Sustainability, Genetics, and New Technologies

Report on ILSI SEAR / AACC Symposium, held July 28, 2015, in Melbourne, Australia

ILSI SEAR Australasia, in cooperation with the AACC International (formerly American Association of Cereal Chemists) (AACC), and supported by CropLife Australia, held a one day symposium on the 28th of July in Melbourne to discuss Sustainability, Genetics, and New Technologies as they pertain to the production and handling of cereals in Australia. Approximately 50 people representing the research, industry and regulatory sectors met and listened to speakers discussing a range of topics, before a group panel discussed some of the future challenges in the area of cereal development.

Professor Geoffrey Fincher, the director of the ARC Centre of Excellence in Plant Cell Walls, and Dr. Kim Plummer, the President Elect of the Australasian Plant Pathology Society and Head of the molecular plant pathology group at AgriBio, La Trobe University, talked about new technologies and their impact on plant breeding, plant protection and biosecurity. Prof. Fincher began by explaining some of the recent advances in his research on the regulation of plant cell wall synthesis. These advances, thanks to high throughput sequencing technologies like RNAseq, are symptomatic of advances being seen in other plant research fields. Dr. Plummer also highlighted the advances in the field of omics; genomics, transcriptomics, proteomics, and metabolomics. These fields of research rely on collecting vast amounts of data which allow for the identification and study of large groups of genes and proteins. Prof. Fincher stated that despite these advances, traditional cytological and molecular techniques like transgenic analyses still had a strong role to play in molecular plant research, giving the example of his own work studying the regulation of the development of the barley endosperm.

Both speakers also talked about the challenges facing the industry in regards to plant pathogens. Dr. Plummer noted that over $900 million is lost every year in Australia due to crop losses relating to pathogens like stripe rust and yellow spot. However, these losses would be far greater, exceeding $3 billion annually, if we did not have our current control measures available to use. Dr. Plummer used the cautionary tale of Ug99, a particularly virulent lineage of wheat stem rust discovered in Uganda in 1999. Since then, Ug99 has spread through large parts of Africa and the Middle East and threatens to spread elsewhere. It has shown itself to be virulent to a range of previously resistant wheat varieties.

Fortunately for the crop industry, the various omics based technologies are giving researchers access to much more data than was previously available. This allows researchers to scan for differences between genetic resistance factors to pathogens to identify what exactly is giving pathogens like Ug99 their virulence.

The symposium next focussed on some of the technological advancements being made in the agricultural biotechnology sector, and consisted of presentations from Mr. Tony May, the Technology Development Lead at Monsanto, and Ms. Sue Cross, the Head of the Crop Protection Development Department for Bayer CropScience in Australia.
Both speakers gave an overview of the research currently being undertaken by their organisations in developing new crop varieties and agri-chemicals to reduce the effect of pathogens on crops, and also touched on efficiencies being made in agronomic practices. Mr. May and Ms. Cross both pointed to the need for global food production to increase, with estimates saying production will have to double by 2050 to feed a growing global population. Despite this, only 3% of the Earth’s surface is suitable for farming. Ms. Cross suggested reducing losses in yield due to pests, weeds, and diseases could account for a large amount of these estimated increases.

Mr. May pointed to Monsanto’s development of new pest resistant crop varieties like Bollgard® 3 cotton and Xtend™ soybeans as a way to decrease crop losses. He also showcased some of the company’s technological improvements such as their seed chipper, which enables non-destructive genetic testing of individual seeds. Mr. May said Monsanto was investing heavily in other important research areas too, such as bee health and climate science.

Ms. Cross said advances in agri-chemicals were becoming harder to make. In the decade from 2000, Bayer found one successful compound that conformed to safety and regulatory standards for every 150,000 compounds they tested. Bayer’s response has been to invest in automation and other processes to speed up the discovery rate of useful compounds. Another Bayer investment includes their new Weed Resistance Competence Centre in Frankfurt, Germany, aimed at understanding resistance mechanisms of pesticide resistant weeds.

The third part of the symposium invited Mr. Pat Wilson from GrainCorp Ltd, Dr. Roger Bektash from Mars Asia-Pacific and Dr. Janet Gorst from Food Standards Australia and New Zealand to speak. Between them, they explained the processes and the challenges of moving cereals from the farm to the consumers. They discussed the logistical, safety and regulatory difficulties that the industry faces.

Mr. Wilson explained the scope of the issue; GrainCorp alone services over 14,000 growers across the country and ships up to 280,000 trucks of grain every year. This creates an incredibly complex supply chain which must be managed and documented. After harvesting, grain is stored and tested in a range of ways to determine its quality and suitability for the market. The grain might be transported and stored several more times before being shipped to its final destination, which can be overseas. The ability to trace back this shipment at any stage to its origin is crucial in ensuring a safe final food product. Another major challenge of the transportation process is the multitude of regulations that must be followed. There are significant regulations covering the transport, quarantine and export of the grain as well as regulations covering any Genetically Modified (GM) grain that is collected. Other certifications, like Halal and European Sustainable, are often sought to improve marketing and to facilitate shipment to other regions of the world.

Dr. Bektash stated that globally in 2013, Mars used 6.8 million tons of raw materials, a large portion of which was grains. One of the most important focuses for Mars, Dr. Bektash explained, was the consumer experience. Product quality and high food safety standards are therefore paramount. Like Mr. Wilson, Dr. Bektash highlighted the importance of ‘farm to fork’, the ability to trace a crop from initial production to its end use.

Dr. Bektash then discussed Mars’s approach to dealing with mycotoxins in food. Understanding the risks and potential hazards at each step of the food production chain, from the field and harvesting, through to storage and manufacturing of the final product, is key to ensuring the safety of Mars products. Dr. Bektash was questioned about his industry’s approach to GM. While companies like Mars see great benefits in GM crops ultimately, he said, the customers have the final say.
The final speaker, Dr. Janet Gorst, who presented the immense challenges facing the regulatory body Food Standards Australia and New Zealand (FSANZ), specifically when regulating the range of New Breeding Technologies. In 1999, FSANZ developed a broad regulatory code for GM. Subsequently new GM technologies have been developed, ranging from targeted mutagenesis processes like CRISPR, to transient expression techniques. There is uncertainty as to whether the current code adequately covers these new breeding techniques.

Lastly, a panel comprised of Dr. Geoffrey Annison from the Australian Food and Grocery Council, Dr. Heidi Mitchell from the Office of the Gene Technology Regulator, and Dr. Phil Reeves from the Australian Pesticides and Veterinary Medicines Authority, engaged the group in a robust conversation on a variety of issues relating to GM crops. The panel was chaired by Professor Les Copeland from the University of Sydney.

Several questions focussed on the issue of the risk, or perceived risk, of GM foods amongst consumers. It was noted that GM is viewed by some consumers quite negatively. Poor communication of the safety of GMOs by scientists and industry was given as one possible reason why this is so, while others argued that marketing of products as ‘organic’ or ‘non-GM’ has created a negative impression of GM. If marketers use ‘non-GM’ as a positive selling point, it is reasonable that consumers may view GM products as inherently negative. A similar point was raised in relation to the use of ‘spray-free’ or ‘hormone-free’ claims in marketing. Labelling products as containing or possibly containing GM products was argued as one way to show the widespread use and consumption of GM products, in an attempt to alleviate fear of GM. The point was raised that science and industry groups have been debating the best way to explain the safety of GM food to the wider community for decades, with little or no change in public perceptions.

The panel also discussed the issue of regulation of GM foods. The OGTR is preparing for a review of the Act covering the regulation of GM plants released into the Australian environment and are hoping to use it as an opportunity to update and future proof the Act. Dr. Mitchell said it would be a potential chance to harmonise the regulatory standards of the OGTR and FSANZ, and bring Australia’s regulations into harmony with the global community. Other regulatory issues discussed included regulating the marketing of food products as either ‘GM’ or ‘non-GM’. Dr. Annison said that research showed that the public does not view GM as an important community issue relative to other issues like job security or education. Despite this, supermarkets and other retailers were constantly trying to offer a perceived benefit in order to ensure customer loyalty. This included marketing food items as ‘non-GM’ or ‘pesticide free’.

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