were presented. Peter Schieberle reviewed the "odour activity concept" for determination of key aroma compounds in rye and wheat flour, rye and wheat sourdoughs, and the final rye and wheat breads. Studies that determined flavor formation from "flour to bread" have established that microbial fermentation has a crucial role in flavor formation from the amino acids, lipids, carbohydrates, and phenolic compounds in flours. Improved knowledge about the biotransformation of flour components to aroma compounds enables the targeted development of baked goods based on the metabolic potential of the LAB and yeasts employed in dough fermentations.

The symposium concluded with a session on nutritional and health aspects of sourdough bread, a field of investigation that has rapidly evolved in the past few years. Key concepts for improving the nutritional properties of bread by using sourdough fermentation were put forth by Kaisa Poutanen, Finland, and Marco Gobetti, Italy. Established applications of sourdough to improve the nutritional quality of bread include the improved palatability of fiber-enriched bread, the reduction of antinutritive compounds such as phytate by sourdough fermentation, and the reduction of the glycemic index of wheat breads. The use of sourdough to decrease the toxicity of gluten to celiac sufferers

as well as to increase the concentration of bioactive components such as folates and free phenolic acids are emerging concepts with potential for future applications in the formulation of functional baked goods.

The excellent organization of the symposium made it a very successful and enjoyable meeting that provided ample opportunity for networking and scientific exchange. The Fourth International Symposium on Sourdough has been scheduled for October 14–17, 2009, in Freising, Germany.

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