Quality Assurance and Safety of Crops & Foods

ICC MoniQA

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EVENT REPORT

CST-SA – ICC international grains symposium: quality and safety of grain crops and foods, 3–5 February 2010, University of Pretoria, South Africa

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Introduction

South Africa is proud to celebrate its diversity by describing itself as the 'rainbow nation'. The International Grains Symposium organized by Cereal Science and Technology South Africa (CST-SA) and the International Association for Cereal Science and Technology (ICC) certainly celebrated the diversity with around 150 scientists and technologists (a number which exceeded the organizers expectations) from 17 countries gathering to discuss Quality and Safety of Grain Crops and Foods.

The primary raw materials discussed included wheat, barley, maize, sorghum, millets, rice, spelt, tef and even Marama beans, an as yet undomesticated legume. Along with the wide variety of raw materials the symposium covered a wide range of final products. In addition to many types of bread speakers considered cookies, gluten-free products, beer and even fish feed. In describing her work on fish feed Corinda Erasmus, CSIR Biosciences South Africa, highlighted the unique challenge she faced in persuading carnivorous fish species to turn 'vegetarian' so that she could examine the impact of changes of feed composition on the growth of farmed fish. In five sessions the symposium ranged from crop breeding and evaluation, crop storage and risks, product manufacture and development, along with impacts on diet and health.

The Executive Director of the National Chamber of Milling in South Africa, Jannie de Villiers, set the scene with a keynote paper on 'The two legs of food security – South Africa, the way forward'. He described the cereals world as being between two storms, both related to the complex relationship between the prices of oil and grains. He emphasized the need to invest in order to meet demand and the key role that science has to play in increasing food production. He identified key issues as being food security (the availability of sufficient food), problems with water resources and shortage of skills in cereal science and technology. In South Africa they are trying to address the latter by providing bursaries for students to study and carry out grains-related research work. In the session which followed de Villers opening address a number of the scientific presentations were made by recipients of bursaries.

Synopsis of the technical sessions

Grain breeding for quality

Sam Millar, UK, opened the session by describing some key results from a 7-year research project which aimed to link quality attributes in UK wheat with those in bread and puff pastry products. A total of 606 quality trait loci (QTL) were identified for milling yield, loaf volume and crumb softness. The numbers of QTLs involved only served to highlight the complexity of the wheat grain. The non-destructive examination of the characteristics of single wheat kernels was the subject of a presentation by Floyd Dowell, USA. The potential to sort individual wheat kernels is of immense value to wheat breeders who are seeking to deal with a range of quality issues.

Rachael Oelofse considered the role of sodium dodecyl sulphate sedimentation test in aiding the selection of wheat breeding lines in South Africa. The test was chosen because of its relevance to baking quality. Her findings suggested that high dough strength was not necessarily a requirement for South African wheat varieties. The 'local' theme was continued by Mayke Labuschangne who also considered from her studies of the polymeric and monomeric proteins that breeding for higher protein quality was not necessarily the ultimate aim in South Africa. Mark Laing widened the discussions and addressed the important issues related to breeding for agronomic and herbicide resistance with a number of South African cereal crops. He referred to the use of the Cyclotron in Japan to induce genetic changes in grains.

Grain processing for safety and quality

Stanley Cauvain, UK, reminded attendees that wheat and flour specifications had to be relevant to end-product quality by considering the impact of gluten quality on some

aspects of dough processing and bread quality. Using examples form when the Chorleywood Bread Process was launched in 1961 he questioned the relevance of some of the dough testing and processing methods still in use. Practical aspects of using tef in breadmaking and its nutritional benefits were assessed by Meinholf Lindhauer, Germany. Tef has its origins in Ethiopia and could be added as flour or whole kernels. The importance of grain conditioning by the miller was considered by Jan Cilliers, South Africa, who examined the impact of conditioning times on soft and hard South African wheats.

Methodology for grain and food quality and safety assessment

The grading and uses of Australian wheat varieties were considered by Bob Cracknell. He described the changes in approaches to wheat classification, which now was under the umbrella of the Wheat Classification Council and based on a broad spectrum of industrial stakeholders. Marena Manley, Stellenbosch University, described applications of near infrared hyperspectral imaging to the study of maize and wheat kernel hardness and the development of fungal infections with maize – a major crop in South Africa.

The relevance of rheological testing to cultivar segregation was considered by Arnaud Dubat, Chopin Technologies, France. The variability of wheat flour as a consequence of both geographical location and environmental impacts was considered in the context of the projected end-use of for the flour. The relevance of testing equipment and methods was also considered by Bronwyn Elliott, Perten Australia, in the context of using the rapid visco-analyser to evaluate extruded foods and feeds. Of particular importance was the degree of cook, which could be achieved in the extrusion process itself.

Roland Poms, the ICC Secretary General, Austria, described the mechanisms behind some selected rapid method for evaluating food safety and quality. Some of the work considered came from the MoniQA project, which involved many different countries around the world in examining the harmonization of approaches to food safety.

Idelet Meijering, SAB Malting, South Africa, changed the focus of the meeting by looking at pesticide-related issues relevant to brewing. She reviewed a case study on the presence of Lindane, which had created a safety issue some years after it had been banned. A key message from her presentation was the need for constant vigilance even though the relevant 'systems' and documentation may be in place.

Hayat Abd El Rahman Hassan provided an overview of cereals research in Sudan. He considered the traditional products of the region and how changes in processing were contributing to increase the safety of foods in an area which faced many challenges related to food security for all.

Nutrition and health

Concha Collar, Spain, addresses the major nutritional challenges to which grains could make a positive contribution. In addition to wheat, rye, oats, Kamut, spelt and buckwheat were considered and the final qualities, including palatability, of products made with mixtures such grains were identified. Jan Willem van der Kamp, the Netherlands, continued the health theme and described the EU-funded Healthgrain project. Target 'healthy' compounds in the project include vitamins, phytochemicals and various types of dietary fibre. Vitamin analysis was addressed by Sigrid Hans-Lauterbach, R-Biophram, Germany. She also considered the evaluation of flours fortified with folic acid.

The protein quality of maize grown under low nitrogen stress conditions was considered by Angeline van Biljon, South Africa. Low nitrogen stress decreased tryptophan and protein concentrations in the grain and increased the protein quality index. Solid-state fermentation processes have been used to engender improvements in the nutritional and sensory qualities of cereal flours and Lewis Ezeogu, Botswana, described work on improving the nutritional properties of fermented sorghum flours using enzymic actions.

The development of gluten-free foods in Scandinavia using traditional African grains was discussed by Mats Stading, Sweden. The prolamins in sorghum and maize, kafirin and zein showed extensional properties, which were useful for the baking of leavened breads.

Grain and food quality and safety

Using NIR to evaluate grain properties, particularly barley aimed for brewing, at intake to allow millers to decide how to handle the material being delivered was the subject of a presentation by Gunner Nilsson, Sweden. Martin Kebakile from Botswana continued the grain quality theme and examined the quality parameters relevant for the industrial uses of twelve types of sorghum.

Andrew Flounders, Denmark, outlined and explored some of the traditional methods of measuring wheat flour properties and discussed the limitations of the methods in the context of the flour specifications and use in baking. Of particular relevance was the role of different potential

enzyme additions on dough rheology and final baked product quality.

The current situation with respect to the contamination of cereals with mycotoxins in South Africa was summarized by Mike Dutton, South Africa. Mycotoxins remain a critical area of food safety and the management of methods used to harvest and store grains can have a profound impact on the potential problems. Three projects involving the fermentation of cereals were described by P.J. Jooste, South Africa. In a fermented maize beverage a range of probiotic *Lactobacillus* species were tested for their growth in maize gruel and sensory acceptability of the resulting products. Pressed oilcake and soy milk were the two other products.

The contributions of protein and starch were considered in two papers from South African presenters. Nosuma Diamini examined the by-products of cereal processing as sources of protein ingredients. Kafarin from the sorghum brewers spent grain and pennisetin were investigated at laboratory and pilot-scale. Naushad Emmambux investigated the effects of treating teff and maize starches with stearic acid using the Rapid Visco-Analyser and confocal microscopy. Higher paste viscosities were attributed to the probable formation of amylose-stearic complexes and may have the potential for use as fat-replacers in food production.

Conclusions

This wide ranging symposium programme highlighted the diversity and complexity of grain-based foods. The scientific sessions were well attended with a capacity audience present from start to finish. In addition to the scientific sessions there were a large number of posters to read and a technical exhibition to visit. Before the gala dinner guest were entertained by The University of Pretoria (UP) Chorale who were formed some 12 years ago. The members of the Chorale all come from the University and they performed a variety of songs and dances that are indigenous to South Africa. At the end of the symposium it was very clear the entertainment had ensured that South Africa lived up to its reputation as the 'Rainbow nation' and all concerned with the organization of the event had demonstrated a degree of professionalism at least the equal to other events in the cereals world. I hope that there will be future events of this quality organized by our colleagues and friends in Africa.

A short note on the University of Pretoria

The University of Pretoria has its origins in the establishment of the Pretoria Centre of the Transvaal University College in 1908 and became affectionately known by the acronym TUC (Tuks or Tukkies). It started with four professors, three lecturers and 32 students. Its name was changed in 1930 to the University of Pretoria when it was the largest tertiary institution in South Africa with > 900 students.

Today UP is the leading research university in South Africa and one of the largest in the country. With six campuses (and still expanding), UP offers > 1800 academic programmes and has 50 000 students. The academic programmes at UP are offered in nine faculties, 140 departments and 85 centres, institutes and bureaus. In 1996, UP became the university with the highest research output in South Africa, a status it has proudly maintained and it remains at the forefront of tertiary education in that part of the world today.

Pictures courtesy of Roland Poms, Secretary General, ICC

Figure 1: Jannie de Villiers, Executive Director, National Chamber of Milling, South Africa, delivers the keynote paper.

Figure 2: Dr Janet Taylor, Chair, CST-SA and Professor John Taylor, ICC President, both of the University of Pretoria and prime movers behind the meeting listen to the technical presentations.

Figure 3: Meeting attendees at the technical sessions.

Figure 4: Meeting attendees at the technical sessions.

Figure 5: Professor Mark Laing, Africa Centre for Crop Improvement, University of KwaZulu Natal, South Africa, raises a question during the technical sessions.

Figure 6: Kathy Surmon, Danisco, South Africa, a key member of the organizing committee.