Sustainability, Quality, and Health: The Past and Future of Cereal Science

A Report on the 5th Cereals&Europe Spring Meeting

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The 5th Cereals&Europe Spring Meeting, which was co-organized by Cereals&Europe (the European Section of AACC International) and the Department of Applied Biotechnology and Food Science of the Budapest University of Technology and Economics, welcomed more than 100 participants from 16 countries, who had the chance to enjoy 40 oral and 30 poster presentations. The scientific program offered a uniquely arranged overview of the different fields of cereal science—from breeding, through cultivation and processing, to end-product applications, including the quality and technological properties of raw materials and cereal-related health and food safety questions.

The event was opened by Zsolt Feldman (Hungarian deputy state secretary for agricultural economy). After welcoming the participants to the conference, Feldman highlighted sustainability, health, and quality as three of the most important keywords in modern cereal science. During the opening ceremony, as a part of the AACC International centennial year celebrations, four senior Hungarian cereal scientists, Radomir Lásztity, Zoltán Bedő, Lajos Szalai, and András Salgó, were honored for their outstanding contributions to Hungarian and international cereal research. Afterward, the historical review continued with lectures by Jan Delcour (AACCI past president) and Michaela Pichler (ICC secretary general and CEO), who both reflected on the history of their organizations and described the need and possibilities for future collaborations.

After the formal opening ceremony, plenary lectures provided an overview of some of the hottest topics of the conference. First, Eleonora Dupouy (FAO representative) discussed the importance of cereals in human nutrition and the challenges presented by a growing population and other global phenomena (e.g., climate change) and what they mean for agriculture. She also introduced a number of FAO initiatives aimed at tackling these challenges and providing a safe and sufficient food supply for the ever-increasing population of the planet in a sustainable manner. Potential solutions for these challenges include, but are not limited to, increasing the production yield of cereal crops. As Peter Shewry (Rothamsted Research and University of Reading) explained in his plenary lecture, breeding is a tool for increasing yield and improving the technological properties of cereals. However, there has been growing concern about breeding decreasing the quantity of healthy bioactive components in wheat. Shewry's research revealed that although the quantities of these components in modern varieties have not decreased, they may appear to be lower due to the diluting effect of high yields and starch. The opening session was closed by Jan Delcour (Katholieke University Leuven), whose talk dealt with another hot topic in cereal science—the opportunities for producing bioactive components, in this case prebiotics, from wheat bran. In his presentation, Delcour introduced a pilot-scale process for extracting arabinoylan oligosaccharides from bran and confirmed the prebiotic status of these oligosaccharides.
Work continued in subsequent sessions that focused on more specific topics. In session 1, attendees had the chance to hear about the latest advancements in breeding and its future tasks in terms of nutritional and technological quality. As Zoltán Bedő (Centre for Agricultural Research) described in his keynote lecture, there is a growing expectation for breeders to create wheat varieties that are richer in nutritionally beneficial bioactive compounds. According to Bedő, this can be achieved by studying the variability of these components among cultivars, selecting germplasms with higher quantities of bioactive components, and introducing them into European varieties. Another presentation revealed that triticale may be a very promising choice for cereal product development because it contains high levels of bioactive compounds. In addition to nutritional aspects, improvement in the baking quality of wheat remains a major goal of breeding, which is closely related to gluten content and composition. However, the closing presentation in this session reported that temperature and other environmental factors also have a significant impact on gluten strength.

The first day of the conference concluded with session 2, which turned the attention of attendees toward the analytical methodology of wheat qualification and the tools of predicting wheat quality. Keynote speaker Stefano Renzetti (TNO) introduced the challenge of producing bakery products with lower sugar or fat contents and the applicability of different analytical methods for creating reformulated products with optimal baking qualities. The session covered a wide range of analytical method applications, e.g., how to apply laboratory methods to improve product quality, a new rapid method for studying gluten behavior, and an imaging methodology for studying grain defects and foreign materials. The use of isotopic analysis to identify the geographic origin of spelt grains was the topic of one presentation. Development of predictive tools was another important topic covered. Examples of this approach were the application of traditional rheological methods to predict sensory moistness of toasted breads and the prediction of traditional viscosograph values from RVA data.

On the second day of the meeting, health and food safety issues were the center of attention. The day opened with a plenary lecture given by Fred Brouns (Maastricht University), in which he addressed the growing consumer interest in reducing gluten intake. To provide scientific evidence for the validity of this trend, Brouns introduced an initiative for human trials on gluten consumption. After this lecture, a forum discussion on the best practices for the development of products with health claims, organized by Campden BRI Hungary, took place. Strongly connected to these issues, session 3 dealt with the technological and sensory aspects of a health-promoting cereal-based diet. Keynote speaker Emilia Nordlund (VTT) highlighted the increasing demand for health-promoting foods accompanied by snacking as an increasingly preferred eating habit and the need for development of more health-promoting, cereal-based snack products. The session also provided an overview of the role of cereals in human nutrition and some related facts and myths. Multiple presentations discussed issues concerning a common health-promoting cereal product, whole meal bread. One of the concerns raised is related to consumer perception of these products, which might be compromised by adding colorants to breads that lead consumers to attribute higher fiber content to these products. Another is the problem of the shorter shelf life of these breads, which can be improved by the application of different enzyme solutions. Finally, another important question discussed was how the addition of health-promoting components (e.g., fibers) affects the baking quality of these products.

The focus of session 4 was food safety issues related to cereals. In his keynote lecture Peter Koehler (Deutsche Forschungsanstalt für Lebensmittelchemie) provided the audience with an overview of the most important safety issues related to cereals: mycotoxins, foodborne toxicants, and cereal-related disorders. The latter problem was discussed repeatedly during the session—in presentations covering the analytical problems of gluten analysis in general and in starch samples specifically and an effort to ease analytical difficulties through the development of a gluten reference material. The session also covered the improvement of risk assessment of masked Fusarium mycotoxins through the use of an enzymatic method.

Finally, session 5 closed day 2 with a discussion on underutilized cereals and pseudocereals and their applicability in gluten-free products. In the keynote lecture, Regine Schönlechner (University of Natural Resources and Life Sciences) shared the
results of collaborative research that investigated the chemical, rheological, and bakery properties of specialty cereals and their potential use in gluten-free products. Other topics in this session included the characterization of the swelling of granules of different types of starch and the antioxidative properties of malted purple and blue grains.

The last day of the conference kicked off with session 6, which focused on product quality development for the 21st century. Keynote speaker Christophe Courtin (KU Leuven) explained that there is a price to pay for the incorporation of bran and its healthy components into cereal products when it comes to the baking quality of these products. However, there are promising results showing that these undesirable effects may be compensated for by changes in the breadmaking procedure. The presentations in this session argued that to develop products that meet the requirements of today’s consumer, it is necessary to gain more insight into the molecular events taking place during the production of cereal products. Such events include the behavior of gluten and starch; their interactions with each other and with other components; staling, enzymatic, and fermentation procedures; and the effects of the raw materials used on product quality.

Finally, during session 7 traditional and novel technological developments were compared from a sustainability point of view. In the keynote presentation, Walter von Reding (Bühler) emphasized the importance of making the cereal industry sustainable and increasing energy and overall efficiency and compared traditional and novel technologies in this regard through a case study of a new milling technology. The presenters in the session also provided solutions to reach these goals, e.g., application of new fermentation methods, development of low-energy ovens, and use of industrial by-products as food ingredients.

Attendees socialized during the Gala Dinner held at the splendid and monumental University Hall of the Budapest University of Technology and Economics. The dinner included professional folk dancers from the Hungarian National Dance Company, members of the university’s symphony orchestra, and an introduction to the rich culinary culture of Hungary through fine foods and wines; all of which made a deep impression on the participants.

The 5th C&E Spring Meeting provided an excellent opportunity for the European cereal science community to become familiar with the latest advancements in many important areas of cereal research and to extend their professional network, while celebrating the long and productive past and promising future of the field.

Detailed program information can be found online at www.cespringmeeting2015.org.

Acknowledgments
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